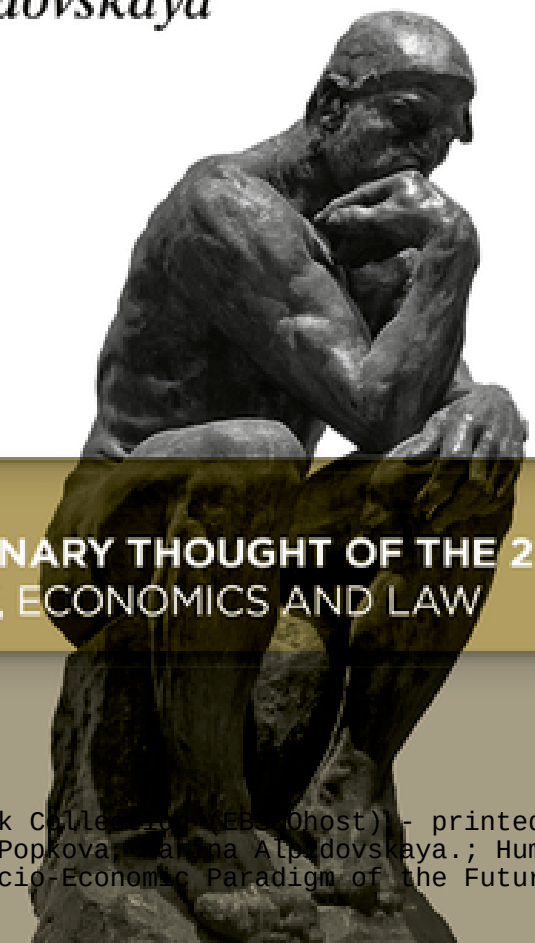
DE GRUYTER

# HUMAN AND TECHNOLOGICAL PROGRESS TOWARDS THE SOCIO-ECONOMIC PARADIGM OF THE FUTURE

PART 2

*Edited by Elena G. Popkova and Marina Alpidovskaya*



INTERDISCIPLINARY THOUGHT OF THE 21ST CENTURY
MANAGEMENT, ECONOMICS AND LAW

# Human and Technological Progress Towards the Socio-Economic Paradigm of the Future

# Interdisciplinary Thought of the 21st Century

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Elena G. Popkova and Artem Krivtsov

## Volume 1

# Human and Technological Progress Towards the Socio-Economic Paradigm of the Future

Part II

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Elena G. Popkova and Marina L. Alpidovskaya

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# Introduction

The combined problem of the digitization of the economy, the digitization of humanity as a whole and human existence in time and space as a subject has been actualized in recent times. Indeed, the projects of the future world economy are inextricably connected with the achievements of scientific and technological progress linked with global social and economic transformations at the system and intersystem levels.

Nevertheless, the question of urgency and the imminent necessity of these events arises. Is this process so necessary for modern Russia and other countries of the globalized world and what is its impact on the economic and social life of sociohistorical organisms? Back in the early 2000s, Robert Solow, winner of the Nobel Prize in Economics, wondered how the introduction of information technologies had an effect on the growth of labor productivity in various industries. The USA gave the answer – the staff of their Bureau of Statistical Analysis found out that the bi-factor productivity did not increase in any of the branches of the American economy, except for one – computer production. At the same time, there is a steady trend towards a decline in labor productivity and capital in the economy as a whole. In addition, the problem of universal access to information due to global Internet networks plays a less positive role in creating a favorable background of social comfort in the population of the countries of the global world. The standard of living of the notorious "golden billion", formed in the late 1950s and early 1960s due to the introduction of innovative technologies in all possible industries and a sharp jump in bi-factor productivity, is still not achievable for the remaining almost 5 billion people using all sorts of "Gadgets". This leads to the inevitable growth of social tension. . . Against the background of the "failures" of the modern socioeconomic system, some projects are offered to get out of this situation. Not all of these projects and proposals are unequivocal. Consequently, the outcome of their implementation is the same.

In modern society, it is very difficult for a person to manifest his or her creative purpose. The consumer function of administration has become the embodiment of life ideals, aspirations, ambitions, social significance and status weight. The problem of human creative and generative self-realization and realistic realization of ideas in the economy of the future has faced the present society.

Today, the variants of the future society are mostly drawn archaically harshly. However, we should not forget that, in accordance with the already established views, the acceleration of economic growth over the past 200–250 years of human existence was caused by three successive scientific and technical revolutions (STDs). The world is on the verge of the fourth. The West has always independently carried out technological "breakthroughs", relying on all sorts of incentives: trade and production incentives, financial advantages, better conditions for the functioning of capital, as well as global integration. Moreover, Russia has always been able to choose

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the path of forward-pragmatic-rational-emotional movement, which is able to bring out not only her and her satellites, but the rest of the world from the dimension of non-existence. . . In addition, if the future takes place, it will go along the development trajectory emotionally – an intuitive relationship space, remembering, of course, the ratio. . .

This volume is about these major trends in the development of humanity, society and economy.

Part II develops a socio-economic paradigm of the future in the context of digital transformation. The problem of the provision of an economy's openness in the conditions of globalization of the world economic system is considered using the example of modern Russia. The tendency of archaization of socio-economic relations is determined, as a manifestation of national modernization, which is connected with the gradual disappearance of ineffective institutes ("institutional traps") and their replacement by new institutes.

Attention is paid to the regional aspect of the digital economy – perspectives of development of the ethno-economy in the context of integration of regional economic systems are determined. The problem of preserving social identity and supporting the uniqueness of competitive advantages of the region's economy in the conditions of digitization is actualized, and its perspective solutions based on region's globalization management are offered. In addition, the problem of national and regional food security is considered. Increased social significance of the agro-industrial complex and the necessity for its de-economization on the platform of the digital economy are substantiated.

A new concept of the market economy in the conditions of digitization and the Fourth industrial revolution is developed; the economic power of technological progress and possibilities of managing and re-directing this power are determined. The authors substantiate the transition to the Sixth technological mode and the related transformation processes in the economy. Furthermore, the authors focus on the problem of the shadow economy and corruption and consider the perspectives of its overcoming based on the possibilities of digital technologies. The idea of deregulation based on the possibilities of automatization and AI is opposed to the idea of the increase of state regulation based on ubiquitous computing and digital monitoring of economic activities. The perspectives of increasing the economy's transparency in the digital age are identified.

The alternatives to the current model of development of the digital economy are given, and scenario analysis of consequences of observing these models based on the cognitive approach is performed. New opportunities for the development of the integration processes in entrepreneurship in the conditions of the digital economy are shown – in particular, in the aspect of inter-regional and transnational sectorial clustering. Clusters are considered as growth points of the Russian economy, and new Russian experience of formation and development of clusters in the sphere of higher education in the context of region's economy is studied.

The authors examine the contribution of technological developments in entrepreneurship in modern Russia and come to the conclusion that, despite the unique possibilities, digital technologies do not necessarily create additional value for entrepreneurship, and their application could be ineffective due to additional capital expenditures in case of complexity of return of long-term venture investments.

The needs of entrepreneurship for innovative infrastructural provision in the context of the digital economy are determined, and barriers on the path of its creation and practical application due to necessity for applying new forms of business organization are shown. Specific features of state management of a region's economy in the conditions of digital modernization are shown, and the modern Russian practice of e-government as a response to the current challenges is studied. The authors outline new perspectives of development of public-private partnership as an effective direction of industrial and cluster policy of a modern region.

For a better understanding all Russian sources have been translated into English. The responsibility lies with each author.

Marina L. Alpidovskaya and Elena G. Popkova

# Contents

Alexey M. Tsikin

# 1 Antinomy of Self-Sufficiency and Openness of the Russian Economy

## Introduction

The cardinal change of the paradigm of economic development in Russia in the post-Soviet period revealed a complex of problems caused by the shock introduction of the free-trade policy. Over the years, the Russian economy has evolved as a self-sufficient system, mainly using internal resources and growth factors. In the Soviet period, the common economic space in the modern sense was a giant transnational corporation that used the systems of labor division, transfer pricing, cluster principle of production organization and other elements inherent in today's most competitive market agents.

The collapse of the USSR destroyed the existing production and technological relations between enterprises, significantly narrowed the market for high-tech products, and opened the borders for the free import of products from foreign countries. The ongoing economic policy contributed to the deep penetration of imported technologies, equipment and materials into the Russian market. In full accordance with the global plans for the division of labor, in which Russia was assigned the role of the periphery of the world economic system and its raw material appendage, the overwhelming share of imported products in the post-Soviet period was high-tech goods, and the basis of exports was raw materials and low processing products. The artificial limitation of financial, human and material resources, coupled with the ill-conceived state policy, led to an increase in the import dependence of the Russian economy, since Russian enterprises were simply not ready to compete with global transnational corporations supported by states or even their associations.

The problem of increasing the competitiveness of the Russian economy today is becoming more and more relevant. The specialization of post-Soviet Russia in the production of goods with diminishing returns creates a real threat to the economic security of the country. The technological and financial restrictions imposed by the Western economies have shown that even the energy sector is in danger, because increasing costs for the production of such products require the use of advanced techniques and technologies that are absent in modern Russia.

The successful development of the Russian economy in the conditions of contradictory factors of the external and internal environment requires the creation of

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a new strategy for the development of the national economy based on the resolution of the antinomy of its self-sufficiency and openness. The result of the national development strategy on the basis of laws and principles of dialectics should be the revival of industrial potential, the maximum full beneficial use of resources, specialization in the production of innovative products and services, characterized by increasing returns. These elements of the national strategy should be introduced both at the federal level and in individual industries, the development potential of which can be significantly expanded.

## Methodology

The centuries-old experience of cognizing the surrounding reality shows that dialectical (historical) materialism is the main methodological apparatus (Lenin, 1973). Relevant considerations can undoubtedly be used to shape the concept of the development of the Russian economy in modern conditions. It should be noted that, at present, economists do not pay enough attention to philosophical understanding of the problems that arise, despite the fact that it is only with the use of the apparatus of dialectical logic it is possible to form truly scientifically grounded recommendations for the development of Russian society. There exist only few works that use dialectical logic to develop national development strategies and analyze emerging contradictions (Alpidovskaya, Gryaznova, and Sokolov, 2018)

One of the most important consequences of the dialectical approach to the study of economic phenomena and relations is that they are in constant movement and development, which predetermines the need to use the principle of historicism (Suslov, 1983). The principle of historicism allows us to consider modern economic relations in their inseparable connection with the previous ones. This is due not only to the relationship of the present with the past, but also of the future with the present, which predetermines the possibility of using the dialectical method for the qualitative prediction of the development of socio-economic systems.

The principle of historicism is directly connected with the principle of systematic phenomena. In the context of the analysis of the national economy competitiveness, the use of the principles of historicism and system determines the dynamic integrity of the factors of national competitiveness that are in continuous motion. Thus, the competitiveness factors of different levels are an interconnected system, the composition of which varies depending on the internal and external factors of social development.

The principles of historicism and system are specified in the basic dialectical laws: mutual transition of quantitative and qualitative changes, denial of negation, and unity and struggle of opposites (Suslov, 1983).

Transitions of quantitative to qualitative changes directly characterize the process of the development of the world economy. At a certain stage, the aggregate of accumulated quantitative characteristics (for example, concentration of capital) leads to the formation of a new model of economic development (pre-industrial → industrial → post-industrial → neo-industrial). In the framework of the new model described by the new set of indicators and factors of competitiveness, quantitative changes occur in the standard of living of the population, the technological level of production, human potential and other parameters.

In accordance with the dialectic law of denial of negation, the development of the economic system proceeds from the old to the new, that negates the features of the past model. Such a logic makes it possible to see the historical interconnection of economic phenomena and relations form within the framework of new models the positive aspects of previous approaches to ensuring national competitiveness, and ensure the continuity of state economic policy. The law of denial of negation fills with meaning and makes it necessary to perform the analysis of patterns of economic relations development, which is the basis for the formation of national competitiveness models.

The dialectic law of unity and struggle of opposites plays a special role in analyzing the nature of economic phenomena and relations. In accordance with it, any socio-economic phenomenon is characterized by internal contradictions, which are integral parts of a single whole. These parties are in continuous internal struggle, which is the source of development. In the context of the national economy competitiveness, it is advisable to single out the self-sufficiency and openness of the socio-economic system, characterizing fundamentally different approaches to the development of the economy, as such contradictions.

## Results

In accordance with the capitalist model of the national economy, the unconditional openness of state borders for the free movement of capital, goods and people is necessary. At the same time, similar approaches, extended to all countries regardless of their level of development, in practice lead to further enrichment of developed countries and consolidation at the periphery of the global economy of countries that have not achieved international competitiveness. Because of the free-trade policy at the world level, most of the advantages come to the countries that are part of the core of the capitalist system, while the standard of living in the periphery countries is steadily decreasing. An alternative approach is to ensure the self-sufficiency of the national economy, which is possible and necessary in Russia, but is not practically analyzed in the works of Western researchers.

The explanation of the absence of self-sufficiency factors in modern foreign models of managing national competitiveness lies in the very essence of the world capitalist system. Capitalism is inherent and immanent non-autonomous way of existence and development, which involves the implication of external resources or the extension of the resources, functional nature to the substantiality of the very nature of relations. This is explained by the essence of capitalism as a production process for profit, i.e. the stage of exchange acquires a dominant role and autonomy and, in many respects, determines the stage of production. Under capitalism, the functional contradiction between the relations of production and exchange is leveled, and each product is viewed primarily as a commodity on the world market. In this regard, a free global market along with industrial production is the basis of a capitalist society (Fursov, 2008).

Initially, in the philosophy the antinomy term was viewed as a contradiction, formed by two judgments, each of which admits the same convincing rationale (Gritsanov, 1998). Corresponding contradictions characterize the dialectical nature of knowledge, and in this context, the analysis of the antinomy of self-sufficiency and openness of the economy is the key to understanding the development of the national economy as a manifestation of the law of unity and struggle of opposites.

Today it becomes obvious that antinomies characterize not only the process of dialectical knowledge, but are also reflected in real life (Volkov, 2008). After the collapse of the USSR, the libertarian ideas of the free market, proclaimed as a universal good, in fact turned out to be the embodiment of the economic interests of a narrow group of people, while the ideas and interests of another, larger part of the population, were virtually ignored. This circumstance has led to the fact that the questions of choosing the general development of the Russian economy today remain unanswered and involve the use of various, often directly contradictory, mechanisms. Thus, Toshchenko defines antinomianism as a natural characteristic of the crisis development of society, characteristic of modern Russia (Toshchenko, 2010).

In the post-Soviet period, the Russian economy was confronted with a practically unlimited free global market. At the same time, a thesis was put forward about the possibility of autoregulation of the competitiveness of the Russian economy, which rejected the idea of self-sufficiency of the economy. However, studies show that modern processes of the development of the world economy (in particular, globalization) rather increase the importance of self-sufficiency factors in both the national economy and its individual industries and enterprises (Bergman and Feser, 1999). It should be noted that Porter, in his work, pointed out that despite the transition in the author's model from comparative to competitive advantages, they [as well as comparative] are localized in the same territory, where the aggregate factors of competitiveness (effective demand, employee qualifications, national institutions, intensity of competition, etc.) provides the basis for the long-term competitiveness of the national economy (Porter, 2017). Without directly noting this fact, Porter leads to the fact that

one of the appropriate models for improving the competitiveness of the economy is to ensure its self-sufficiency.

The dialectic of Russian competitiveness and self-sufficiency implies an analysis of the historical aspect in the process of transforming Russian models of the development of the national economy. The low competitiveness and self-sufficiency of the Russian economy in the pre-revolutionary period became one of the reasons for the revolution of 1917 and demanded that the new Soviet leadership accelerate the provision of national industry with domestic resources. Thanks to the chosen policy of increasing the self-sufficiency of the economy, it became possible to industrialize the country in a very short time, which became one of the components of the victory in the Great Patriotic War. The continuation of this policy in 1950–1960 predetermined the recovery of the Russian economy and bringing it to a leading global level with extremely high rates of economic growth. Thus, for Russia, historically logical is the path of development of the national economy as an autonomous, self-sufficient system, which relies on endogenous factors of competitiveness, own resources and the domestic market. In modern conditions, the self-sufficiency of the economy does not imply the isolation of the country from the global market, on the contrary, the export of high-tech products should be maximally expanded, which will make it possible to more fully use the effects of scale to enhance national competitiveness. In this context, the prospects for the Russian economy should be described as "soft autarky".

At the same time, it should be noted that modern geo-economic and geopolitical factors (in particular, instability of the external environment) determine the special need for autarky for key economic sectors that determine national security, and, in particular, for the defense industry complex. In the post-Soviet period, the defense industry complex suffered one of the most significant losses because of privatization. It was in it that the negative consequences of the breakdown of economic ties, the loss of state property and highly qualified personnel that accompanied the collapse of the USSR were most clearly manifested. The result of the modern state policy in relation to the Russian army and service industries was a significant reduction in the country's defense, physical and moral deterioration of weapons.

To develop a strategy for ensuring the self-sufficiency of the national defense industry, it is necessary to take into account the negative aspects of the development of the defense industry complex of the USSR. In the Soviet period, the defense industry complex used the resources of civilian production, in fact, receiving non-repayable and interest-free loans (Lyachin, 2011). In this case, the paradox was realized when the increase in expenditures on national security causes the opposite effect, which ultimately was one of the reasons for the collapse of the USSR with the subsequent degradation of the once advanced defense industry complex.

Not repeating this situation is possible with equal consideration of all stages of the process of social reproduction when elaborating a strategy for national development. The stage of consumption plays an important role in modern society, contributing

to the intensification of the reproductive process and determining the competitiveness of both goods and objects of a higher level. In this regard, a secondary, but no less important function of the modern Russian defense industrial complex is to ensure the technological progress of national manufacturers, focus on the production of high-tech products, characterized by a positive effect of scale.

In connection with the reasons stated, the development and provision of self-sufficiency of the Russian defense industry complex is obvious. The industrial production associated with the supply of the army is an industrial cluster capable of accelerating the development of related branches of the national economy. The involvement in the cluster of the defense industry complex enterprises of other economy sectors' organizations will lead to an accelerated development of the country's competitiveness at all levels. It should be noted that the defense industry complex is one of the most knowledge-intensive segments of the economy, requiring the use of the best human resources. At the same time, science in the defense industry is of significant applied nature, which provides an increase in the degree of implementation of R & D results into practical activity. A rather important feature of enterprises of the defense industry complex is that their development is in line with the chosen vector of overcoming the peripheral nature of the domestic economic system, since the military industry, like no other, requires a high degree of localization of production and self-sufficiency of the economic system as a whole.

The main aspects of the formation of a self-sufficient defense industry complex in Russia that require additional analysis are technological, technical-production, financial, informational and raw material (Gordienko, 2011).

The technological aspect of the formation of the Russian defense industry complex autarky provides for the independent development of new technologies both in the field of the defense industry and related civilian industries. An important characteristic is the possibility of carrying out relevant R & D and implementing their results at the expense of internal resources. In this regard, the issues of resource provision are fundamental in the development of self-sufficiency and competitiveness of the national defense industry complex.

The technical and production aspect is connected with the ability of the state in case of forced isolation of the country (for example, because of military actions or sanctions restrictions) to minimize the negative impact, expand reproduction and ensure the satisfaction of common economic interests. To solve this problem, it is necessary to ensure the import independence of the Russian industry, primarily related to ensuring national security. Technological and technical-production aspects of ensuring self-sufficiency must be taken into account when developing strategies to support key sectors of the Russian economy.

The financial aspect means the possibility of satisfying national needs solely at the expense of domestic monetary resources when imposing restrictions on borrowing or using credits of friendly countries during other periods. This element of self-sufficiency of the Russian defense industry is probably one of the most controversial

issues. Building up national monetary reserves for use in the defense industry complex as a whole limits the possibilities for financing development projects and delays resources from civilian sectors of the economy, the urgent need to modernize production facilities in which is obvious.

The informational aspect of ensuring the self-sufficiency of the Russian defense industry complex is determined by both the internal systems of the transfer of scientific, technical, industrial and other types of data, and by the exchange of information with friendly countries. In this case the protection of information constituting military secrets and other information protected by law must be provided. The implementation of this aspect, coupled with the technical and production element, means the need to increase production in the country of domestic samples of information and switching equipment and related products that meet the requirements of the modern digital economy.

The raw material aspect includes the stable provision of the defense industry complex of food, energy, and other types of resources with the introduction of financial and technological constraints to the country. This element of the development of autarky of the Russian defense industrial complex is directly related to the most comprehensive utilization of national resources, which is one of the most important ways to increase the competitiveness of the economy.

Thus, the main basis for the development of the defense industry complex is expanded reproduction with an emphasis on the production of means of production, which is an urgent task for the Russian economy. The production of means of production ensures the orientation of the activity of the national economic system not on financial, but on the actual result. It should be noted that the chosen vector of the priority development of the defense industry complex, undoubtedly, requires a corresponding change in the behavior of the state and private business. On the part of the state, it is necessary to qualitatively change the policy of state regulation of the economy, to form a clear economic policy, to increase the effectiveness of state control and supervision, especially in the financial sphere.

Equally important is the creation of a business environment for domestic business: limiting bureaucracy, pressure from law enforcement agencies, ensuring the rule of law, a free judicial system. The task of private business is to implement in their development strategies the satisfaction of common interests as opposed to personal enrichment and the implementation of the de-offshoring policy, deducing the cash flows from foreign to domestic jurisdiction. It should be noted that the main elements of ensuring the self-sufficiency of the defense industry complex are directly related to ensuring the conditions for domestic producers' activity at a level not inferior to foreign competitors. Mechanisms for solving relevant issues in modern Russian reality are discussed in detail in paper (Tsikin and Alpidovskaya, 2019).

## Conclusions/recommendations

Thus, resolving the antinomy of self-sufficiency and openness is represented in the formation of the strategy of the Russian economy's-controlled openness, suggesting the existence of national economic system in the form of "soft autarky", which relies mainly on endogenous factors of competitiveness, national resources and the domestic market. The main directions of improving the competitiveness of the Russian economy in this case are supporting backbone industries, improving the efficiency of national resources use and promoting small and medium-sized businesses as a source of innovation in the digitalization of the economy. When implementing the proposed strategy, the country is not isolated, but the vector of export orientation of domestic products from commodities to high-quality products is transformed.

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# 2 Archaization of Socio-Economic Relations as a Challenge to National Modernization

## Introduction

The issues of archaic manifestation in modern Russia has been topical since the 1990s to the present day. They are actively discussed in socio-human knowledge, also in relation to the peculiarities of the country's modernization and accompanying socio-economic transformations.

The range of issues covers a wide area of interdisciplinary research on the phenomena of archaic and traditionalism, the sources of the archaic trends from the historical and logical point, the comparative analysis of cross-country and regional/local models.

Russian scholars agree on the essence of the archaic and the forms of its translation to modern society but disagree in the assessment of its potential. What is a return to the archaic for society in the era of modernization: the fulfillment of self-preservation in the face of inevitable crisis or a destructive process restraining the upgrade? Can informal institutions of the Russian archaic promote ground-breaking projects? What are the chances of the upgrade, rather than of maintenance or destruction, and what can a viable tradition suggest here?

## Methodology

A. S. Akhiezer defines archaization as "observance of cultural programs historically developed in the layers that have been formed in simpler conditions and do not meet the increasing complexity of the modern world, the nature, and range of the dangers. People return to old ideas in response to the crisis, i.e. archaization acts as a form of regress" (Akhiezer, 2001).

Ch. K. Lamazhaa considers archaic as "a culture formed at the early (ancient) stage of social history, which is a system of practices of joint and several actions developed in the interaction between the society, nature, and other societies, and expressed in the public consciousness (mindset). These are the simplest and most reliable ways

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of interaction between the individuals of ancient society, nature and the social environment" (Lamazhaa, 2011).

The author argues that today archaic is being displayed in the form of archaic trends understood as the commitment of individuals and society to archaic, sociocultural experience (Lamazhaa and Khairullina, 2015).

Ch. K. Lamazhaa highlights in the structure of the archaic phenomenon foremost the status of social actors towards spreading the feeling of different kinds of losses in the society. Further, people assess the opportunities for meeting their basic needs and aim actions at quick satisfaction thereof. Such activity takes place against the background of social anarchy in the form of simple and proven archaic practices. Archaic myths, images, concepts, and meanings are distributed in society at the mental level. Further, archaic metaphysical values begin to impact the social relations and the nature of social institutions' performance.

Based on the concept of anomie given by Emil Durkheim as "the destruction of the entire existing system of values, customary rules of life, the emergence of a value vacuum in society", V. G. Fedotova defines archaic as "something rooted in the people's mind and culture and reviving in dramatic social transformations, which is confirmed by wrenching modernization of the modern world" (Fedotova, 2005). This is a long-standing code deeply absorbed in the people's mind and culture. The archaic is accompanied by the state of anomie as a destruction of the usual order of things due to the departure from the previous system of jointly sanctioned values and meanings of the reality construction. Anomie leads to an anarchic order related to extremely negative individualism that eliminates trust and solidarity. This order is based on the so-called "ideology of the natural state" that recognizes small property, direct democracy and participation in problem-solving. The anarchic order leads to early feudal strife and the clan pattern of government authority that hide behind democratic procedures. The consequence hereof is social apathy, fear of changes, unwillingness to risk, aggravation of patriarchal paternalist expectations and sentiments.

I.G. Yakovenko studies the archaic from the point of the ratio between the barbarism, archaic culture and various types of civilization. "Archaic culture is framed by tough mechanisms that block the extended production of the original universe due to the continuity and invariability of the cultural resource" (Yakovenko, 1995). In contrast to the archaic culture, civilization is constantly augmenting its cultural resource and expanding the space of regulations, signs, and subject-matters. Barbarism as a strategy of life is a surprising concentration of the archaic and civilization unity is concentrated as an effect of their continuous interaction. The author argues that the barbaric world as a way of life of an archaic person in the conditions of the civilization is complicated, controversial, internally tense, poorly integrated into a particular society, but a self-organized pattern.

P. Sztompka's attitude to archaic as "social trauma", "cultural trauma", or "social changes due to trauma" is also of interest. Cultural trauma arises out of the destruction

of the routine way of life, the collapse of the former social ties, the crash of the usual systems of moral and cultural values (Sztompka, 2001). Supporting P. Sztompka, V. G. Fedotova emphasizes that Russia not only keep the trauma but also adjust to it (Fedotova, 2005).

Alvin Toffler states that the shock of the future happens when the limit of novelty comes, which can be reached by a person in the short term. The shock of the future is the consequence of fears of dramatic changes due to uncertainty. (Toffler, 1970).

Indeed, ethnic self-definition being in a state of shock therapy and the establishment of the Western democracy search for more steady foundations of identity, which is provided by the religion. Ethnic self-consciousness in the form of Russian ethnic nationalism and radical Islamic fundamentalism are manifestations of sensitivity towards innovations in traditional society; from the archaic point of view, they are the echo of the earliest tribal strife. In this regard, the opposition starts consolidating outside the system and take the form of various kinds of extremism, and terrorism against dissention is raised to the level of justice.

A. S. Akhiekhzer says that the main reason of archaization is a crisis situation, when "society and person can tackle with the dangers, either by developing innovative ideas that open up new creative opportunities for more effective solutions or returning to time-proven values" (Akhiezer, 2001). The author views archaization as a form of regress when behavior patterns are past-oriented that is not identical to the present.

The high level and inorganic nature of institutional changes lead to disassimilation of social innovations and the emergence of the archaic social practices. This is associated with the violation of the "novelty pace" when the society is developing and transforming within the paradigm of inorganic, catching-up modernization. Thus, the more dramatic the social transformation is, the more the society is split in its values, the less it is prone to dialogue and compromise due to its mental and religious features and, moreover, the more likely a return to archaic is.

Ch. K. Lamazhaa defines the archaization of society as a process of mass spontaneous return to the archaic cultural heritage that had developed within the crisis of social transformations. Therewith, "social transformation is not always accompanied by archaization. The latter acts only as an indicator of social crisis. The more crisis-ridden the social transformation is, the more apparent the archaization and, consequently, the more dramatic the social transformation is" (Lamazhaa, 2011).

Within the framework of the methodological approach to the sufficiency/insufficiency of the social conditions of modernization, N. N. Zarubina calls the factors assisting the revival of archaic trends, such as rent-oriented economy, structural changes of recent decades, the state of the labor market, intensification of deeply-archaic economic pre-market institutions (Zarubina, 2015).

Indeed, a rent-oriented economy allows using non-economic resources to gain competitive advantages, to earn income beyond the real contribution to the economy, to block complex activities that can hardly be expressed through formal monetary

indicators. The structural crisis determined by partial deindustrialization, reduction of own industrial production in the crucial areas that require modernization, monopolization of critical sectors of the Russian economy created the effect of underutilization of human labor and aggravated the issue of de-qualification of the labor force and survival respectively. In this regard, the current forms of employment are not aimed at improving the level of modern labor skills. Barters, consideration in kind, self-sufficiency, the development of subsistence farming evidence the intensification of archaic pre-market economic institutions.

Representatives of the theory of "middle culture" in the name of N. Berdyaev, B. Vysheslavtsev, and B. Erasov suggested that the society always establishes a stable and compatible set of values that mitigate the tension of opposition senses and meanings and reproduces a steady moral ideal that is acceptable for the general public over a quite long term.

In the context of everyday life, the middle culture serves as a basis for a strong and stable network of social ties which ensures the stability and unity of society, the mutual adjustment of social groups and removal of the most acute contradictions. Everyday life never remains a closed system; it has mobile and invisible boundaries. These correlations are diverse: on the one hand, everyday life is filled with "mainstream" ideas due to gradual routinization, on the other hand, it becomes a generator of innovations that underlie social development. Moreover, it is important that the number of acceptable innovations could not much interfere with the comfortable state of the subjects of development.

According to the theory of "organizational path dependence" and the effect of "historical track" (P. David, B. Arthur, G. Plekhanov, N. Berdyaev, G. Fedotov, A. Auzan, et al.), in Russia repeatedly undergo historical events, recurrent restoration of traditional institutions and related limitations of development.

As P.A. Sorokin believes (the theory of "special properties of mindset"), the innovative development of modern Russia is hampered by passivity, routinization, falling into consumerism and the lack of large-scale projects that could induce creative initiative. Instead of active social creativity, people return to decisions made by the authorities. In modern Russia emerge passive-sensuous type of thinking characterized by a consumer direction of life expectations, a blinkered vision of reality and social practices concentrated on techniques of sensual pleasures (Sorokin, 2017).

The concept of politarism and neopolitarism by Yu. Semenov is represented within the paradigm of the Asian mode of production. The author stresses the critical importance of the state and the common-class bureaucratic ownership of the major resources and the identity of citizens. The basis of politarism is a specific common-class public property (Ancient Egypt, Mesopotamia, Ancient China). The Asian politarian socio-economic system must comprise regular violence as a method to consolidate common-class domination and maintain intraclass integrity. The supreme leader-autocrat governs an integral state. Neopolitarism in the USSR is an analog of the Asian mode of production, where there were, among other things,

relations of exchange and payment services and family ties for solving the economic issue (Semenov, 2008).

From the global standpoint on the reasons for the reproduction of archaic trends, we should mention the theory of the "exclusive development" by M. Castells. According to M. Castell's words, in the context of globalization occurs a process of continuous territorial conversion under the influence of social networks and information flows, which entails the elimination of entire regions, as well as related social groups from planetary interactions (Castells, 1999). The inability of such social enclaves to adjust to a complicating society continuously reproduces the "deep periphery" with its poverty and backwardness in the form of a system element of the world order. The material and geographical centers of global space are megacities, place-territories, essentially processes that provide the flow of information via global networks and generate innovations (Solovykh, 2017). Integration into a single flow network brings together these financial and management centers despite their territorial remoteness.

Raul Prebisch has a similar opinion, stating that today there are two types of capitalism: central capitalism and dependent peripheral capitalism (Prebisch, 1992). In economically depressed countries under liberal reforms aimed at the destruction of former social patterns may occur a reverse effect (capital flight, enormous inequality between rich and poor, commodity specialization, simplification of social and cultural life, escalation of aggression and xenophobia) instead of renewal and development. The general conclusion is that peripheral capitalism propels the country into poverty, long-lasting economic stagnation, anomie, and spiritual degradation.

## Results

The basis of archaization, which takes place in modern Russian society, is the distortion of social reproduction stages. The economic backwardness of Russia from the leading countries of the world is primarily explained by the disproportion between public production divisions that emerged in the transition to the market and in subsequent years (Koroleva, 2017).

Regional archaization indicators are most pronounced in the North Caucasus region, which has become the main direction of the intra-civilization split in Russia. It was here where several trends appeared in the post-Soviet period to judge the archaic development.

One of these trends is the derussification/titulization of the population aggravating against the background of inter-ethnic tensions associated with simmering Chechen-Ingush, Chechen-Lak, Chechen-Kumyk, Ossetian-Kumyk, Ossetian-Ingush, and Russian-Kumyk disputes.

The leaders of derussification are three republics of the North Caucasus, such as Chechen, Ingush, Dagestan. North Ossetia, (Alania, Kabardino – Balkaria, Karachay-

Cherkessia) located in the center and in the west has a significant number of Russian-speaking population and its presence has a great impact on the socio-cultural and economic background. Russians are expelled from Cossack villages of the Karachay-Cherkess Republic. The land fund is still the unsolved issue. Owing to the spatial status of integration into the territory of the Krasnodar Krai, Adygea has the limited demographic potential of the titular community, which prevents its growing monoethnization.

In this context, the fate of the Russian-speaking ethnic communities becomes a factor that slows down the process of a general modernization of the North Caucasus republics and their movement to a sustainable path of economic development. This trend also depresses the opportunity of developing a regional diversified upgrading economy.

To be sure, in modern conditions the rules and values of the Russian minority in the North Caucasus republics conflict with the basic ideas of the dominant culture of mountain Caucasians. The status of the Russian-speaking population as a creative, scientific, and political majority achieved in the pre-revolutionary and Soviet times, greatly weakened after the transformational change (perestroika).

The flight of the Russians resulted in a wide-scale commitment of citizens to local values – community, tribe, clan, teip, family, which could be another step towards the defederalization of the region.

The aggravation of the land issue caused by the contradictions of the land reform of the 90s of the 20th century initiates archaic trends in the North Caucasus republics associated primarily with inter-ethnic tension.

Land sharing had not been implemented in full (Dagestan, Karachay-Cherkessia) or had never been implemented before (Kabardino-Balkaria). The agricultural lands in the majority of republics are not privatized, the rules on the privatization terms are postponed for different periods, and the land is officially disposed of by regional public authorities.

As a result of the actual restitution, non-privatized land was distributed in accordance with the traditional legal regime of Sharia and Adat laws, where the plots are distributed by lot and assigned to households on an ongoing ancestor basis.

Given the relative land shortage, the overwhelming majority of the land share areas is officially or unofficially leased and subleased. The local population of most republics uses a closed leasing system within the local community, which don't allow external lessees. The lease is paid in kind, the term of the lease is not provided. For example, Dagestan keeps the traditions of communal ownership of plowed fields, forests, cattle pastures and hayfields that belong to the Jamaat. In the highland and foothill areas, there is a century-old tradition of the right of pre-emption to an alienated land plot by relatives/fellow villagers and a direct ban on the sale of land to others. All this is a hefty offset to the controversial policy of replacing the autochthonous livestock communities by the grain business and local network enterprises.

The land issue associated with the alienation of the flatlands of some Dagestan districts in favor of distant pasture cattle breeding and the establishment of winter-range households formally attached to mountain communities but lost contact with them is escalated. These lands are classified as inter-settlement territories and withdrawn from agriculture. Lands of distant pasture cattle breeding and cattle runs form a strip holding of land and narrow the space of plain natives and these lands are redundant and underutilized against the background of the decay of distant-pasture cattle breeding infrastructure and reduction of cattle stock. The lack of an appropriate regulatory framework on these lands instigates interethnic conflicts between the highland and lowland inhabitants of Dagestan.

The extensive archaic cattle breeding that captures spawning reservoirs (lakes) by their draining to arrange cattle pasture and a corruptive mechanism of supervision prevent the Cossacks from doing traditional fishing on the coast of the Caspian Sea.

In the Kabardino-Balkarian Republic, the long-standing confrontation of Kabardians and Balkarians on the issue of inter-settlement territories in lowland areas is aggravated by the risk of inter-ethnic disbalance in the land use pattern, which locally displayed in a growing number of Meskhetian Turks. The current dynamic trend hereof leads to a gradual replacement of the native population from both the local space of land use and traditional areas of activity.

The archaic is intensifying in the North Caucasus in the context of a segmented (fragmentary) pattern of the economic complex and the enclave presence of modern sectors. The main share is new production is concentrated in various segments of light industry (wool processing company "Kvest-A", factory of company group "Obuv' Rossii" in Karachay-Cherkess Republic), machine engineering (car plant "Derveis" in Karachay-Cherkess Republic), glass industry (Caspian plate glass factory in Dagestan), agro-industrial complex (greenhouse complexes).

In the midst of high off-the-books employment (Chechnya, Ingushetia, Dagestan), all republics have 60–90 percent subsidy, which entails the tremendous dependency and commitment to various subsidies. The issue of land shortage often consists in that access of the local population is limited for two reasons: the growing number of agro-holdings engaged in the grain business, and the clash of clans. The replacement of livestock communities in the main by large-scale grain business curtails their economic space, thus inducing a conflict of overlapping rights to resources (Kukina, 2017).

Among the most painful recurrences of archaic in the North Caucasus are a stronger family-clan unity, nepotism, and cronyism in local socio-economic practice, including the staff policy. There is a reason to believe that semi-feudal estates have developed here over the past twenty years having different financial and economic resources and high legal status.

Restoration of archaic trends also shows as the raid element embodied in ethnic crime and the re-emergence of captive trafficking. All these circumstances revive archaic methods of exploitation, such as semi-slavery-dominarism (involuntary servitude, hireling work, parasitism).

Within this background, the mobilization consciousness of the highlanders is mainly criminal, and cronyism (nepotism) is a serious obstacle to adequate competition in all areas of public life.

The primitivization of social consciousness, the transformation of myths into the pre-rational stage of collective identity, call for like-mindedness, construction cultural traumas or appeal to them produce conditions for any manipulations (Salafism in Dagestan).

In contrast to this situation, we can provide an example of transformational relations that affected the mindset of Kazakhstan society and brought positive changes in socio-economic relations. The banking sector of Kazakhstan has achieved high development rates during the years of independence. Certainly, this is the result of the economic and financial sector restructuring programs previously and currently adopted in the country (Talimova, Kalkabaeva, 2015).

## Conclusions

In a specific historical situation, the archaic could reasonably meet the challenges of the time, but ongoing social inversion will inevitably lead to a revival of some controversial and conflicting circumstances typical for a closed society.

The price for the return to a certain social order is isolationism. If this state is long-lasting, it will inevitably reject both all innovations essential for further progressive development and competitiveness in cooperation with other communities. Having a heavy mobilization capacity, which is indispensable in a crisis, the archaic is incapable to be in long-term confrontation to the world of stability, well-being, and security.

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Betal M. Bizhoev

# 3 Perspectives of the Development of Ethnoeconomics: Inequality, Integration and Socio-Economic Development

## Introduction

By the beginning of the 21st century, interest in the "ethnic issues" has gained increased attention of the scientific community. Actual became not only the study of phenomena and processes that directly characterize ethnicity, but also the study of ethnic aspects of socio-economic existence and ethnogenesis.

First, such interest is caused by the growing role of globalization as an effective tool for the formation of a single information, economic and geopolitical space, "erasing" the boundaries of markets and states, and "eroding" certain ethnodemographic territorial-localized entities. Secondly, by the manifestation of ethnic renaissance, regionalism, cultural changes in the ethnosphere, and as a result – the growth of ethnic tension, xenophobia, i.e. the emergence of serious contradictions in economic modernization, the difficulties of socio-cultural adaptation, and in general, the essential reaction of ethnic groups themselves to integration processes (Andreev, 1996).

The economic aspect of ethnic development makes it possible to assess the various processes of economic management and the relations that take shape in the system of production, distribution, exchange and consumption of ethnic groups. Thus, intragroup interaction in ethno-economic systems is usually viewed through the prism of economic sociology – as a line of research, suggesting an analysis of economic activity from the standpoint of social theory. We study the whole set of economic processes – markets, government, households or individuals.

A close relationship forms in the interaction of the economy and ethnos: the nature and level of development of the economy influence the ethnos, on the other hand, the ethnos significantly affects socio-economic relations. Thus, ethnoeconomics is, on the one hand, a scientific discipline, the subject of study of which are the features of the economic activities of ethnic groups, and on the other, an important component of a regional economy (or a subsystem of the economy, characterized by a number of specific features).

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# Methodology

The processes of integration of ethnic groups show a number of problems of economic interaction of racial and ethnic groups, the incomplete realization of their rights even in the developed countries of the world. Although in some areas of developing countries, such as China, the proportion of ethnic minorities is dominant. Figure 3.1 shows the proportion of ethnic minorities in the population of China by region. In 2017, on average, 51.76% of the population in minority areas belong to ethnic minorities, and about 84.82% of the population – in Hunan Province.

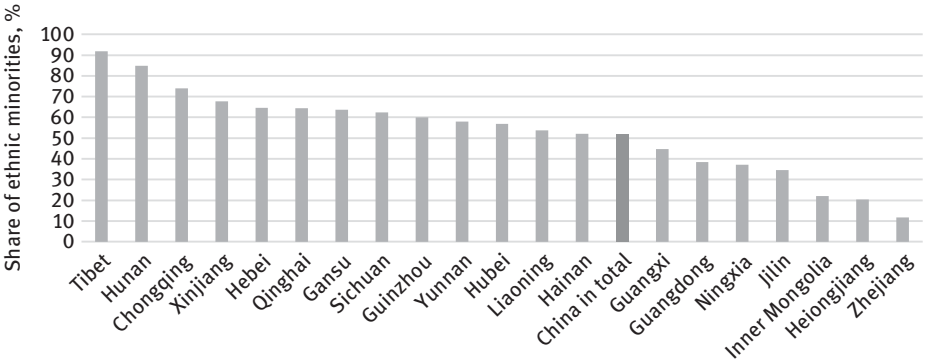


**Figure 3.1:** Proportion of ethnic minorities in China's population in 2017 by minority areas.
Sources: National bureau of Statistics of China; State Ethric Affairs Comission.

And in Turkey, about 20% of the population is Kurd's ethnic minority (Figure 3.2).

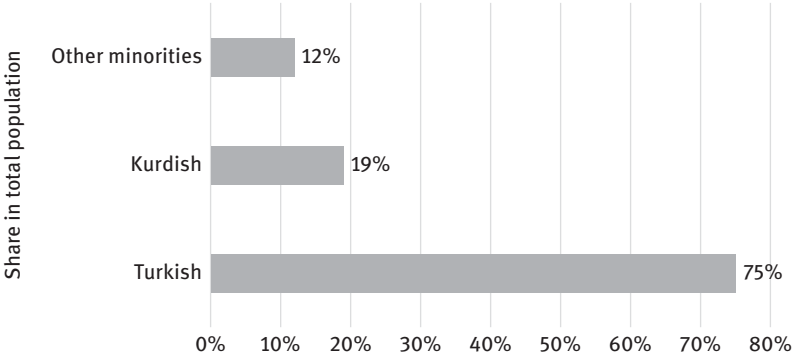


**Figure 3.2:** Ethnic distribution of the population of Turkey in 2016.
Sources: CIA Turkey 2018.

In the US, 32% of the Hispanic population was under 18, as can be seen from the statistics of the distribution of race and ethnicity of the US population in 2015 by generations (Figure 3.3).

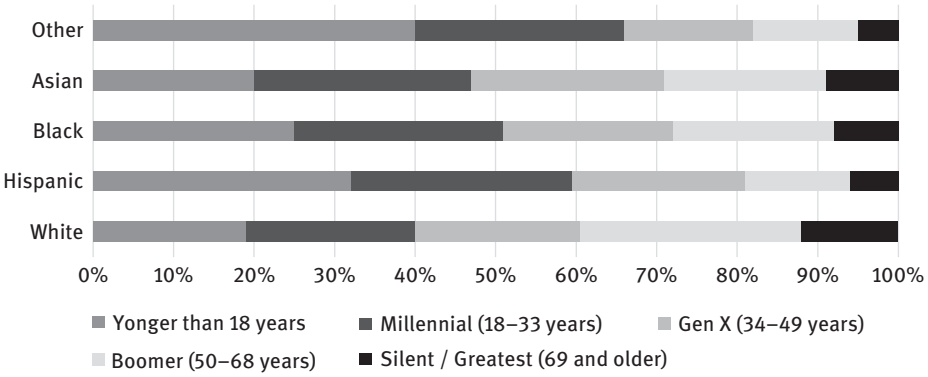


**Figure 3.3:** The race and ethnicity of the US population in 2015 by generation.
Sources: Pew Researh Center; US Census Bureau.

Modern ethnoeconomic studies update the subject of assessing the influence of ethnic minorities and their role in the formation of trading models in the post-Soviet space. Thus, in the work "Ethnic networks in the countries of the former USSR", the authors note the dependence of the formation of trade relations on informal institutions (such as ethnic networks), and assesses their special role in the transition period when the institutional framework are weak (Gokmen, Nickishina and Vezina, 2017). Thus, on the basis of the standard linear equation of gravity, which controls the fixed effects of distance, import-export contact, the influence of ethnic networks on trade in time intervals is estimated. According to the calculations, the first reaction option after the collapse of the Soviet Union and before the establishment of formal business and trade relations between countries was an appeal to a resource of ethnicity, which in fact replaced the broken supply chains and centralized trade (Gokmen, 2017). However, in the 2000s, there was a decrease in the influence of ethnic networks on trade, which is interpreted as the establishment of formal rules, the emergence of an institutional framework (Greif, 1993).

Referring to the discourse of this category, we note that the "ethno-economy" is presented in a "narrow form" – at the micro level (economic behavior of households, family business, folk crafts), at the meso-level (segment of the economy, social reproduction, population subjective factors of the economy of the ethnoregion) and, in a broader form, as science and discipline.

Ethno-economics, having its own subject of research different from related sciences, becomes interesting because it studies the use of a person – a representative

of an ethnos as an economic resource (in the framework of, for example, house-building and backyard farming, family business) and the production factor, considered as a means of production.

A special role in the formation of a full-fledged ethno-economic scientific discipline is also represented by the latest research on the territory of the European Union, and in particular in Germany, due to the increasing influx of migrants. For example, some studies show that migrants prefer to change their habitat region based primarily on the representation and size of their ethnic group in the region, rather than on the level of well-being (Akay, Constant, Giulietti, and Guzi, 2017). In addition, the ethnic diversity of the population plays a positive role in the relationship with the social well-being of local residents.

The statistics of migrants also illustrate the problems of ethno-economic development. Thus, according to official statistics from the United States, out of 1 million legal immigrants, only 6% arrive in the USA annually, they are highly qualified specialists, about 50% immediately apply for unemployment benefits, and the rest, i.e. approximately 44% work in the field of manual labor, i.e. actually engaged in the field of ethnoeconomics.

In Russia, the proportion of people with "actualized ethnicity" currently reaches 40%. The European analytical agency Gefira Team concluded: "the Swedes in the next 40 years will become an ethnic minority". Thus, there will be a general redistribution of the population.

Ethnic processes are relevant for the whole world, but in the regions with a predominant role of ethnoeconomics objective prerequisites for ethnosocial stratification remain, which are rooted in specific characteristics of ethnic communities, and are a consequence of social time (the stage of development of an ethnos), which determines the remaining significant dependence of ethnosocial communities on the natural environment ("enclosing landscape").

Ethnic professional and social stratification should be considered in the context of the scientific discipline of ethnoeconomics (within the framework of the concept of economic nationalism with a pronounced ethnocratic component, when privileges and preferences are created only for representatives of one nation). Thus, ethno-economics allows distinguishing two interdependent processes:

- Employers and firms in a host country or a country with a national minority rarely give preference to national minorities, there is racial and ethnic inequality.
- Ethno-economic enterprises set limits for external workers, often using compatriots.

This is clearly seen in the statistics. For example, the percentage of workers who earn an hourly rate at or below the prevailing federal minimum wage in the United States in 2018 is ethnically based (Figure 3.4). In 2018, about 1.24 million white people were paid at the federal minimum wage or below.

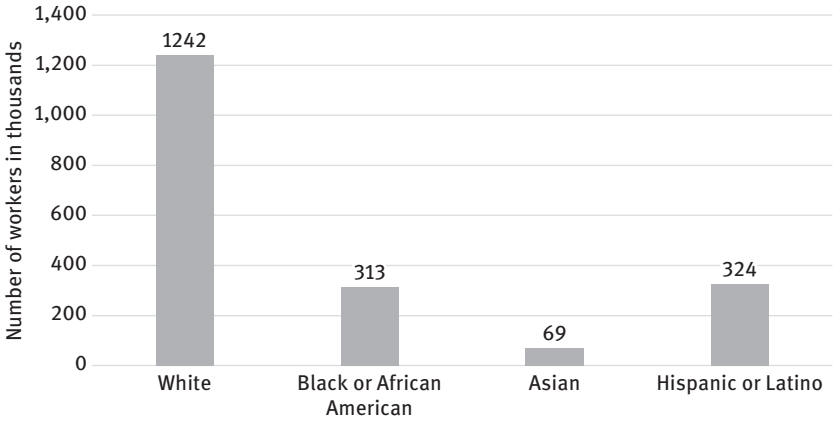


**Figure 3.4:** Number of workers receiving hourly wage rates in the United States or below the minimum wage in 2018, by ethnic groups (in thousands).
Sources: Bureau of Labour Statistics; United States 2018.

A number of related statistics further illustrate the current state of racial and ethnic inequality in the United States. The real average household income for households in Asia was $ 81,331. At the same time, the average household income in the United States of all racial and ethnic groups in 2016 was $ 56,516. Asian and Caucasian households (white, non-Hispanic) had relatively high average incomes, while households of black and Hispanic families were lower than households with average national income (Figure 3.5).

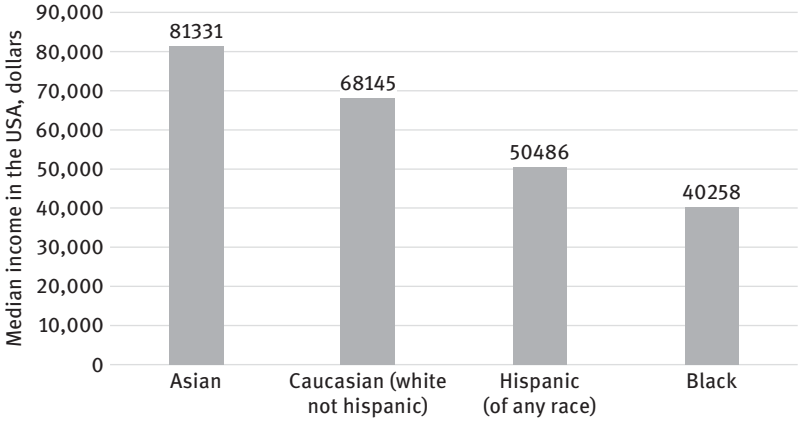


**Figure 3.5:** Average household income in the USA in 2017 by race or ethnic group (in US dollars).
Sources: US Census Bureau 2017.

The ethnicity of US households in the United States in 2015 also differs by size (Figure 3.6). In 2015, about 28.3% of Latin American households were two-person households. And the percentage distribution of household income in 2017 by ethnic groups shows that 14.6% of Asian private households in the United States had an annual income of $ 200,000 or more in 2017 (Table 3.1).

In England, statistics show the proportion of the population that agreed that their locality was a place where people from different social classes got along well

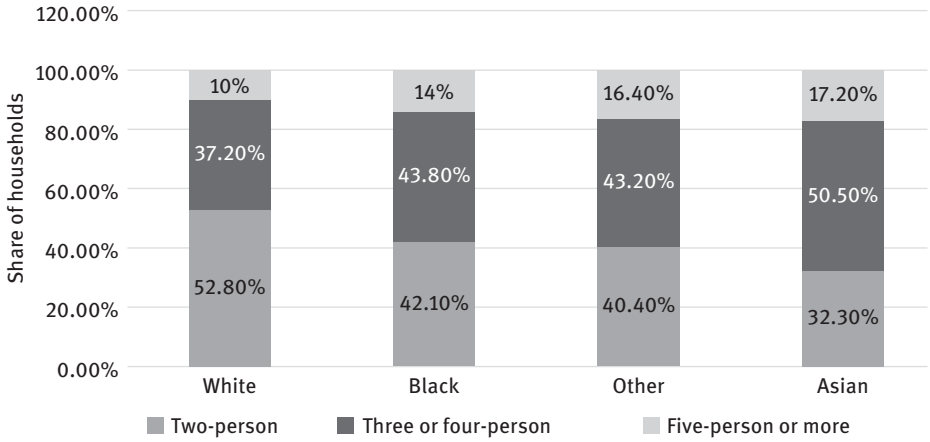


**Figure 3.6:** The race and ethnicity of US households in 2015 by size.
Sources: Pew Researh Center; Unites States 2015.

**Table 3.1:** Percentage distribution of household income in the USA in 2017 by ethnic groups.

| Annual household income in U.S. dollars | White alone, not Hispanic | Black alone | Asian alone | Hispanic (any race) |
|---|---|---|---|---|
| Under 15,000 | 8.5% | 19.9% | 9% | 12% |
| 15,000 to 24,999 | 8.9% | 12.7% | 6.6% | 11.1% |
| 25,000 to 34,999 | 8.6% | 11.6% | 5.8% | 11.3% |
| 35,000 to 49,999 | 11.6% | 14.1% | 9.6% | 15% |
| 50,000 to 74,999 | 16.4% | 15.7% | 14.5% | 18.1% |
| 75,000 to 99,999 | 13% | 9.8% | 12.9% | 12.6% |
| 100,000 to 149,999 | 16% | 9.5% | 16.3% | 11.5% |
| 150,000 to 199,999 | 8% | 3.5% | 10.8% | 4.5% |
| 200,000 and over | 8.9% | 3.1% | 14.6% | 3.8% |

in 2017–2018 by ethnicity (Figure 3.7). This belief was proportionally more common among representatives of "other" and mixed ethnic minorities.

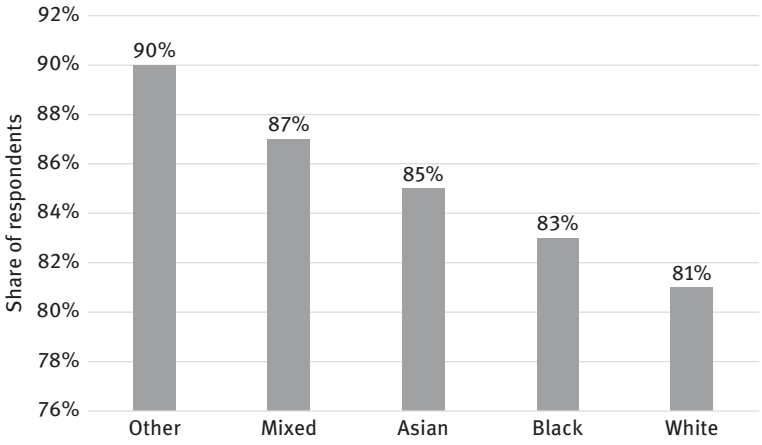


**Figure 3.7:** Percentage of the population that agrees that their locality is a place where people of different origins get along well in England in 2017–2018 on an ethnic basis.
Sources: Cabinet Office UK United Kingdom 2018.

## Results

The monitoring of the "livelihoods" of the network of immigrants, diasporas and ethnic groups (autochthonous and allochthonous) made it possible to identify the following stages of the process of ethno-economic integration of ethnic groups:

- ethno-economic implantation: the process of ethnos inclusiveness (both as a whole and as represented by its individual representatives) in the economic sphere in the host territory
- ethno-economic adaptation: the process of adaptation of the ethnos (its individual representatives) to the changed environmental conditions, the specific conditions of the regional organization of society
- ethno-economic institutionalization: the process of streamlining and organizing the rules of conduct and support of intra-ethnic relations
- ethno-economic reproduction: the process of resuming the factors of production and ethnic group (groups) as a whole
- ethno-economic stratification: the process of stratification of intra-ethnic groups according to professional and status criteria

At the same time, research in the field of trust, including inter-ethnic interaction, shows the following conclusions (Zak and Knack, 2001):

- Increased trust leads to increased investment and economic growth.
- Homogeneous societies demonstrate a higher level of trust and, accordingly, investment and economic growth.
- Equitable distribution of income stimulates trust, and, accordingly, investment and economic growth.
- Various discrimination reduce the level of trust, reducing investment and economic growth.

An analysis of the current situation shows that achieving sustainable development of the world economy regions requires the development of a strategy for taking into account and incorporating ethno-economic processes into comprehensive plans for social and economic development, the need for which is actualized by the need to compensate for negative effects, including in the labor market.

For example, the total value of microloans that supported projects aimed at immigrants or persons from ethnic minority groups provided by microfinance organizations in Europe as of 2013 illustrates that the country with the highest proportion of loans issued for projects oriented for immigrants was Spain, with microcredit amounting to about 72.117 million euros in 2013 (Figure 3.8).

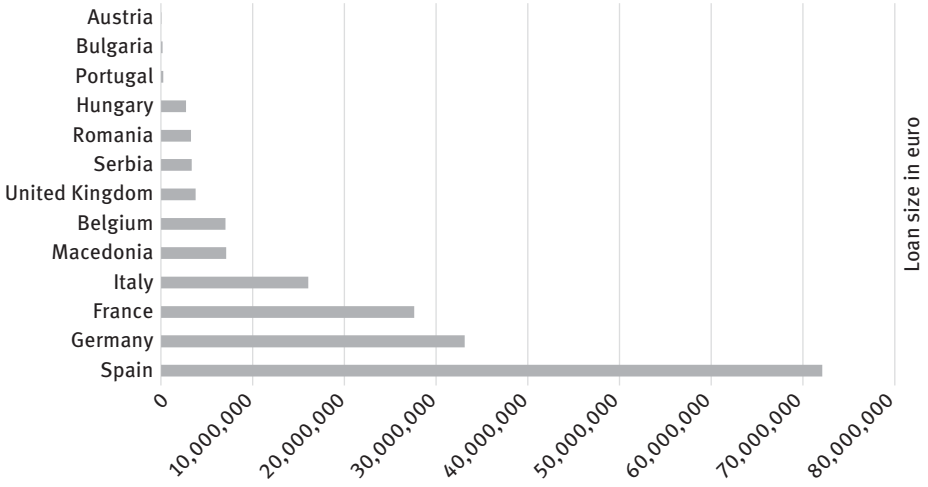


**Figure 3.8:** The total cost of microloans to organizations and projects in Europe focused on immigrants and ethnic minorities in 2013 by countries (in euros).
Sources: European Microfinance Network Europe 2013.

Despite the relatively high share of microfinance of public organizations by the developed countries of Europe, in general, the statistics are disappointing. Attitudes towards ethnic groups and migrants are not always satisfactory, even in developed countries. For example, 29% of respondents fully agreed that immigrants have been very important for the future economic stability of Canada since 2014. However, the other, bigger part have opposite views (Figure 3.9).

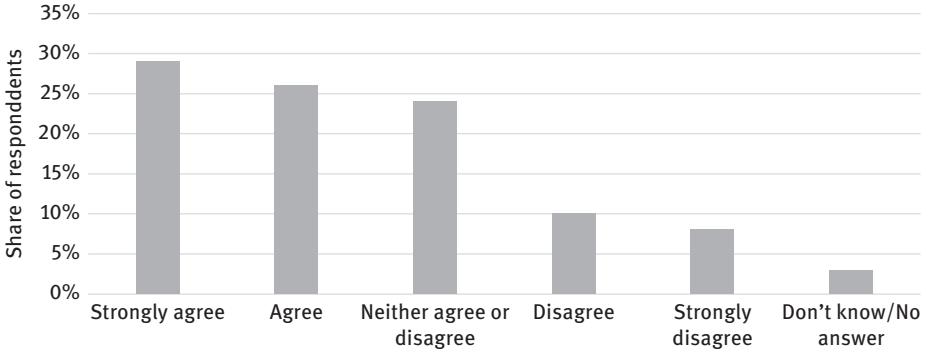


**Figure 3.9:** The distribution of Canadians's views on whether immigrants are important for the stability of Canada's economic future since 2014.
Sources: CBC/Radio Canada. Canada 2014.

## Conclusions/recommendations

Structural changes occurring in the world economy, strengthening of the innovation-information factor, the predicted offensive of the fourth industrial revolution dictate the emergence of cardinal changes in the economy, ethnic groups and the system of state regulation of entire regions and countries. The scientific, technical and technological revolution is changing the approaches to the regulation of ethno-economic entrepreneurship, leading to changes in the main directions of development of migration flows and to global changes in the life of every person.

The social and economic development of countries and regions depends not only on the availability of resources, technological advances and other economic and structural factors, but also "on the cultural values shared by people living in certain regions, on the level and quality of their social relationships and norms governing these relationships" (Volchik, 2016; Lebedeva and Tatarko, 2010). Management of modernization processes in the regions requires the development and implementation of economic strategies and mechanisms that take into account the resources of the ethno-economic sector of the national economy, as well as the development and implementation of policies for institutional ethno-economic integration.

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# 4 Agro-Industrial Complex as a Socially Important Sphere: Reasons of Economization and Means of Overcoming Them

## Introduction

Adoption of the global goals in the sphere of sustainable development, in which provision of food security is at the first place, predetermined increased attention of the global society to the issues of development of the agro-industrial complex. In Russia, as in other developed countries, the purpose of increasing the level of national food security led to starting the government initiative of digital modernization of the agro-industrial complex – within the concept "Technological development of digital agriculture 'Digital agriculture'" of the Ministry of Agriculture of the Russian Federation (2019).

This initiative was first discussed in 2017, due to start of the program "Digital economy of the Russian Federation". This initiative was adopted in terms of legislation in 2018. However, it was not supported by entrepreneurial structures of the agro-industrial complex of Russia, which is proved by absence of growth of the share of gross added value that was created in agriculture in 2018 as compared to 2017 – according to the Federal State Statistics Service (2019), it reduced from 4.6% to 4.4%.

As is stated in the concept of the Ministry of Agriculture of the Russian Federation (2019), "digitization of Russian agriculture will require an active phase of investments into companies of the agro-industrial complex. A large part of direct digitization of processes – implementation of the Internet of Things, development of applied math, consulting, and data processing – are tasks that could be realized only with the help of private financing". However, low interest of entrepreneurial structures in practical implementation of this concept at the initial stage does not allow forecasting attraction of the sufficient volume of private investments even after provision of state financing of the initiative.

The working hypothesis of the research is that the key problem of development of the agro-industrial complex in modern Russia and, in particular, its digital modernization, is economization – institutionalization of the practices of striving for obtaining commercial profit with damage to the interests of social responsibility of the participants of economic relations in the agro-industrial complex: employees,

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investors, and entrepreneurial structures. The purpose of the paper is to determine the signs and reasons of economization of the agro-industrial complex in modern Russia and to develop recommendations for overcoming them.

## Materials and method

The existing publications – Bogoviz et al. (2019), Egea et al. (2018), Marques-Perez et al. (2017), and Troyanskaya et al. (2017) – emphasize social significance of the agro-industrial complex due to its key role in provision of the national and global food security. The issues of economization of agro-industrial complex are considered indirectly in the works Litvinova et al. (2016), Litvinova (2017), Litvinova et al. (2019), and Morozova et al. (2018).

However, the causal connections of economization of agro-industrial complex are poorly studied. For evaluating the influence of economic factors (monthly average nominal accrued wages, investments into fixed assets) on the indicators of economic activities in the agro-industrial complex by the example of agriculture (labor efficiency, annual average number of the employed and the index of food security). Dynamics of the values of the indicators that are used during the analysis are shown in Table 4.1.

**Table 4.1:** Dynamics of the economic factors and indicators of economic activities of agriculture in Russia in 2009–2018.

| Year | Indicator | | | | |
|---|---|---|---|---|---|
| | Average monthly nominal accrued wages, RUB | Investments into fixed assets, RUB billion | Labor efficiency, RUB thousand (in constant prices of 2005) | Average annual number of employees, thousand people | Index of food security, points |
| | x1 | x2 | y1 | y2 | y3 |
| 2009 | 9,619 | 327 | 43.7 | 6,580 | 42.5 |
| 2010 | 10,668 | 303.8 | 42.2 | 6,465 | 41.2 |
| 2011 | 12,464 | 376.8 | 39.2 | 6,583 | 38.3 |
| 2012 | 14,129 | 476.4 | 48.6 | 6,428 | 47.5 |
| 2013 | 15,724 | 516.6 | 61.4 | 6,364 | 60.1 |
| 2014 | 17,724 | 510.3 | 66.6 | 6,199 | 65.2 |
| 2015 | 19,721 | 505.8 | 67,2 | 6,297 | 64.4 |
| 2016 | 21,755 | 611.2 | 55.6 | 6,286 | 63.8 |

**Table 4.1** (continued)

| Year | Indicator | | | | |
|---|---|---|---|---|---|
| | Average monthly nominal accrued wages, RUB | Investments into fixed assets, RUB billion | Labor efficiency, RUB thousand (in constant prices of 2005) | Average annual number of employees, thousand people | Index of food security, points |
| | x1 | x2 | y1 | y2 | y3 |
| 2017 | 23,999 | 412.5 | 82.4 | 5,059 | 65.5 |
| 2018 | 26,474 | 455.0 | 74.7 | 5,581 | 67.0 |

Source: compiled by the authors based on Federal State Statistics Service (2019), The Economist Intelligence Unit (2019) and Center of Strategic Developments, National Research University "Higher School of Economics" (2019).

As a result of regression analysis, the following models of linear regression are obtained:

$-y_1 = 24.2993 + 0.0024 * x_1 + 0.0173 * x_2$, significance $F = 0.0054$; multiple $R = 0.8803$;

$-y_2 = 6580.4160 + 0.00945 * x_1 + 2.7412 * x_2$, significance $F = 0.0015$; multiple $R = 0.9194$;

$-y_3 = 13.1865 + 0.0014 * x_1 + 0.0391 * x_2$, significance $F = 0.0013$; multiple $R = 0.9226$.

The above regression models show sustainable direct dependence of indicators of economic activities on the agriculture in Russia 2009–2018 on the economic factors, which shows economization of domestic agro-industrial complex.

## Results

Economization of the agro-industrial complex is a problem, as barriers of entering the agro-industrial complex are high. This is due to limited possibilities of formal education (receipt of educational services with provision of a diploma) and large share of informal education (exchange of experience and tutorship) due to value of know-how in agriculture. At the same time, barriers of leaving the agro-industrial complex are low, which could be the reason for deficit of personnel, outflow of private investments, and decline of business activity. Economization of the agro-industrial complex could become an "institutional trap", which is shown in Figure 4.1.

Figure 4.1 shows that economization of economic activities in agriculture, which is the core of the agro-industrial complex, leads to outflow of investments – private investors switch to more profitable (less risky) projects in other spheres of economy. This leads to ageing of assets and reduction of wages – i.e., aggravation of labor conditions. This leads to deficit of personnel due to growth of labor mobility of the workers of

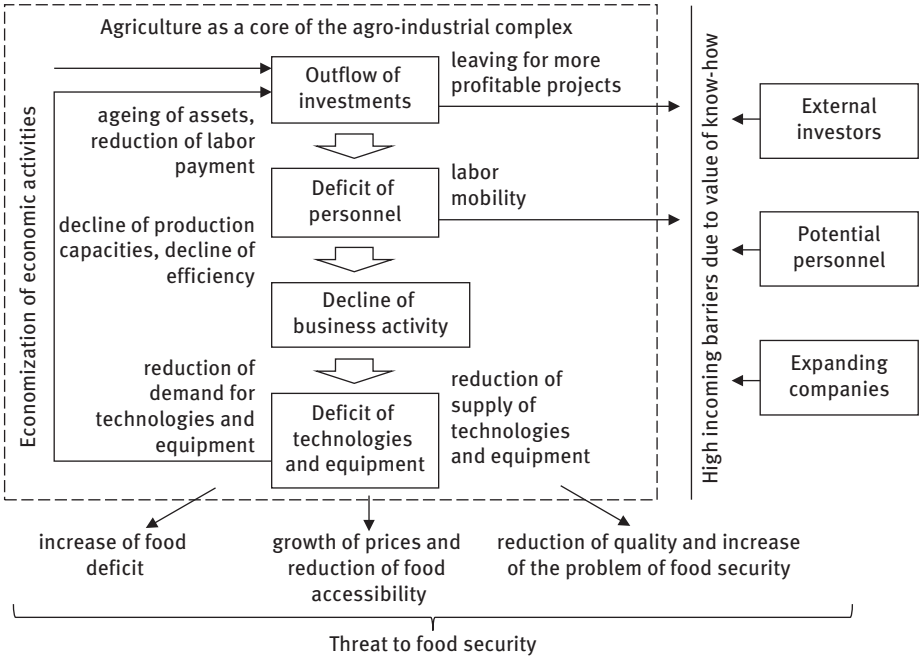


**Figure 4.1:** "Institutional trap" of economization of agriculture as a core of the agro-industrial complex.
Source: compiled by the authors.

agriculture. Production capacities and labor efficiency are reduced, which causes reduction of business activity.

Reduction of demand for technologies and equipment causes reduction of supply of technologies and equipment – i.e., their deficit. This starts a new cycle, reducing investment attractiveness and causing larger outflow of investments from agriculture. External investors, potential personnel, and expanding companies from other spheres of economy cannot overcome high incoming barriers of agriculture due to value of know-how and their inaccessibility for new market players. As a result, food deficit growth, prices increase, accessibility of food reduces, quality reduces, and the problem of food security grows – which poses a threat to food security.

As a result of analysis of the process of economization of the agro-industrial complex in modern Russia based on the data of the Federal State Statistics Service (2019) and the World Bank (2019), the three following reasons are determined:

- increase of the volume of state financial support for companies of the agro-industrial complex – primarily, agrarian companies – which leads to reduction of their own initiatives on provision of their competitiveness and formation of sustainable dependence on state financing

- growth of agrarian risks (volatility and unpredictability of the index of crop research and cattle breeding), which increases poverty of citizens of rural territories (in the formulation of the World Bank)
- deregulation of rural territories, which leads to liberalization of entrepreneurship and employment in agriculture, which result is reduction of the population of rural territories of Russia

These reasons are to be overcome by the mechanism of de-economization of agriculture as a core of the agro-industrial complex (Figure 4.2).

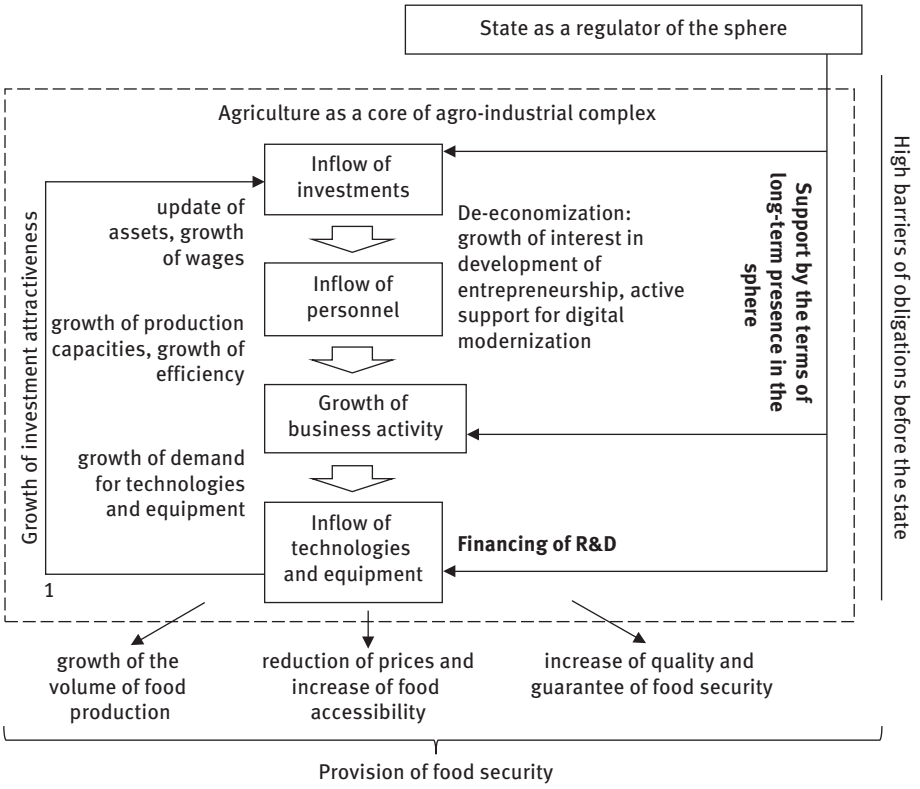


**Figure 4.2:** The mechanism of de-economization of agriculture as a core of the agro-industrial complex.
Source: compiled by the authors.

As is seen from Figure 4.2, starting the offered mechanism would require implementation of two measures of state regulation of the agro-industrial complex: financing of R&D and providing investors (in the form of tax preferences), employees (in the form

of state-funded education), and companies (in the form of subsidies) with support by the terms of long-term presence in the sphere. This will create high incoming barriers of obligations before the state and will lead to de-economization: growth of interest in development of entrepreneurship and active support for digital modernization.

Growth of accessibility and increase of supply of technologies and equipment will increase the investment attractiveness of agriculture and the agro-industrial complex in the whole. This will lead to update of assets and increases of wages – i.e., improvement of work conditions, which causes the inflow of new personnel. This will allow achieving growth of production capacities and labor efficiency and increase of business activity. As a result, volumes of food production will grow, prices will reduce, food availability will increase, and quality and guarantee of food security will grow – which will allow ensuring food security.

## Conclusion

Thus, the working hypothesis has been confirmed. The authors determine economization of the agro-industrial complex of modern Russia due to simultaneous combination of the factor of state regulation (de-regulation), geographical factor (unfavorable conditions for agriculture), and the market factor (aggravation of business climate).

Complex management of these factors in the interests of de-economization of the agro-industrial complex of modern Russia is to be ensured by the developed and presented mechanism on attraction of new players to the market of agriculture and simultaneous creation of high incoming barriers. The result of practical implementation of the offered mechanism will be provision of Russia's national food security in the long-term.

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# 5 Market Economy in the Era of Digitalization and the Fourth Industrial Revolution

## Introduction

The fourth industrial revolution has become the next stage in the development of civilization. It affects not only the industrial sectors of the economy, but also the vital activity of the humanity as a whole in a digitalized and information society. Openness of business, reduction of transaction costs, and elimination of information asymmetry is the path to what Ronald Coase called "the perfect market" (the utopian idea of some economists and some ordinary citizens), but for the economics it is the science of business of human life, according to Alfred Marshall's well-known definition. However, we consider the path to perfect market from a moral and ethical position. Will human morality and worldview change after the progress in production relations? Will it change under shift in material conditions of existence? Alternatively, is a human in their deeply inner essence, metaphysical, and their basic moral and ethical qualities are unchanged under a thin layer of human civilization? Is it humane to deprive a person of free will and individual choice (to act honestly or to lie)? Will the good deed, made based on violent prerequisites, be good? In addition, does humanity need a free market "at gunpoint"? These are the questions that modern human faces in the era of the fourth industrial revolution.

## Methodology

We base the general methodology of this study on the opposition of subjective individualism to objective materialism, metaphysics to dialectics, and methodological individualism to methodological holism. The authors proceed from the premise that it is necessary to consider the economy from the point of view of narrative, market paradigm, through the prism of individual economic agents (free market participants: a person, a firm, a state), who follow the moral imperative of free, fair and just exchange. It is assumed that the inner essence of a human including ethical and moral guidelines remain the same and does not depend on

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changes in the material conditions of existence (in this case, directly related to the fourth industrial revolution, thanks to which the digitization of the economy and society as a whole is carried out).

# Results

## The Fourth Industrial Revolution

The fourth industrial revolution refers to a further stage of development in the organization and management of the value chain in the industrial sector of the economy. First, it relies on the achievements of the digital revolution, characterized by the widespread introduction of the Internet and the creation of a single information space, as well as the development of artificial intelligence. Industry 4.0 is widely used throughout Europe, especially in the German manufacturing sector (Elliott, 2015).

Close interaction between virtual and physical systems helps achieve the use of "smart plants technology". As the operational business cycle of an enterprise undergoes significant changes, it creates new business models that are significantly different from the previous ones. Sensors, chips and other digitalization devices connect to a single network, thereby already allowing you to manage supply chains at a certain level, monitoring existing assets. This process carries out optimization at the level of individual parts of a single chain (Schwab, 2015).

Thus, it enhances the transparency of doing business, causing honest business conduct and excludes information asymmetry and opportunistic behavior.

Meanwhile, that the fourth industrial revolution is leading to shifts not only in new technologies of the business environment. The paradigm of the economy as a whole is changing due to the penetration of "imperialism of economic methods" (Becker, 1974) into all areas of human life, since, as we noted before, "economics is the science of the business of human life" (Marshall, 1890). In other words, the subjects of economic research have become previously unheard topics as the economics of impressions, knowledge, education, friendship, love, manipulation and deception; economics of human perception and thinking – neuroeconomics; narrative economics; everything that fills out the human life, which is not limited to the production, distribution, exchange and consumption of economic benefits.

In this continuum of human species, it is necessary to single out the main link, which pulls out the whole chain (Lenin, 1967). Thus, according to futurologist Michio Kaku, "the world is moving towards a perfect market" (Kaku, 2012), and this is precisely the main tendency of world development, since the free market is the most efficient social technology (Hanauer, 2013).

## Market Paradigm

Since the market seems to be the main trend of world development, we regard the market category as a paradigm along with the traditionally accepted ones: formational, evolutionary, civilizational, neoclassical, institutional, complex systems; dynamic stochastic general equilibrium, and agent-based modeling.

At the same time, "by paradigm I understand the scientific achievements recognized by all, which for a certain period of time give the scientific community a model of problem statement and their solution" (Kun, 1962).

The category of the market is considered as one of the many visions of the world – narrative (the basic element of social consciousness), which must be laid in the basis of the institutional design of the economy. The market is not a tool and not a model describing reality, since there is not and cannot be objective reality (Laitman). There is no material world that a theoretical system can reflect, because what a human knows about the world around them is nothing more than a product of their perception and agreement made between them and other individuals. "Life is what we think about it" (Aurelius).

The market is a set of principles of economic design; and when we teach them, the economic system functions most efficiently. The market is a set of principles of the institutional framework of the economy, which we should lay out at the stages of upbringing and education. The market should be the basis of social discourse, which comes out to replace defunct economic theories (Skalkin, Burykin, Aleksashina, 2015).

In line with this, it is necessary to emphasize that in this study the market category is not considered from the point of view of the theory of general equilibrium, as was done by the classical school, for example, L. Walras, K. Arrow, G. Debreau, T. Sargent, N. Wallace, etc., which led to the creation of DSGE model (Dynamic Stochastic General Equilibrium). The authors of this study are parallel to the branches of classical economics, neoclassical economics, utilitarianism, choosing a branch emanating from the teachings of Adam Smith and his seminal work "The Theory of Moral Sentiments". On this basis, the market is not a virtual stochastic point, not an optimum, which achieves economic efficiency, although this is also important. However, the market is, above all, a process, a condition of human satisfaction and the happiness of dedication. It is in the market, and not in other forms of human society, which achieve absolute freedom of everyone, acting as a condition for the absolute freedom of all. Thus, the market is not a result, but is a process (Mises, 1949).

The philosophical foundations of the market paradigm are metaphysics and dialectics. The deductive-inductive foundations are individualism and holism.

Metaphysics is the doctrine of the original source of the creation of the world, of the nature of being, of the true essence of things, of that which is permanent.

Metaphysics of the market lies in the fact that it runs through the possible stages of world development: globalization, anti-globalization, de-globalization,

and reglobalization, bypassing various national characteristics inherent in individual civilizations and societies, culture, existing economic systems and institutions. The market exists outside of the time and space.

The market is an honest, free, and fair exchange between two entities (a person, a firm, and a state) at a price that both parties consider fair (Skalkin, Burykin, Aleksashina, 2015). At the same time, market participants are assumingly equally informed about the subject of the transaction and are free to make their choice. Based on this definition, we can conclude that where there are two, there is a market. This is an exhaustive definition of market; in which all sufficient conditions exist for its being.

The market as an exchange arose from the beginning of human existence, largely due to the division of labor and specialization. Despite the fact that Adam Smith was the founder of the theory of specialization, it took place already in the era of the hunt for mammoths and the gathering of plants. Therefore, there is already scientific evidence that the market arose even before the appearance of human, and already occurred among monkeys (Cheney and Seyfarth, 2007).

Jewish teaching Kabbalah defines Dialectics as a dynamic process of perception of the essence of being. In accordance with this definition, the dialectic of the market lies in its spiritual origin. According to Kabbalah, Adam was the first person to know spirituality, but he was not the first person in the biological sense of the word. Animals manifest the market at the level of instincts. We consider such a market as a materialistic category, for animals are materialists. However, Human is able to see and feel beyond the tangible, empirical. According to the Epistle, sometimes attributed to the Holy Apostle Paul to the Jews 11: 1, "faith is confidence in the invisible, foreboding of things to come". Based on this, a market without spirituality is just a set of instincts, and not a conscious manifestation of love towards one's neighbor.

Socrates defines dialectics as a method of knowing the truth by contrasting the counter argument to the argument. Market dialectics is the opposition of the interests of the seller and the buyer.

Dialectics is a contradiction and interaction of ideas that goes through three stages of development: thesis, antithesis, synthesis (Hegel). In accordance with this, the dialectic of the market lies in the struggle between two principles. The human passions drive the world, including fear and greed.[1] These passions are anti-market and completely opposite to the market. Anti-market is a transaction between two entities (a person, a company, a state), performed in a forced order at a price that only one party considers fair or no party considers fair. In this case, the parties have unequal information about the subject of the transaction. The market

1 There is even a "fear and greed index" on the financial market https://money.cnn.com/data/fear-and-greed/.

is God (Adam Smith called market an invisible hand of Divine Providence). However, God is love. (John 4:8). Therefore, Market =God=Love. Anti-market means human passions, the devil. The dialectic of the market consists in defeating passions and finding the path to spirituality. The devil is also a son of God, but rebelled against the Almighty, so God, equal to the market, is one-step higher. As God rules the world, so the market is the basis of existence – hence the dialectic of the market.

Therefore, we transfer the study of the nature of the market from the field of objective materialism to the area of non-material, spiritual, subjective idealism.

Based on this definition of the market – "free, just, and fair exchange between the two willing parties" (Smith, 1759) and the spiritual beginnings of the market and market relations, we treat the market as a moral imperative.

The market as a moral category emphasizes the ethical basis of human relationships, in life and business, and means that the two free participants carry out exchange between themselves in the presence of a subjective perception of the deal as fair and just. At the same time, we exclude violence and deception, and the parties possess symmetrical information about the nature of the transaction and its consequences, and realize their own interest. Thus, a society in which the market is the dominant relation, moral imperative, narrative, adopted paradigm we consider a market economy. At the same time, a market economy is often (although not necessarily) defined as a system that develops based on private property and commodity-money relations. The market economy relies on contractual relations between economic entities, which determine the principles of free enterprise and choice (Skalkin and Sidorova, 2018b).

If we talk about the deductive-inductive foundations of the market paradigm, then it is necessary to consider individualism and holism. The central question is what moves the economic agents, what is the role of society and the state.

According to the Austrian and neoclassical school (advocating for methodological individualism), the economy should mainly be viewed through the prism of individual economic agents, who act rationally in pursuing their own utility, guided by individual choices. Utility is achieved in the process of market exchange, which is caused by changing preferences, thereby sending signals in the form of prices and volumes of sold / consumed economic goods in accordance with the law of supply and demand (Hayek, 1988).

From the point of view of heterodox economists (institutionalists) who adhere to methodological holism, a person exists in society, and therefore, a reasonable choice of an individual is due not only to the pursuit and to achievement of subjective utility, but also a complex system of social rules and norms that are cultural rituals embed and codified institutional arrangements. Failure to comply with such norms entails sanctions imposed by society, and often by the state (depending on the current political regime).

Within the framework of this discussion question of various schools, we note that methodological holism is not identical to ontological holism. A human being is

an ontological whole, which we model by obtaining an organism consisting of subsystems-cell-organs in relationship with each other. However, there is no such substance as society. Society implies a complex adaptive system, which we construct as a conceptual model. However, there is no living being that corresponds to society. Society is not an organism; therefore, we can talk only about the modeling of such an organism. There is an opinion that society as a substance we view from the position of ontological holism, but there is no scientific evidence for this statement. Simply put it, there is only a single individual and a bunch of people, consisting of separate individuals. However, there is no society. Society is only a conceptual model. Consequently, the economy, first, we be view through the prism of individual economic agents participating in market relations. (Hodgeson)

Accordingly, the author's position on this issue is as follows. It is necessary to make the moral imperative of free, just, and fair exchange the basis of public institutions, and the system of regulation and public coordination as market political services provided by the state to society (if there is a demand for such services) (Skalkin and Zhuravleva, 2016). Within this context, we may note that in scientific circles and in public life, not a single hundred years there has been a debate on the question of what should be the role of the state in the economy. There are supporters of active intervention (communists, socialists), supporters of his complete absence (anarchists, libertarians). Conservatives will consider that the role of the state should be limited to the role of the "night watch" in protecting the rights of private property and competition. The authors' position boils down to the fact that the role of the state in the economy should be determined by the market. That is, what matters is not the presence and absence of the state, but the lack of any agent of a monopoly, whether it is a monopoly on a product or service, or a monopoly on power. The provision of political services in response to public demand for these political services, including coordination and regulation, as well as services for the provision of public goods. At the same time, we consider the state as a separate economic agent providing market political services to society. Thus, the market is the basis of both individual and to and public relations.

## "Digitized" Way to a Perfect Market

The very existence of transaction costs separate humankind from the perfect market (Coase, 1937). Accordingly, the degree of "marketability" of an individual society we define as the ratio of the share of transaction costs in total costs. Alternatively, as the ratio of market transactions to the total number of transactions. With zero transaction costs, according to Coase, we achieve a state of perfect market.

The fourth industrial revolution solves this problem. Business and human relationships are becoming more open. The presence of information asymmetry approaches zero. Reduced time costs for finding the necessary information, as well as

for the transaction itself, including the preparatory stage. This is what the supporters of the perfect market have always strived.

Digitization of the economy can lead to the fact that a person cannot and will think about opportunistic behavior in relation to his neighbor, since such thoughts will break out at the root. In this connection, the question arises of free will and individual choice (to lie or tell the truth) (Skalkin and Sidorova, 2018a).

According to Marxist theory, human consciousness, ideas about ethics, morality and ethics change under the influence of changes in the conditions of their material existence, which biological and social evolution determine (Marx and Engels, 1975). In accordance with this, the question arises: will a human change upon deprivation of the possibility of moral choice. Will they truly become spiritual or turn into a robotic creature, whose thoughts, actions and deeds will be pre-determined and as accurately as possible predicted.

The authors adhere to the position that human metaphysics, human nature is unchanged. Therefore, the change of epochs, times, industrial and scientific revolutions does not change the deep essence of humans. An example is natural selection and the struggle for survival. We do not deprive a human who has an animal origin of these processes. We can talk only about the change of methods and methods of struggle in primitive society and civilization. Consequently, if desired, a person in a digitalized information society will be able to find ways to circumvent the benefits of the fourth industrial revolution, so that the struggle of opposites (dialectics), on which human existence rests, is not exhausted.

Nevertheless, if we assume that the individual loses his free will and individual choice, the question arises whether a perfect market may exist “at gunpoint”; whether good appears under pressure; and whether it considers good. We assume that only a free will can do a good. In accordance with this, the digitalized path to the perfect market can only pass the next horizon, followed by the same path, only on a qualitatively new basis.

## Conclusion

In this study, we consider the fourth industrial revolution in the context of movement and approximation to the state of the perfect market. Digitalization of the economy leads to the fulfillment of the fundamental condition for its existence – the presence of zero transaction costs. There is no doubt that the free market as a moral imperative meaning free, just, and fair between two willing parties, and this is the most appropriate development paradigm for any nation and the global economy as a whole. However, the question arises of free will and individual choice. How humanity will behave, technically reaching the state of the perfect market, and what will happen to public morality, in this state, is an interesting topic for future research.

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Vyacheslav Dementyev

# 6 Technical Progress and Economic Power

## Introduction

The main problem for the national economy of Russia is to ensure sustainable and long-term development based on the growth of innovative activity and the transition to new technologies.

The facts of the technological and innovative lag of the Russian economy are well known.

According to the Higher School of Economics, technological innovations of 2017 were carried out by 2321 industrial production organizations, or 9.6% of their total number. Since 2013, the level of innovation activity has not changed significantly: in 2013–2014. – 9.7%, a further decrease in the indicator value to 9.5% in 2015 and 9.2% in 2016, which generally indicates a low innovative potential of the economy and insufficient rates of its development. In the ranking of European countries, where similar surveys are conducted, Russia still remains in 28th place, ahead of only Romania (6.4%). In Germany, the figure is 58.9%, in Finland – 52%; France – 46.5%, Great Britain – 45.7%, Denmark – 39.4%.

Since 2013, the level of innovation activity in Russia has not undergone significant changes: in 2013–2014 – this figure was 9.7%, in 2015–9.5%, in 2016–9.2% (Indikatory innovatsionnoy deyatel'nosti v Rossiyskoy Federatsii: 2017, 2017).

We can state the innovative immunity of the Russian economy. The demand for innovation does not respond to the innovation policy of the state – innovation programs and strategies for the development of the national economy.

It becomes obvious that the lack of innovation is not a problem of lack of resources, but a problem of the state of economic order or the institutional model of the economy that forms the structure of incentives for economic behavior. There is a rejection of technical and organizational innovations on the part of the existing economic order.

Hence, we state the questions that we will try to answer in this paper: why the economic order (institutional environment) impedes innovation activity and new technologies, what features and elements of order result in the rejection of innovations, how did this economic order form, what institutional changes are needed for solving the problem of technical backwardness and the transition to innovative development?

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# Methodology

The research methodology is based on the institutional concept of economic power as a factor determining the amount of income (Dementyev, 2003; Preiser, 1971; Samuels, 1991). The General model of behavior used in the work includes the following cause-and-effect relationships. The configuration of power (hierarchy, distribution, and balance) determines the possibilities of gaining income by using excess power (rent power). The possibility of obtaining rents of power has an impact on the content of economic behavior. The implementation of behavior to maximize the rent of power has the consequence of the conclusion of appropriate institutional agreements between economic agents and the formation on this basis of a spontaneous economic order. This economic order, firstly, consolidates and expands the asymmetry in the distribution of power, contributing to the reproduction of conditions for obtaining rents of power, and secondly, the economic order, acts as a coercive force in relation to economic behavior and creates additional costs (including transaction) to maximize income in an alternative way, i.e. due to the growth of productivity of factors of production. The result is a lack of motivation for innovation and limitations of technological progress.

# Results

## Revenues and Economic Behavior

The state of the economic system – technical progress, opportunities for economic growth, the presence (or absence) of innovation, susceptibility to technical progress, economic order (deliberate and spontaneous, etc.), etc., – is the result of economic activity of economic entities.

The objectives and content of economic activity is the result of the structure of incentives. Hence, we see the value of profit, as the dominant form of monetary income, for understanding the motives, content and results of economic behavior, in particular, the presence or lack of innovation.

It is the desire for profit that drives the movement of the economy. Waiting for profits creates incentives to expand production and also acts as the main factor for the formation of investment demand in the economy. The absence of opportunities in retrieving profits leads to the lack of motivation in the economic activity, particularly in investing to the new technologies.

Thus, the basic condition for the emergence of innovative demand for new technologies, developments, research, creation and copying of innovations is the fact that these investments will be more profitable than alternative forms of income maximization.

What is the nature of economic profit, in what alternative forms does entrepreneurial income come forward and, further, what factors determine its size?

In a state of long-run equilibrium, economic profit is absent. The payment of each factor, including the employer, is equal to its marginal product and the profit is zero. What are the causes of economic profit ("entrepreneur income")? J. Schumpeter answers this question: "whatever their nature in other respects, entrepreneurs' gains will practically always bear some relation to monopolistic pricing. Whatever it is that produces these gains, it must be something that, for the moment at least, competitors cannot parallel for, if they did, no surplus over costs (including entrepreneurial 'wages') could emerge" [Schumpeter, p.864].

To create economic profit, there must be conditions that go beyond the free competitive order. The cause of profit is the inequality between firms and economic agents. This inequality creates advantages that break the competitive equilibrium and are realized in the form of profit.

The fate of technological progress and innovation activity depends on what advantages create the opportunity for obtaining entrepreneurial income in this institutional environment that firms and owners of assets are seeking to acquire.

Depending on what advantages firms have, we can distinguish different models for creating profits.

## Entrepreneurial Income: Power or Efficiency

In the market system (if we exclude the influence of external circumstances in the form of favorable market conditions), the following advantages, the possession of which allows increasing revenues and obtain economic profit, are possible.

Firstly, economic profit arises as a result of creating benefits in resource efficiency. This refers to the productivity of factors of production, as well as the efficiency of resource allocation. The source of these benefits are: technological and product innovations; advantages in business organization based on organizational innovations; advantages in the quality of human capital and entrepreneurial activity.

Economic profit is the result of an account of advantages in the physical consumption of resources per unit of production, or through the production of goods with characteristics that other manufacturers cannot achieve.

Secondly, the economic profit arises as a result of asymmetry or inequality in the distribution of power.

Resources, sources and rights of economic power in the economic system are unevenly distributed, as the inequality in the distribution of market power and opportunities for monopolizing the market, inequality in the distribution of ownership of assets, inequality in the distribution of administrative power within firms, unequal access to the use of state power and state protection, etc.

This inequality in access to resources and the rights of power for different firms results in the existence of dominant and subordinate economic units.

Advantages in access to resources and the rights of economic power creates for its carrier an "excess of power", which can be used for private purposes – to coerce resource providers and economic agents to accept the terms of transactions that are imposed by the subject of power. This refers to administrative, economic and state control over sales prices, prices of production resources used, restriction of market entry and control over sales volumes, etc.

An excess of governmental or economic power thus becomes a private economic good that has the ability to generate income for its owner.

In this case, income arises that exceeds the contribution of the production-controlled factors of production to the creation of a social product. The basis of economic profit in this case is the exploitation of public resources (wage labor, consumers, suppliers, the state).

Each of the specified models of profit creation (performance or power) creates its own mode of accumulation (the order of creation, distribution, accumulating and using the profit)

Depending on which profit creation model underlies it, the accumulation mode can be described with such features as: investment directions; temporary borders of obtaining a positive profit and related temporary horizons of investment planning; spatial and industrial limitation of profit receipt; the nature of the influence on the total or public value in the national economy ("the national dividend"). These models have different meanings for generating cumulative profits in the national economy. Basing on this, one can speak of the dominant model(s) of creating profits in the national economy or the dominant income. The dominant form of maximizing income determines the features of the mode of accumulation prevailing in the national economy and, further, the pace, quality and sustainability of economic growth.

The features of the dominant mode of accumulation, in turn, forms the investment demand for new technologies in the national economy. The attitude of economic agents to technical progress and the specifics of the investment demand for innovations depends on which profit creation model or, more generally, which accumulation mode dominates in the economic system.

The dominant mode of accumulation (the dominant income) is the result of a choice made by economic agents. The question is, what model and what way of influence on the cost of the price will the investor choose?

## Power as Capital

Taking into account, firstly, the low proportion of enterprises engaged in innovation; secondly, a high degree of monopolization of the national economy; thirdly, the level

of corruption in the relationship between business and government; fourthly, the meaning of the criminal factor when doing business – it can be argued that the institutional conditions under which the dominant condition for the creation of economic profit was formed has become an artificially low relative cost of doing business, and the main competitive advantage is the power (its excess or deficiency) – the market power in its various forms, administrative authority, monetary authority, access to sources of political and law enforcement authority, criminal authority, corporate fraud in and so on.

The main reason for this situation is that access to an excess of power (private economic power) is a relatively more affordable, cheaper and efficient (profitable) economic good for a market agent than new technologies.

Under these conditions, the most important asset for an enterprise is power. Access to power is a basic condition for access to property, protection from arbitrariness and gaining income, etc. It is the possession of power that turns the assets of the owner into capital, i.e. gives them the ability to generate cash income.

In such a political and economic system, in order to make economic profit, a firm must either have access to power itself, or submit to its established hierarchy. The competition around new technologies and quality is supplanted by competition for sources of economic power.

Improvement of technology and organization of production is not the dominant condition for the creation of profits. The source of economic profit is power, and technology is only an external constraint imposed by market conditions.

The result is the emergence of motivation to invest in power and a decrease in motivation to invest in innovative developments.

The result of investments in power is the formation of a system of economic institutions or economic order as a set of stable relations and forms of management, through which economic profit is created and appropriated: distribution of property rights, business relations with the state, sectoral market structures, corporate governance models.

This set of economic forms can be described as “the economy of power”, the basis of which is the relationship of domination and power that develop between enterprises, within corporations, and also between business and the state.

In conditions when the rent of power appears as the dominant form of income, it is the economy of power that acts as the dominant form of economic order in the economic system or as the dominant economy, crowding out alternative forms of farming and alternative possibilities of maximizing the income.

## Economy of Power: Success and Failure

The dominant form of profit creation and the institutional mechanism created by it determined the contradictory features of economic growth in Russia in recent decades.

On the one hand, one can observe the indisputable positive influence of the model based on economic power on the functioning of the economy and economic growth in particular.

The establishment of a stable economic power over the use of assets, as well as the strengthening on the vertical of state power, allowed to overcome the economic chaos of the early 90s and the predominance of predatory profit-making mechanisms, with their inevitably short-term interest and lack of motivation to invest in the development of productive assets.

In addition, it must be borne in mind that production assets that were left in the heritage after the collapse of the USSR could yield a profit only if it was possible to cut off a number of costs or reduce their value. The profitability created in this way gave a rise to an interest in expanding production and made it possible to attract investments and ensured the revenues to the state budget.

However, the described mechanism of maximizing the economic profit of creating cash income has limited development opportunities. Like any income based on the exploitation of resources, power rent has diminishing returns, and the rate of profit tends to decrease.

The downside of the quality of economic growth under this model were the limited goals and time horizons of the investment policy, rejection of innovation, the "underproduction" of public goods, increasing diminishing returns from investments in physical capital and the instability in time.

It can be stated that at present the internal possibilities for creating profits have been exhausted.

Firstly, the artificial lowering of prices for production costs and overpricing for finished products creates a distortion of the conditions for the reproduction of factors of production.

The second point is the pace of technical development in the global economy. The creation of new technologies has the effect of creating products with such characteristics that the Russian economy is no longer able to produce. The result is a gradual reduction in the world markets of a "niche" for Russian products and a real threat of crowding out from international markets.

A sign of the crisis of the dominant economic model, on which the mode of accumulation and economic growth is based, is a steady decline in the share of profits in the national economy over the past decade.

Since 2005, there is a tendency to lower the rate of profit in the Russian economy. The proportion of unprofitable enterprises in 2014 amounted to 33% of their total number. The share of profits in Russia's GDP has fallen to its lowest level for the last 15 years. The return on assets of organizations has decreased by almost 4 times since 2005. The profitability of goods, works and services sold has declined by half in 10 years.

The level of enterprise an entrepreneur income in the common earnings of the economy is currently at the lowest point in history (lower, then before the crisis of 1998 and in the midst of 2008–2009).

The situation with the profitability in Russian economy suddenly changes *in* yy. 2015–2016. Thus, the share of the unprofitable enterprises in the Russian Federation, according to Rosstat, *has fallen by 26% this* by the end of 2016. *The causes of the situation are inflationary processes that resulted on the value of labor cost, that has been made up to 91% according to 2014 with the industrial goods prices growth by 10,7% in 2015 and 7,4% in 2016. The sanction policy had a certain impact on it, too.*

The situation changes again in 2017. The reduction in the rate of inflation resulted in a fall in the rate of profit in the economy. The net financial result of large sectors of the real sector of the economy (industry, agriculture, trade, transport, communications) declined by 8.5% in nominal terms to 10.3 trillion rubles for the last year. The income of profitable companies fell by 5%, while the amount of loss of loss-making companies jumped by almost 20%. The percentage of loss-making companies grew by three tenths of a percentage point, up to 26.3%. (Rossiya v tsifrakh. Stat. spravochnik v 2017, 2017).

The condition for the long-term and sustainable development of the domestic economy is increasingly becoming massive innovative production and new industrial technologies.

Is a mass transition to new technologies or, in other words, an industrial revolution under the "economy of power" possible (an economic order based on the dominant importance of access to economic and state power)?

## Economic Power vs Industrial Revolution

As a result of investments in the expansion of private economic power, an economic order that rejects new technologies and innovations arises. This order creates such additional institutional costs that weaken the motivation to innovate. The availability of these costs is the reason for rejecting innovation in Russian business and limiting the investment demand for new technologies.

The first point is the availability of alternative sources of income. Hence, we see the lost profits that accompany investments in new technologies. Why bear additional risks and fund research and development when income can be obtained in a different way with less risk and cost? Moreover, retardation in technology is by no means a mortal threat to domestic business. Domestic business is more afraid of the prosecutor than of technical backwardness and low competitiveness for international markets.

The second point is high transaction costs of innovation. Any power is accompanied by transaction costs associated with the establishment of control over behavior, the application of sanctions, etc. These costs are a necessary condition for the

exercise of economic power. At the same time, these costs are at the same time an obstacle to innovation activity.

Third. The personnel resistance. Economic power is a condition of not only functional, but also personal income. The main factor determining the size of individual incomes in the economy of power is not a contribution to productivity growth, not labor costs or qualifications, but, above all, a marginal contribution to the exercise of power. Hence, we see the resistance to innovation and agents of change, since the latter are the threat to the established distribution of income, occupations and positions in the corporation.

The fourth point is the limited time horizon of economic planning (short-term economic interests). Where there is a surplus of private economic, state, and criminal power, no economic agent, either at the level of the individual or at the level of the firm, cannot be protected from arbitrariness, from the risk that his property and income, and even personal freedom will not be lost.

The fifth point is economic freedom as a condition for innovation. The implementation of innovations implies the existence of a certain "corridor of freedom". At the same time, since in an economy of power a condition for earning income is the possession of rights and resources of power, then, accordingly, the condition for an increase in income is the expansion of power. The expansion of the power of one participant means restriction of the economic freedom of other participants in the economic process. Under these conditions, the freedom of others is perceived as a loss of profit.

Thus, the main obstacle to the new industrial revolution is not the lack of funds or "development institutions", but, above all, the "economy of power": the structure of the economic order, based on inequality in the distribution of economic power and, further, an excess of private economic, administrative and political power.

The problem of creating an effective innovative demand for new technologies from enterprises is, first of all, the problem of transforming the economic order and its inherent institutions.

Even if business and the state are aware of the need to move to an innovative way of creating economic profit, and even if economic and government agents want to introduce new technologies, their possibilities are limited on this path. They fall into the institutional trap: they interfere with the current (with the direct participation of the latter) economic order.

Hence, in particular, we see the "schizophrenic duality" of Russian business and power structures: on the one hand, the desire to receive economic rent through the exploitation of resources, which undermines the efficiency of the economy, and on the other hand, the intention to have competitive and modern production, which contradicts the interest in extracting rent power.

For the transition to an innovative economy, it is not enough to approve another innovation strategy, to create another "development institution" or to increase spending's on education and science.

Technical progress implies the creation of such institutional conditions or such an economic order, where exactly innovations and new technologies are the main source of maximizing personal and functional incomes

## Conclusion

Each industrial revolution is accompanied by a change in the structure of economic power. This concerns the relationship of power and control within the firm, the relationship between firms, the state and business. This revolution in power relations is not only the result of changes in technology, but also a condition for changes in the technical basis of production.

Overcoming the "economy of power" should be the central problem of economic and, above all, institutional policy in the conditions of the industrial revolution. Without this, it is impossible to provide motivation to use new technologies and create conditions for long-term and sustainable economic growth. According to K. Herrmann-Pillath, "The main force opposing a market economy is both economic and political power. Therefore, the protection of a market economy from power is the most important goal of its political component". (Herrmann-Pillath, 1999, p. 49)

There is a need for such a transformation of the structure of economic power and its connection with political power, which will make it possible to eliminate or limit the use of private economic power as the main factor in obtaining economic rent.

Solving these problems involves changes in the system of economic power of society – in intra-company relations, power relations between firms and the relationship between government and business.

The transition to a new economy involves the creation of a new (according to E. Toffler) socially necessary order of power [8].

A new socially necessary order of power cannot form spontaneously. Conscious redistribution of economic power, naturally due to the desire to maximize benefit or the "creative destruction" of the existing economic order, is necessary.

Creating a new order of power should be the subject and purpose of the state economic policy in the new industrial revolution. "Like any other policy", according to germen economist V. Eucken, "economic policy faces the problem of power" (Eucken, 1995, p. 427). Moreover, from his point of view, this is the *first principle of* state economic policy (Eucken, 1995, p. 427).

The condition of the new industrial revolution is the creation of a new economic order, where any power would be limited, the market would be competitive, there would have been no arbitrariness of private state and economic power, freedom of innovation would have become a priority, and innovation would have become the dominant source of creation and appropriation of income.

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# 7 Digital Transformation of the Economy as a Dominating Factor of the Formation of Sixth Technological Mode

## Introduction

The relevance of the topic is justified by the need to define the digital transformation of the economy as a process that allows significantly accelerating the formation of a new technological mode and substantiating the main opportunities arising from the use of digital technologies. The article is devoted to the analysis of the basic capabilities of digital transformation, their use in production and business processes, as well as the substantiation of the objective need for legal regulation of innovation processes caused by the emergence of a variety of risks and threats.

Digital transformation of the economy is a rather long-lasting phenomenon, smoothly moving from one stage to another. There is no single opinion in the exact definition of the beginning of the digital transformation. S. Glazyev believes that: "The beginning of the information-digital revolution should consider the emergence of electronic computers that, without human participation, perform operations with numbers, receiving, transforming and transmitting information" (Glazyev, 2017).

Digital transformation is a process that generates a new economy – the economy of numbers, because it is based on information streams encrypted in the form of digital computer codes. And the programs that use these codes for work are various, increasingly popular applications installed on various gadgets – computers, smartphones, and tablets. People use these devices in various spheres of life – politics, economy, culture and art, travel and communication. Usage of applications in production and business processes allows society to improve the infrastructure, to create a single high-tech-logical system, thereby achieving higher quantitative characteristics of the operations and tasks performed. This, in turn, makes it possible to improve the quality of the results of these processes, whether it is a product or work, or a service. Thus, we come to another, new definition of the digital economy – "application economics".

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## Methodology

Methodologically, we rely on the concept developed by S. Glazyev on the pattern of changing technological structures in the development of world and national economies, as well as on institutional theories of organization and market behavior of companies, since the technological breakthrough in the economy depends largely on the company's strategies, from government policies affecting the innovative behavior of firms.

Technological order as a category is a single cyclic system, reproducing all stages of the production process, based on the processing of primary resources, the output of which are formed goods and services, and indirectly strong non-linear feedback between them. The layering of experimental and technical developments, as well as the results of their application in practice form the technological basis of the structure. The composition and structure of technologies changes significantly when technological structures are changed used in production processes, new technologies replace technologies with the used potential, which significantly affects the sectoral structure of the economy, that is, there is a reduction of some sectoral reproduction processes. At the same time, a new technological mode is emerging, using new technologies that replace the old ones.

Thus, as noted in the literature, the technological structure is a system of interrelated industries (including technological chains dependent on each other) with an equal technological level (Odegov, Pavlova, 2017.)

In 25–30 years, according to the forecasts of specialists in the economies of developed countries, the sixth technological mode will become dominant. In developed countries, the level of the formed sixth technological mode is 10%. Meanwhile, Russia's readiness to function in a new way is still very low. The fourth technological mode is currently formed in Russia, the fifth technological mode is being formed, and a third of the technologies are based on the third technological mode. The level of the sixth technological mode is 1%. Under such conditions, there arises an objective need to make a technological breakthrough in the state, not so much in order to preserve global competitiveness, but because of maintaining a high level of security and preserving the independence of society as a whole. The process of the formation of technological structures is closely connected with the definition of leaders in the global socio-economic space, therefore the formation of a strategy for the technological development of the state is a key direction in the development of an effective government policy.

## Results

Currently, the countries with the largest budgets for the development of innovations are the USA, China, Japan, the countries-locomotives of the European Union and

some others, so it is not surprising that these countries are claiming leadership in the sixth technological mode, as they could invest a sufficient amount of funds in the development of new digital technologies, which are the driving force for the formation of the sixth technological mode.

The level of development of innovative technologies in world practice is currently estimated using the Information and Communication Technologies Development Index. This is an indicator characterizing the achievements of the countries of the world in terms of the development of information and communication technologies (ICTD); this combined indicator is calculated and published by the International Telecommunication Union, a specialized UN agency.

We reviewed the rankings of countries with the highest ICT level in 2018, and brought the most noticeable results to the graph (Figure 7.1). It should be noted that the first lines in the rankings do not always occupy the countries with the highest GDP, which is remarkable, that is, it speaks of the specialized focus of the state strategy of the state towards innovative development. In addition, we estimated the level of cybersecurity in these countries, because the main performance parameter of using innovative technologies is their reliability for users. It is also worth noting that the security level of innovative technologies is a weak point for managers and this situation requires careful work.

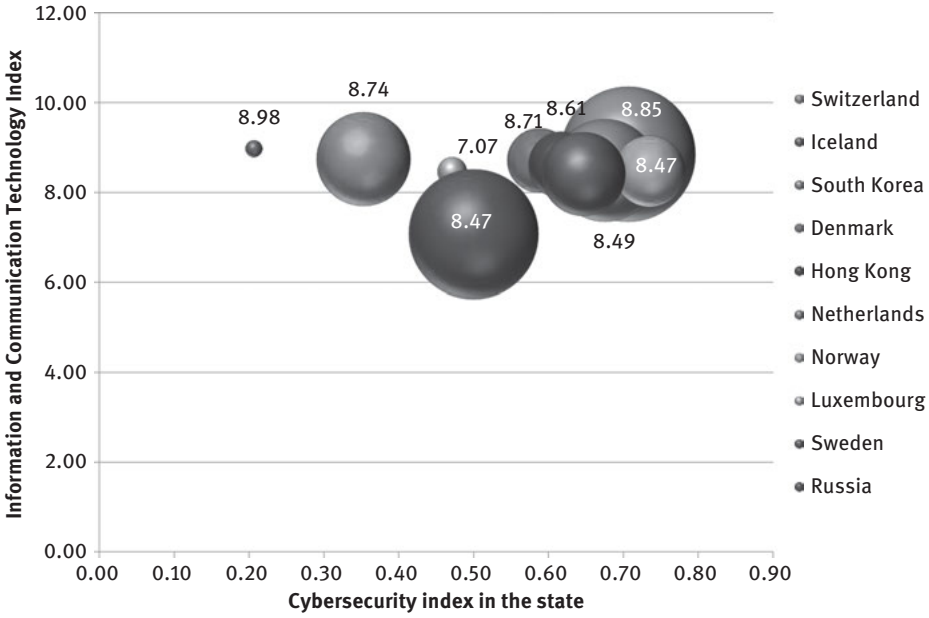


**Figure 7.1:** Grouping of countries with the highest ICT, 2018.

By 2020–2025 there will be a new leap in technology, where the following areas will dominate: nano- and biotechnology, information and communication technologies, other non-machine and hybrid technologies with machine technologies based on robotics.

It is very important to note that in the process of the emergence and development of innovation technologies it is necessary to take into account the possibilities of their further use and use in the economy directly when creating work and services. Indeed, not all innovative discoveries are applied in practice and turn out to be truly effective. We also emphasize the point that business owners are directing efforts to improve financial results and save resources, and when developing a strategy, they will certainly take into account the costs of mastering innovations as well as their payback.

In this case, we can conclude that in the process of changing technological structures the structure of demand for scientific discoveries and inventions changes. Many of them remain unclaimed for a long time, since they do not fit into the production and technological systems of the dominant technological structure. Only with the exhaustion of the possibilities of its growth, there is a need for fundamentally new technologies, the competitive selection of which forms the basis of new technological trajectories.

Such a "discontinuity" of the demand for new technologies is an important feature of the regularity of the periodic change of technological structures. The prerequisites for their appearance are created in advance in the form of relevant developments in the scientific field, scientific and practical centers, and fundamental technologies. By the time when traditional technological opportunities for capital expansion due to saturation of relevant needs and reaching the limits in increasing production efficiency are exhausted, these prerequisites are realized, turning from potential ways of investing in real ones (Morozov and Morozova, 2018).

Digital transformation brings many possibilities to society, but it also generates a significant number of threats and risks. At present, there are several fundamental problems in the economy that can be solved with the help of digital technologies.

As we know, financial resources are the basis for the implementation of any economic activity. A necessary condition for expanded reproduction is an increase in the scale of activities and the involvement in the cycle of more financial resources. Every year, the problem of access to additional financial resources is becoming increasingly important. The financial component is currently, probably, the toughest and uncompromising business. Fulfillment of cost reduction requirements implies sometimes-difficult decisions to reduce resources and investment plans.

However, in modern realities there is a problem of maintaining competitiveness through the introduction of innovations. This combination of requirements seems impossible, and, most unpleasantly, is detrimental for the company, especially for the regional one. We propose to consider these requirements as complementary, that is, to use innovative solutions to save financial resources.

For example, cloud technologies that are gaining popularity can be a good innovative solution that will reduce the cost of maintaining data centers and providing information services to a company, and commercial outsourcing contracts will replace the high cost of additional wage labor. The introduction of robotic technologies reduces many operational costs, for example, the costs of servicing and transaction support or the costs of servicing additional departments of the bank. Thus, innovative technologies do not always require significant investments and a long payback period, they are often created to save the company's financial resources and optimize its operations.

The problem of innovation management lies on the surface for a considerable period. The process of developing and introducing digital technologies is only a small fraction compared to the effective use of new developments and the efficient construction of an innovative culture in the company. Because of this, most of the useful properties of innovations are lost at the entrance to the company's activities.

We join the opinion of A. V. Medvedev that the world is moving to a new economic model of "everything as a service". The operating costs of a business are gradually crowding out capital costs, and after a period, the end customer will be offered not a product, but a service. This is a client-oriented model. In addition, to realize it, one needs to know the client very well. Having learned it better, the company will be able to more accurately calculate its risks and opportunities, better think through the development strategy of the company and its product. This information about the client can be given by the Internet of Things, which will become the basis of the new economy "everything as a service". Thus, we see the main benefit of introducing technologies of the Internet of things into the production sector – this is the formation of a qualitatively new business model that allows us to increase the competitiveness of both the company and the state as a whole (Medvedev, 2014; Glaz'yev, 2010; Glaz'yev, 2017; Glaz'yev, 2019).

Currently, the introduction of innovative technologies has become a familiar part of the strategy of almost any successful company, as the main factor in maintaining competitiveness and maintaining market share. This can be justified by the fact that innovation processes benefit companies. At the same time, there are a number of problems of different nature, the solution of which must be found at the stage of development of the innovation management policy, and integrated into the company's tactics. Below we consider the range of the most pressing, in our opinion, problems and the most accessible solutions for companies.

In recent years, the technology of distributed blockchain data registries has become widespread. Cryptocurrencies today are a real headache for government agencies that provide counteraction to the legalization of income and the financing of terrorism and extremism. All payments are anonymous and securely encrypted. It is also important that the transfer of assets between entities is carried out without financial intermediaries, disclosing information about the sub-visual operations to the controlling structures. Therefore, the problem of cryptocurrency regulation lies

not so much in the absence of a legislative base, as in the absence of any technical mechanisms that allow control over this area. Nevertheless, any innovation direction introduced in the financial, or especially in the banking sector, requires mandatory legislative regulation. Economic agents using innovative technologies must be protected by the state, since the development of economic offsets is impossible without preserving the security of the infrastructure of these offenses.

Also, very relevant at the present stage is the problem of the social responsibility of the company as a prerequisite to the introduction of innovative technologies.

McKinsey & Company has predicted a scenario whereby the widespread introduction of digital technologies into the activities of production and financial companies will contribute to a significant economy of minerals. Figure 7.2 shows the level of demand for resources from the perspective of historical development and from the perspective of the projection of the scenario of technological adaptation of companies to new technologies. Such a scenario assumes the transition of society to a new level of development – the information level – an integral part of the sixth technological mode of the economy.

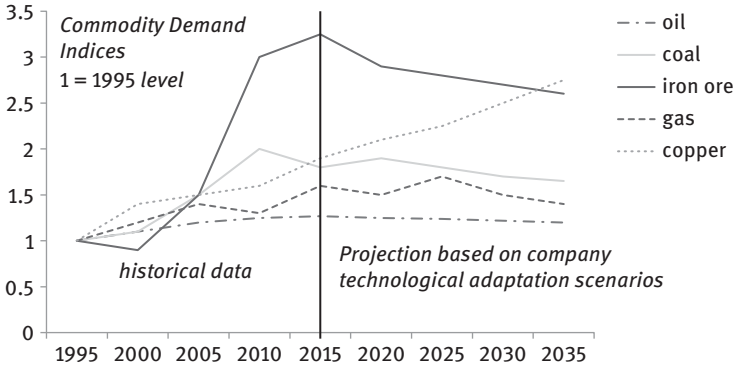


**Figure 7.2:** The development of the sixth technological mode. The level of information society from the standpoint of demand for the commodity sector of the economy Source: McKinsey (2017).

The scenarios that the company modeled suggest that these developments have the potential to unlock $ 900 billion to $ 1.6 trillion in incremental cost savings across the entire global economy by 2035. (McKinsey, 2017)

When natural resources are limited and environmental problems are dominated, the goal of every successful company is to take into account in their production activities such aspect of business as social responsibility of the society. Good reputation is one of the most important goal of each firm. In the conditions of the digital transformation of the economy, firms have a good opportunity to realize this goal and to save resources at the same time. New technologies will help to achieve this result.

In addition, it is worth noting such an aspect of the digital transformation of the economy as the transformation of labor relations. Information resources become more important for society and this situation is changing the demand for human resources. The motivation of people to work is also changing, as well as the requirements for working conditions. Consequently, new types of labor relations, remote employment, virtual labor market are formed.

It is obvious that organizations exercising control functions in the sphere of money circulation will take all possible measures to eliminate the threat. For example, an intergovernmental group for the development of financial measures to combat money laundering (FATF) is currently actively developing standards for the international regulation of cryptocurrencies. According to representatives of the organization, these standards should be respected by financial regulators around the world and apply to digital currency exchanges, wallets and primary coin offers (ICO). It is quite likely that by joint efforts, the controlling organizations will be able to develop measures to regulate blockchain transactions.

Digital technologies allow us to exchange information quickly, cheaply and securely. In the era of Big Data, the amount of data doubles every two years. (Russian Business Gazette – Innovations, 2013) Obviously, it is becoming more and more difficult to control these huge flows. The problem lies not only in the amount of data for processing of which substantial resources are required, but also in their qualitative characteristics: the anonymity of the source, security, lack of control.

## Conclusions/Recommendations

We suggest adhering to the following installations in this area:

First, any transformation using digital technologies should be based on knowledge of the company's history, its mission and values, the economic nature and purpose of the activity.

Secondly, an important role is played by awareness in the interests of the company's stakeholders and a joint analysis of the proposed development prospects.

Secondly, before starting large-scale transformations into a company, it is necessary to develop a concept that is acceptable to all employees of the company. It is necessary that they believe in the idea of the effectiveness of technology and want to go forward and develop.

Thirdly, in behavioral psychology, a new direction in the field of personnel management is currently gaining popularity – a narrative approach. This is a series of psychological techniques that allow to level stressful situations in the company's operating activities. This effect is achieved by leveling people's fear of failures and mistakes. The narrative approach places active work, the process of achieving the goals, as the main cause of errors.

In any company, even the most developed one, when introducing innovations, there are failures, unexpected obstacles and unexpected expenses that arise, and at the same time, managers often give up on this and stop believing in their competence and professionalism. This jeopardizes the implementation of innovative projects, because the managerial component takes a leading place in innovation processes. Narrative principles make it possible to attribute such overlays to the necessary attributes of innovation implementation and thereby develop staff and management confidence in the success of the company.

In conclusion, we would like to note that any technical innovations are associated with opportunities and risks for society. Technological progress cannot be stopped, and humanity can only adapt to its conditions. If earlier the monetary system was completely controlled by the state, now self-regulating structures are emerging that can exist without government intervention. A few years ago it was difficult to imagine fiduciary money without a state. Today, there are hundreds or even thousands of cryptocurrencies on the market, the cost of which is supported by technology, and not by the authority of the authorities.

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# 8 Provision of Restricted Reproduction of Shadow Economy in the Context of Digitalization

## Introduction

The concept of transition to a new economic structure which will be based on the element base of digital economy is gaining strength in economic theory.

Disputes about economic nature of emerging digital economy, the role of a man in it, threats and challenges to all mankind clearly demonstrate increased relevance of these processes.

The purpose of this study is to find the impact of objective processes of digitalization of economic life on reproductive dynamics of shadow economic relations, in an attempt to offer adequate methodological tools for scientific analysis of shadow economy.

Historically, economic science has already faced the problem of transition from one economic system to the forming one – when the existing methods of cognition of objective reality came into conflict with objective examples of economic practice that do not fit into the scientific picture. For example, decomposition of feudal socio-economic relations and formation of the capitalist form led to the development of economic science, in terms of reflection of the object in the subject, and on the basis of the forming subject of the development of methodology.

That is, changes in the object led to the need to revise the subject of economic science, which in turn allowed to improve and develop the method.

Analysis of reproductive dynamics of shadow economy is traditionally associated with the study of factors of growth of its volumes, or otherwise, factors of expanded reproduction of shadow economy, however, in the implementation of anti-shadow policy of the state, automatic regulation of the scale of the shadow sector remains ineffective through the impact on "fixed" causes.

The search of universal factors in reproductive dynamics of shadow economy requires the formulation of different from existing methodological problems of the analysis of this phenomenon, the other, deeper degree of abstraction, to understand the essence of the phenomenon under consideration.

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Hypothesis: historically, the growth of reproduction of shadow economy occurred with the development of the capitalist form, therefore, a new transformational transition from industrial economy to its digital form, will contribute to a new round of expanded reproduction of a shadow form of economic relations.

The article deals with four problems: a review of literature on the analysis of factors of reproductive dynamics of shadow economy, substantiation of the research methodology, an answer to a question – what is the role of digitalization as a factor of reproductive dynamics of shadow economy and the proposal of recommendations in the direction of finding adequate steps to solve the problem of ensuring restricted reproduction of this negative phenomenon.

All of the above determines the relevance of this article.

## Methodology

The theoretical and methodological basis of the study is formed by fundamental provisions presented in classical and modern works of domestic and foreign scientists who implement strong approaches to the analysis of shadow entrepreneurship in various sectors of economy. Formation of the subject definition on the basis of existing methodological approaches did not allow researchers to formulate a holistic theory of shadow economy. Disunity of concepts, difference in the object base, inadequacy of the method to the object of analysis, focus on the description of types of shadow economic activity, inability to identify the universal cause of shadow economy actualized the search for a holistic scientific concept that would solve the task of defining the shadow economy as an objective phenomenon and the need to develop an adequate scientific method. A critical analysis of modern concepts of shadow economy showed the difference in the understanding of the essence of shadow economic relations in different scientific schools, which manifested itself in a variety of interpretations, depending on the adherent of scientific paradigms whether the author belongs to: liberal-market or classical political economy. The greatest progress in understanding the phenomenon of shadow economy, according to the author, was consolidated to the political economy approach, which is associated with the wealth of the immanent scientific method and categorical perfection.

During the development of the problem there was justified the approach to reproductive dynamics of shadow economy; the main reason for both expanded and, more importantly, restricted reproduction of shadow economy: the transformation of the control system in the form of different from existing control system tools, forms and principles of control as an economic alternative to historically specific forms of legal economy.

## Results

The paper attempts to identify the universal cause of shadow economic relations on the basis of consideration of shadow economy as an economic structure based on another historically specific form of relations of control, which, in our opinion, will contribute to the formation of a holistic concept of shadow economy.

We believe that it is incorrect to analyze the shadow economy through the prism of property relations, since property which is subject to ideological influence of law, exists in legal economy, hence there is the opposition of legal and shadow economics as socio-historical antagonists. The solution of the problem of formation of an adequate scientific instrument of knowledge of shadow economy is possible through introduction of economic relations of control into scientific circulation.

The proposed factors in the modern concepts of the dynamics of the shadow economy are contradictory, do not differ in integrity. For example, the main reason for Schneider (2003), taken up by most researchers, points to shortcomings of the tax system, but shadow economy in the form of drug trafficking is not related to tax legislation. Therefore, it either appears in the status of non-shadow economy, or develops in isolation from considered factors of dynamics. We try to solve this problem by forming a model based on a connection between the reproduction of shadow economy and forms of relations of control as a universal factor of dynamics. That ultimately allowed not only to understand the objective nature of shadow economy, but also to offer ways of its restricted reproduction.

The modern view to above mentioned problems can be considered depending on the basic reasons of the growth of shadow economy, which were determined by researchers. Below is the conceptual content on this issue by a number of authors will be shown below.

The main reasons for the growth of shadow economy are the following: general economic background in the country; initial distribution of capital; impact of other areas of shadow economy, for example, corruption; imperfection of state regulation; bureaucratization of economic relations. (Mikheeva, 2008).

The lack of legal and methodological framework which is necessary to regulate and control the sphere of electronic payments creates prerequisites for development of shadow activity. (Anokhin, 2008). High level of tax loading. (Korzhnev, 2008) Vertical centralization, growth of bribery. (Echazu and Pinaki, 2008).

The development of shadow economy is directly dependent on the level of taxation: the increase in tax rates and the number of taxes increase the scale of shadow economic activity. On the contrary, reducing the tax burden encourages legal investment activity of a private sector. (Chursina, 2009).

The growth of informal (shadow, as well as criminal) economy in the transition to market relations is largely due to the costs of domestic public administration. (Bobylev, 2009).

Transformation of social structure of society by replacing the ruling class of owners of production means to bureaucracy (Alpidovskaya, 2009).

The very appearance of shadow economy is primarily due to the fact that formal economy was not able to provide everyone with jobs, taking into account the individual needs of citizens needed to solve life problems. (Gunichev, 2010).

Features of structural reconstruction of economy: lagging behind in the development of services and transport infrastructure from other regions; large proportion of small businesses; increased structure of industry; uneven level of socio-economic development of municipalities and presence of areas with a single-industry structure of economic development; legislative imperfection; tense situation in the sphere of law and order. (Agarkov et al., 2010).

Conflict of interests between institutions of society – state, bureaucracy and population. (Adjikova and Glushkov, 2010).

There are a number of reasons why business goes into the shadow sector. First, high actual tax rates force most enterprises to enter the shadow economy. Secondly, the high level of corruption encourages the transfer of activities to the shadow sector. (Biryukov, 2010).

The offensive struggle against shadow economy is more hampered by discrepancy and inconsistency of court decisions, unjustifiably liberal approach to sentencing the guilty and inefficient use of norms of existing criminal legislation. (Bykov, 2010).

The reasons of shadow economy are connected with the presence of demand and supply for criminal activity in the process of production, distribution, exchange, consumption of various material goods and services both prohibited and permitted in circulation in order to extract criminal income. (Melnikov and Tereshchenko, 2012).

Consideration of the issues of ensuring restricted reproductive dynamics of shadow economy from the standpoint of institutional theory is seen in the development of digital technologies (Nureyev, 2019).

## Conclusion

Summarizing the causal factors of growth of shadow economy in the country, it should be noted that it is based on the conflict between the external source of control and the object of control. It is, in turn, generated by discrepancy between private and public interests at creation of a conflict field.

Thus, we can state the fact that shadow economy is characterized by shadow relations, the most common feature of which is being outside the framework of effective control. In our opinion, control should be understood as economic relations that develop at all stages of social production within the control and reaction to it. This allows us to talk about dualism of control, which acts as a cause of shadow economy and as a tool to combat it.

It must be recognized that the forming digital form of economic relations can indeed dramatically reduce a number of types of shadow economic activity. A number of structural elements of shadow economy will go into the past as historically inefficient (decomposed) forms, others will acquire legal form through the recognition of ruling economic classes, but the new class state of society will bring new reproductive forms of shadow economy to historical arena, based on alternative tools, forms and principles of relations of control.

The provision of restricted reproduction of shadow economy dynamics in the context of digital economy is possible only by reducing class contradictions between the ruling class and society, between the labor that creates value and labor controlling it. The elimination of this contradiction harmonizes economic relations as a whole and will move to a classless society as a society of greater economic efficiency, devoid of social contradictions.

The following imperatives of activation of restricted reproduction of shadow economy in the conditions of digital economy are offered:

- practice regulation of economic interest
- construction of a control system in the broad practice of introducing desubjectivization of control forms (digital technologies) and humanization of economic relations of control (social forms that remove the contradiction between labor and capital)
- introduction of a humanistic mechanism of reconciling interests and striving to reduce the gap between the value, created and controlled

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# 9 On Priority Directions of the Fight Against Corruption and Formalization of the Experts' Assessments Actions

## Introduction

Corruption relates to the costs of a market economy. The dualism of an economic model consisting of entrepreneurs and officials, especially with the permissive nature of certain types of business, generates bribery from the business community and extortion by the authorities.

The impact of corruption on the economy is ambiguous. For example, experts from the World Bank and the International Monetary Fund consider corruption a factor that adversely affects economic development (D.H. Anderson, S.V. Gray, 2016). Liberal mainstream economists believe that corruption has a negative impact on the level of foreign direct investment, which in turn can slow down economic growth. In the works of P. Mauro, L. Pellegrini, R. Gerlach, and others, it is said that, despite the absence of evident negative effects in the short term, in the long term, corruption negatively affects GDP growth rates.

Their opponents, in particular, N. Leff, G. Tullock and others, argue that on the contrary, certain manifestations of corruption can have a positive impact on the economic development of the country as a whole, since they mitigate the effects of market monopolization and inefficient government regulation of the economy.

There are also other arguments in favor of corruption, the analysis of which is beyond the scope of this article, since in the interpretation of corruption by Russian economists, corruption is a criminal act. It is clearly and explicitly defined by the Federal Law "On Combating Corruption". It defines corruption as "abuse of official position, giving bribe, acceptance of bribe, abuse of power,commercial bribery or other illegal use by a physical person of his/her official position in defiance of the legitimate interests of the society and the State for the purpose of profiting in the form of money, valuables, other property or services of material nature, other rights of property for oneself or for third parties, or illegal provision of such benefits to the said person by other physical persons" (Federal law from 25.12.2008 N 273-FZ (amend. 30.10.2018) "On Combating Corruption").

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The following offences are considered to be acts of corruption:

- abuse of official powers (Article 285 of the Criminal Code of the Russian Federation)
- exceeding official powers (Article 286 of the Criminal Code of the Russian Federation)
- bribe-taking (Article 290 of the Criminal Code of the Russian Federation)
- bribe-giving (Article 291 of the Criminal Code of the Russian Federation)
- abuse of authority (Article 201 of the Criminal Code of the Russian Federation)
- bribery in a profit-making organization (Article 204 of the Criminal Code of the Russian Federation), as well as other offences falling under the concept of "corruption" mentioned above (URL: https://mvd.rf/document/10960382), (Accessed 03.05.2019)

However, despite the fact that corruption in Russia is quite commonplace, the criminal prosecution of corrupt officials is still rare. There are many reasons for this. The authors will focus on the analysis of methods to prove the facts of corruption, using the expert judgment. Expert analysis does not exclude completely the subjective factor. Its influence is reduced by the use of formalized procedures. However, according to the authors of this article, the existing methodologies are difficult to formalize.

The purpose of this article is to analyze the shortcomings of the existing expert assessments of the facts of corruption and to justify a promising formalized model for assessing corruption with regard to Russian conditions. Its novelty lies in the methodology proposed by the authors for analyzing priority methods of fighting corruption and in formalizing the actions of experts in its assessment.

## Methodology

The methodology of this article is based on a structural and functional analysis. At the same time, structuring anti-corruption practices requires a systematic approach. A certain contribution to the development of a universal and systematic analytical methodology is being made by the United Nations institutions. They, in particular, elaborated a certain thesaurus on corruption. Most of it is contained in the UN Convention against Corruption (UNCAC), which was adopted on October 31, 2003. Currently, 172 states have acceded to the Convention. The Russian Federation ratified this Convention with the exception of the Article 20 "Illicit enrichment" and Article 57 "Return and disposal of assets". (URL: https://en.wikipedia.org/wikiUnited.Nations_Convention_against.Corruption).

It should be noted that in many countries of the world there are legal and business practices that "legalize" certain types of corruption. For example, in countries

such as Austria, the Netherlands, Belgium, Luxembourg, Switzerland, the United Kingdom, and Japan, all costs and bribes associated with the activities of companies to minimize costs and maximize profits belong to the group of operating expenses and do not even figure in the taxable base of enterprises (The Bundestag Parliamentary Financial Commission study "The Foreign corrupt practices of industrialized OECD countries", Bonn, 23.06.1994).

In addition, in a number of countries, the so-called "establishment", that is, a certain stratum of officials, the "elite" burdened with tacit commitments, whose actions are corrupt in nature, but are not subject to criminal prosecution, prevails. American political scientist Allan Lichtman explicitly states that "corruption in the United States is legal. It is legal and is carried out through billions of dollars allocated for election campaigns and ensuring the predominance of the interests of wealthy people" (URL: https://rg.ru/2016/01/27/korrupciya-site.html). The same stratum of "untouchables" was in the political leadership of China before Deng Xiaoping came to power in the late 1970s. It also emerged in modern Russia following the results of the privatization of the 1990s and the subsequent accumulation of authoritarian power in the hands of B.N. Yeltsin, and then – the current president of the Russian Federation.

At the same time, it should be noted that at the moment there is no convincing evidence that the activities of anti-corruption bodies created following the UN recommendations make a tangible contribution to the formation of the anti-corruption environment of various countries (Forgues-Puccio Gonzalo. Existing practices on anti-corruption // Oxford Policy Management, 2013, p. 21). Estimates of the corruption situation in different countries vary quite significantly. But despite this, almost all experts agree that a systematic approach to considering the problem, structuring experience and methods to combat corruption in several categories, with expert, mathematical or any other analysis, giving certain formalized results, can provide an objective assessment of the situation (Forgues-Puccio Gonzalo Existing practices on anti-corruption // Oxford Policy Management, 2013, p. 21). Thus, the methodology used in the article is shared by most researchers, despite differences in political ideologies, scientific preferences and practical results of the fight against corruption.

In accordance with the systematic and functional approach, the anti-corruption activities can be divided into four categories:

1. reduction of the bureaucratization of the state apparatus, including:
   - measures to increase the openness of information on state activities
   - creation of a special body for fairness and transparency of state and municipal services
   - maintaining open and complete statistics and reporting of state bodies
   - reduction of the number of assistants to civil servants
   - control of public spending
2. legislative regulation:
   - creation of a specialized independent body of anti-corruption resistance

- adherence to international anti-corruption laws and their full ratification
- application of capital punishment to the corrupt officials
- tightening of administrative legislation
- audits of the territorial authorities
- introduction of investigations into the presence of illegally acquired property among distant relatives and friends of persons suspected of corruption (Y.V. Vertakova, – 2015, p. 85)

3. state regulation of the economy:
   - regulation of government orders
   - introduction of a clear consistent regulation of economic activity
   - use of administrative measures to influence entrepreneurs who are found to be corrupt
   - introduction of investigations into the presence of illegally acquired property among distant relatives and friends of persons suspected of corruption
4. media activity and moral and anti-corruption methods, including:
   - formation of a negative attitude towards corruption in society
   - encouragement of citizens to report information on corrupt practices and the subsequent protection of informants
   - conducting a broad nationwide campaign to raise public awareness of corruption issues
   - provision of official housing and other preferences to civil servants
   - prescription on the observance of ethical standards by public servants
   - public disclosure of the corruption cases

To summaries, it is necessary to determine the main methods of combating, which are the following:

- introduction of strict anti-corruption legislation
- establishment of an independent anti-corruption bod
- introduction of investigations into the presence of illegally acquired property among distant relatives and friends of persons suspected of corruption;
- public disclosure of the corruption cases

Based on this classification, this article proposes the author's model of expert assessments of corruption.

## Results

The method of expert assessments used by the authors allows establishing the correlation between various tasks for solving the main problem, ranking these tasks according to the degree of importance and relevance of the application. One of the advantages of this method can be considered the possibility of quantitative

assessment of the impact that each method will have on the tree of objectives (coefficient of relative importance). As a result of the assessment, not only the methods of solving the problem, but also the criteria for their implementation are taken into account. For this purpose, three basic criteria were selected to which importance coefficients (IC) were assigned. Their sum amounts to one:

- budget load (IC = 0.3)
- relevance to Russian realities (IC = 0.4)
- time costs (IC = 0.3)

The names of the integrated categories and methods in the tree of objectives (see Figure 9.1), for convenience, are numbered in the following order:

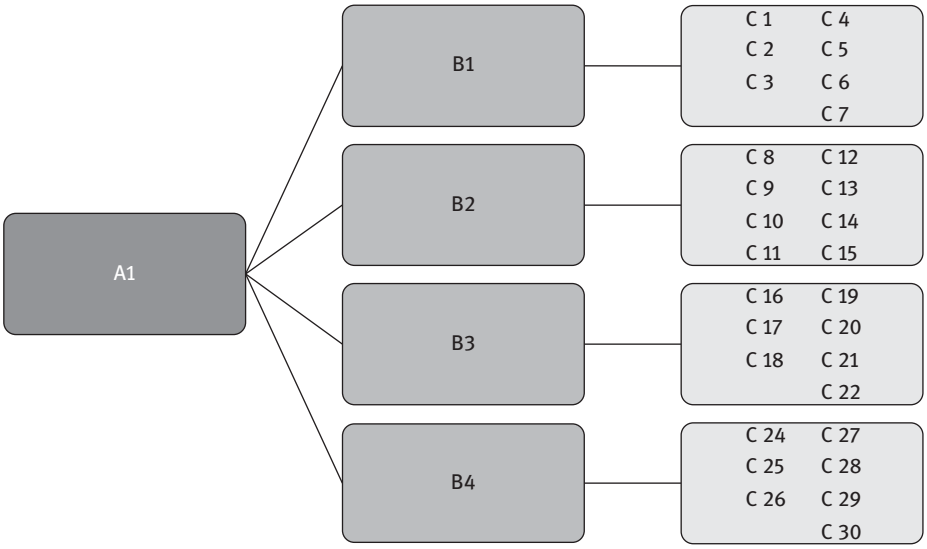


**Figure 9.1:** Tree of objectives "Creating conditions for effectively countering corruption and progressive development of economy".

- A1: create conditions for effectively countering corruption and progressive development of economy
- B1: form an effective state apparatus
- B2: develop an effective legal framework
- B3: develop effective methods of state regulation of economy
- B4: ensure the activity of media in the formation of a negative attitude towards corruption
- C1: reduce the number of documents for permissive business registration
- C2: increase the openness of information on the activities of state officials

- C3: create a special committee on the integrity and transparency of state and municipal services
- C4: introduce a more complete system of statistics and reporting of state bodies
- C5: reduce the number of assistants to civil servants
- C6: reduce the number of preferences for civil servants
- C7: control public spending
- C8: create an independent body of anti-corruption resistance
- C9: create mechanisms for regulating the financing of political parties
- C10: fully adhere to international anti-corruption laws
- C11: apply capital punishment to corrupt officials
- C12: pursue a more effective policy in terms of sanctions
- C13: tighten administrative legislation
- C14: develop effective mechanisms for auditing the activities of local governments
- C15: introduce investigations into the presence of illegally acquired property among distant relatives and friends of persons suspected of corruption
- C16: develop mechanisms for regulating the scope of government orders
- C17: require all individuals, without exception, to file tax returns
- C18: reduce the tax burden on low-income citizens
- C19: introduce more precise regulation of economic activity
- C20: completely withdraw the business from the "grey" economy
- C21: develop the use of administrative measures to influence entrepreneurs who are found to be corrupt
- C22: introduce checks for civil servants for the presence of joint or transferred "in control" property among distant relatives and friends
- C23: actively shape a negative attitude towards corruption in society
- C24: encourage citizens to report information on corrupt practices and subsequently protect informers
- C25: stimulate media for the systematic and regular reporting on corruption and exposing it
- C26: conduct a broad nationwide campaign to raise public awareness about the problems of corruption
- C27: provide service housing, cars and other means to civil servants with reports on their use
- C28: introduce a mandatory prescription for the observance of ethical standards by public servants
- C29: make public cases of corruption acts

Comparison of methods of combating corruption is carried out in stages, each method was compared with respect to other methods of its family (category): For more information, see tables 9.1–9.10: (for More information, see tables 9.1–9.10).

1. Comparison of categories in the framework of the implementation of the main goal (B1, B2, B3, B4)
2. Comparison within the B1 category (C1, C2, C3, C4, C5, C6, C7)
3. Comparison within the B2 category (C8, C9, C10, C11, C12, C13, C14, C15)
4. Comparison within the B3 category (C16, C17, C18, C19, C20, C21, C22)
5. Comparison within the B4 category (C23, C24, C25, C26, C27, C28, C29)

Comparative tables by categories take the following form:

**Table 9.1:** Expert assessments for large categories of anti-corruption methods.

| | IC | B1 | B2 | B3 | B4 | ∑ |
|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.7 | 0.5 | 0.9 | 1 | 3.1 |
| Applicability to Russian realities | 0.4 | 0.8 | 0.5 | 1 | 0.7 | 3 |
| Time costs | 0.3 | 0.6 | 0.7 | 0.4 | 1 | 2.7 |

**Table 9.2:** Expert assessments of anti-corruption methods within category B1.

| | IC | C1 | C2 | C3 | C4 | C5 | C6 | C7 | ∑ |
|---|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.9 | 0.8 | 0.3 | 0.7 | 1 | 0.5 | 0.4 | 4.6 |
| Applicability to Russian realities | 0.4 | 0.7 | 0.4 | 0.8 | 0.9 | 0.5 | 0.6 | 1 | 4.9 |
| Time costs | 0.3 | 0.8 | 0.9 | 0.2 | 0.5 | 1 | 0.7 | 0.6 | 4.7 |

**Table 9.3:** Expert assessments of anti-corruption methods within category B2.

| | IC | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | ∑ |
|---|---|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.2 | 0.3 | 0.4 | 1 | 0.9 | 0.5 | 0.7 | 0.8 | 5.1 |
| Applicability to Russian realities | 0.4 | 0.7 | 0.3 | 0.6 | 0.2 | 1 | 0.4 | 0.8 | 0.9 | 4.9 |
| Time costs | 0.3 | 0.4 | 0.7 | 0.2 | 0.5 | 0.8 | 1 | 0.6 | 0.9 | 5.1 |

**Table 9.4:** Expert assessments of anti-corruption methods within category B3.

| | IC | C16 | C17 | C18 | C19 | C20 | C21 | C22 | ∑ |
|---|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.4 | 1 | 0.5 | 0.6 | 0.3 | 0.9 | 0.8 | 4.5 |
| Applicability to Russian realities | 0.4 | 0.7 | 0.2 | 1 | 0.9 | 0.6 | 0.5 | 0.8 | 4.7 |
| Time costs | 0.3 | 0.9 | 0.8 | 0.4 | 0.5 | 0.6 | 0.7 | 1 | 4.9 |

**Table 9.5:** Expert assessments of anti-corruption methods within category B4.

| | IC | C23 | C24 | C25 | C26 | C27 | C28 | C29 | ∑ |
|---|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.9 | 0.6 | 0.3 | 0.5 | 1 | 0.7 | 0.8 | 4.8 |
| Applicability to Russian realities | 0.4 | 0.4 | 0.9 | 1 | 0.8 | 0.7 | 0.5 | 0.6 | 4.9 |
| Time costs | 0.3 | 0.5 | 0.7 | 0.9 | 0.4 | 0.6 | 0.8 | 1 | 4.9 |

**Table 9.6:** Normalized expert assessments and coefficients of relative importance.

| | IC | B1 | B2 | B3 | B4 |
|---|---|---|---|---|---|
| Budget load | 0.3 | 0.23 | 0.16 | 0.29 | 0.32 |
| Applicability to Russian realities | 0.4 | 0.27 | 0.17 | 0.33 | 0.23 |
| Time costs | 0.3 | 0.22 | 0.26 | 0.15 | 0.37 |
| | – | 0.243 | 0.194 | 0.264 | 0.299 |

**Table 9.7:** Normalized expert assessments and coefficients of relative importance within category B1.

| | IC | C1 | C2 | C3 | C4 | C5 | C6 | C7 |
|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.2 | 0.17 | 0.07 | 0.15 | 0.22 | 0.11 | 0.08 |
| Applicability to Russian realities | 0.4 | 0.14 | 0.08 | 0.16 | 0.18 | 0.1 | 0.12 | 0.22 |
| Time costs | 0.3 | 0.17 | 0.19 | 0.04 | 0.11 | 0.14 | 0.14 | 4.7 |
| | – | 0.167 | 0.14 | 0.097 | 0.15 | 0.169 | 0.123 | 0.155 |

**Table 9.8:** Normalized expert assessments and coefficients of relative importance within category B2.

| | IC | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 |
|---|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.04 | 0.12 | 0.08 | 0.2 | 0.18 | 0.1 | 0.14 | 0.14 |
| Applicability to Russian realities | 0.4 | 0.7 | 0.3 | 0.6 | 0.2 | 1 | 0.4 | 0.8 | 0.9 |
| Time costs | 0.3 | 0.08 | 0.14 | 0.04 | 0.1 | 0.14 | 0.2 | 0.12 | 0.18 |
| | – | 0.092 | 0.102 | 0.084 | 0.106 | 0.18 | 0.122 | 0.142 | 0.172 |

**Table 9.9:** Normalized expert assessments and coefficients of relative importance within category B3.

| | IC | C16 | C17 | C18 | C19 | C20 | C21 | C22 |
|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.09 | 0.12 | 0.1 | 0.13 | 0.07 | 0.2 | 0.17 |
| Applicability to Russian realities | 0.4 | 0.15 | 0.04 | 0.21 | 0.19 | 0.13 | 0.11 | 0.17 |
| Time costs | 0.3 | 0.18 | 0.16 | 0.08 | 0.11 | 0.12 | 0.14 | 0.21 |
| | – | 0.141 | 0.1 | 0.138 | 0.148 | 0.109 | 0.146 | 0.218 |

**Table 9.10:** Normalized expert assessments and coefficients of relative importance within category B4.

| | IC | C23 | C24 | C25 | C26 | C27 | C28 | C29 |
|---|---|---|---|---|---|---|---|---|
| Budget load | 0.3 | 0.19 | 0.13 | 0.06 | 0.1 | 0.21 | 0.15 | 0.16 |
| Applicability to Russian realities | 0.4 | 0.08 | 0.18 | 0.21 | 0.16 | 0.14 | 0.11 | 0.12 |
| Time costs | 0.3 | 0.11 | 0.14 | 0.18 | 0.08 | 0.12 | 0.16 | 0.21 |
| | – | 0.122 | 0.153 | 0.156 | 0.118 | 0.155 | 0.137 | 0.159 |

The estimates from the tables above require normalization, i.e. dividing each grade by the sum of grades. After the product has been normalized, it is necessary to calculate the desired coefficients of relative importance. The following formula is used for calculation, where there are:

- coefficient of relative importance (RI)
- criterion importance factor (IF)
- relative normalized evaluation method by experts (NE)

RI=IT+NE (formula)

The calculated coefficients of relative importance are written next to the corresponding element of the new tree of goals (see Figure 9.2).

In order to identify priority methods of fighting corruption, it is necessary to multiply the estimates corresponding to each element of the tree and related to each branch.

Branch C1 (A-B1-C1): 0.243 × 0.167 = 0.040581
Branch C2 (A-B1-C2): 0.243 × 0.14 = 0.03402
Branch C3 (A-B1-C3): 0.243 × 0.097 = 0.023571
Branch C4 (A-B1-C4): 0.243 × 0.15 = 0.03645
Branch C5 (A-B1-C5): 0.243 × 0.169 = 0.041067
Branch C6 (A-B1-C6): 0.243 × 0.123 = 0.029889
Branch C7 (A-B1-C7): 0.243 × 0.155 = 0.037665

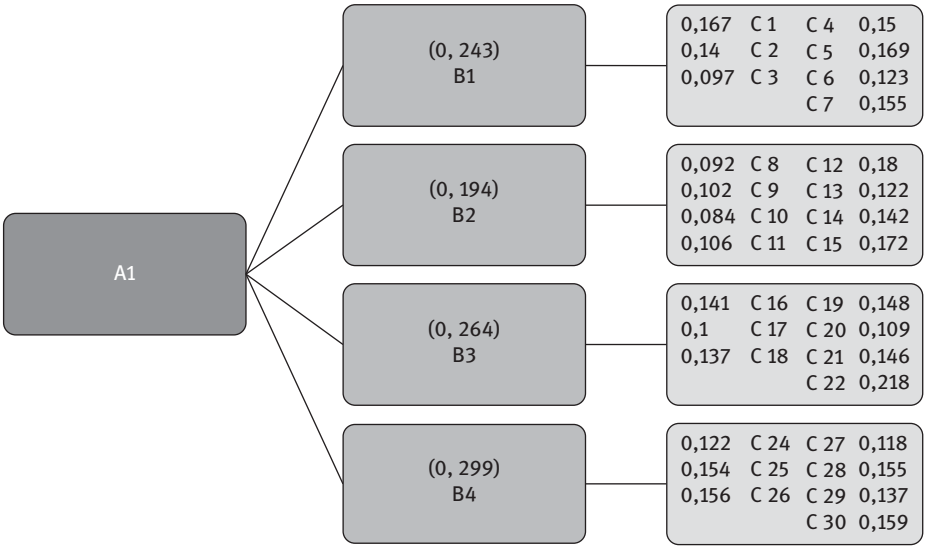


**Figure 9.2:** The goal tree "Creating conditions for effectively countering corruption and progressive development of economy" with an assessment of the importance levels.

Branch C8 (A-B2-C8): 0.194 × 0.092 = 0.017848
Branch C9 (A-B2-C9): 0.194 × 0.102 = 0.019788
Branch C10 (A-B2-C10): 0.194 × 0.084 = 0.016296
Branch C11 (A-B2-C11) 0.194 × 0.106 = 0.020564
Branch C12 (A-B2-C12): 0.194 × 0.18 = 0.03492
Branch C13 (A-B2-C13): 0.194 × 0.122 = 0.023668
Branch C14 (A-B2-C14): 0.194 × 0.142 = 0.027548
Branch C15 (A-B2-C15): 0.194 × 0.172 = 0.033368
Branch C16 (A-B3-C16): 0.264 × 0.141 = 0.037224
Branch C17 (A-B3-C17): 0.264 × 0.1 = 0.0264
Branch C18 (A-B3-C18): 0.264 × 0.138 = 0.036432
Branch C19 (A-B3-C19): 0.264 × 0.148 = 0.039072
Branch C20 (A-B3-C20): 0.264 × 0.109 = 0.028776
Branch C21 (A-B3-C21): 0.264 × 0.146 = 0.038544
Branch C22 (A-B3-C22): 0.264 × 0.218 = 0.057552
Branch C23 (A-B4-C23): 0.299 × 0.122 = 0.036478
Branch C24 (A-B4-C24): 0.299 × 0.153 = 0.045747
Branch C25 (A-B4-C25): 0.299 × 0.156 = 0.046644
Branch C26 (A-B4-C26): 0.299 × 0.118 = 0.035282
Branch C27 (A-B4-C27): 0.299 × 0.155 = 0.046345
Branch C28 (A-B4-C28): 0.299 × 0.137 = 0.040963
Branch C29 (A-B4-C29): 0.299 × 0.159 = 0.047541

The received results can be used to formulate a systemic anti-corruption policy, based on the assumption that anti-corruption methods, which have scored the highest marks, are of high priority and primary use. The method that received the highest rating is C22 – "introduce investigations into the presence of illegally acquired property among distant relatives and friends of persons suspected of corruption". It is necessary to highlight that the methods from the category of ensuring the independence of media and the formation of negative perceptions of corruption in society, such as media activity, state economy in the provision of official housing, cars and other benefits to civil servants, making public the cases of corrupt practices, also scored high marks, and may be of real practical importance in the formation of anti-corruption policy.

## Conclusions/Recommendations

In conclusion, the following should be outlined. Corruption is a vast, difficult to formalize phenomenon. In most cases, corruption is a negative factor that needs to be addressed. Anti-corruption policy requires solving a series of consecutive tasks. The struggle against it should not have an episodic, "sociable" character, it should be progressive and constant. The use of expert assessments for analyzing anti-corruption methods can be of a great help in evaluating anti-corruption counteractions and shaping state anti-corruption policies. These methods of expert assessments make it possible to formalize such a difficult for analysis phenomenon as corruption. Formalizing the actions of experts can significantly reduce the role of the subjective factor.

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Iryna Ivanovna Hutarava

# 10 The Concept of the Alternative Economy at the Present Stage of Scientific and Technological Progress in the Globalizing World

## Introduction

With the arrival of the 21st century a new technological revolution has come. Biotechnology, additive, cognitive and social technologies nanotechnology, genetic engineering, alternative energy begin their development, a transition to "hybrid" technologies is taking place. According to the research by the Russian Academy of Sciences, today the economy of the CIS countries is mostly in the fourth technological paradigm with the elements of the fifth one. At that time, the economy of the leading countries is in the fifth technological paradigm and it is moving to the sixth one. It is well known that the feature of the fifth and sixth technological paradigms is the practical application of knowledge. In turn, in the sixth technological paradigm they begin to use the technology which will become the basis of the future economy. Thus, to a greater extent the sixth technological paradigm will be based on the generation of scientific knowledge and its application in manufacturing to produce products with high knowledge intensity (Bodrunov, 2018).

In light of the foregoing, in modern conditions of managing you can hear the call for the development of an alternative economy, where the goal is the growth of the humanistic culture, as well as the implementation of potential possibilities of building a fair economy. The alternative economy must strive to sustainability, as well as increase of public goods, but not profit maximization. This article considers alternative models of the economy, developed by D. Rifkin (the concept of the Third industrial revolution), G. Pauli (the author of the term "blue economy"), the concept of "green economy".

The objective of the study is to consider the concept of an alternative economy in the modern world.

In connection with the objective it is necessary to solve the following interrelated tasks:

to consider alternative models of economy, developed by D. Rifkin the concept of the Third industrial revolution, G. Pauli (the concept of "blue economy"), as well as the basic ideas of "green economy";

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consider the development of the Republic of Belarus in accordance with the principles of "green economy";
to identify the main promising directions for the development of a "green economy" in the Republic of Belarus.

## Methodology

The President of the World Economic Forum in Davos believes that "The more we think about how to use the huge benefits technological revolution, the more closely we look at ourselves and the basic social models that embody and create these technologies, the greater our abilities to shape this new revolution, to make the world a better place". In countries such as the USA, South Korea, China serious work is being done on the invention of global standards and systems which will provide an opportunity to make production "smarter".

In turn, Director of Innovative Factory Systems, Professor Detlef Zülke believes that "We are awaiting the onset of the fourth industrial revolution" (Bodrunov, 2018).

In the light of the foregoing, recently the desire to develop an alternative economy, in which profit and income become a means and the goal is the growth of a humanistic culture, has become actual (URL: http://edoc.bseu.by:8080/handle/edoc/7773, Shirshov, Alternative Economy, 2011). In turn, M. Yu. Medvedev in a practical guide "Alternative economy. A critical look at modern science and practice" tried to prove the injustice of the principles of the modern economy and came up with the idea to think about the potential opportunities to build a fair economy. At the same time, he showed that ignoring definite rules of the economy leads to a number of problems (Medvedev, 2016).

Recently, the alternative economic models have been of some interest. Among them are, for example, alternative economic models developed by D. Rifkin, G. Pauli. The general idea of these models is presented in Table 10.1. So, D. Rifkin is a popularizer of sustainable development, the author of the concept of the Third Industrial Revolution. The detailed vision of the Third Industrial Revolution was proposed by D. Rifkin in the book "The Third Industrial Revolution: How lateral power is transforming energy, the economy and the world". From the perspective of his theory, the Third Industrial Revolution is based on distributed renewable energy sources, which is everywhere and mostly free (solar energy, wind energy, hydropower, geothermal energy, biomass energy of ocean waves and tides). This dissipated energy will be collected in many places and then combine and divide through intelligent power grids for optimum energy levels and maintaining a highly efficient, environmentally sustainable economy (Rifkin, 2017).

The goal of the third industrial revolution is to lay the foundation for an era of cooperation. So, J. Rifkin believes that the cooperation that arises in the process of merging Internet technologies and renewable energy sources, shifts the interaction

**Table 10.1:** Alternative economic models developed by D. Rifkin, G. Pauli.

| Full Name | Main works | Main ideas |
|---|---|---|
| D. Rifkin | "The European Dream";<br>"The Hydrogen Economy";<br>"Access Epoch";<br>"The Biotech Century";<br>"The End of Work";<br>"The Zero Marginal Costs Society";<br>"The Third Industrial Revolution: How Lateral power is transforming energy, the economy and the world" | The new economy (let it call the "yellow economy") will be developed through the exchange of goods, cooperation, equal and free access to the Internet for everybody, as well as the use of renewable energy sources (URL: https:// www.businessinsider.com/jeremy-rifkin-interview-2017-6 / Jeremy Rifkin, About the new economy that will allow humanity to survive, 2017).<br>From his point of view "the economy based on social principles should take into account the impact of production on health, ecology and the quality of life in general"<br>(URL: http:// www https://theoryandpractice.ru/posts/11723-jeremy-rifkin, Kochetkova, L, Capitalism comes to an end: Jeremy Rifkin about the new economy that will allow humanity to survive, 2018) |
| Mr. Pauli | "Blue economy: 10 years – 100 innovations – 100 million jobs". | The blue economy is an alternative to industrial processes based on unlimited consumption of natural resources, as well as on principles of ecosystem development and economies of scale, more ecological and simple technologies (URL: http:// www https://habr.com/ru/company/philtech/blog/416791/ Report of the Club of Rome 2018, Chapter 3.3: "Blue Economy", 2018)<br>The "blue economy" will strengthen all social systems that create culture, tradition and social capital, as they provide resilience in difficult times and joy in good times (URL: http:// www https://habr.com/ru/company/philtech/blog/416791/<br>Report of the Club of Rome 2018, Chapter 3.3: "Blue Economy", 2018) |

from the top to the bottom to horizontal interaction, which will naturally have a significant impact on the future of both the economy and society as a whole.

Thus, in the history of any civilization, inevitably a definite period begins when it is significantly necessary to change the vector of the development for the realization of new perspectives. In the light of the foregoing, an urgent task in new conditions is the mobilization of the state, market, social capital of mankind to ensure the transition to the economy of the Third Industrial Revolution and the post-carbon era. The transition of this scale must be accompanied by the formation of biosphere consciousness that will save the planet for future generations (Rifkin, 2017).

Another innovator, a well-known specialist in the field of sustainable development, G. Pauli, in his book "Blue Economy: 10 Years – 100 Innovations – 100 Million Jobs", showed the need to revise the general model of the world economic development. Studying ecological and social systems for four years, G. Pauli formulated 21 principles of the "blue economy". As an example, some of them will be highlighted: products and systems of consumption must draw inspiration from nature; efficiency includes the ability to return nature to the evolutionary and symbiotic paths; isolated problems are interrelated in order to create a set of opportunities; everything has value, even waste and weeds (URL: http:// www https://habr.com/ru/company/phil tech/blog/416791/ Report of the Club of Rome 2018, Chapter 3.3: "Blue Economy", 2018), and so on. From G. Pauli's point of view, fundamental innovations6 should be laid in the basis of economic development (URL: http:// www http://www.xn–c1abcnzgbb1aj4h.xn–p1ai/interesting/vesti/ekologicheskie-vesti/golubaya-ekonomika/32-chto-takoe-golubaya-ekonomika/ What is a blue economy, 2019) (e.g., the concept of McKinsey & Company, Tao Toyota, etc.).

With his research, G. Pauli identified a portfolio of 100 innovations that he described in his book in detail. Along with this, his work shows how, by imitating certain natural processes, one can create unique business models that will have an economic, social and environmental effect. At the same time, in the current economic conditions, the BRICS countries hope to intensify cooperation in the implementation of the "blue economy" ideas (URL: http:// www /https://inosmi.ru/politic/20170905/240195989. html Blue economy – a new area of cooperation of the BRICS countries, 2017).

From the President of the International Union for Conservation of Nature Ashok Kosla's point of view, the modern future should be based on the main ideas of the green economy. According to the United Nations Environment Program (UNEP), the term "green economy" is commonly understood as the result of improvement of human well-being and social justice, with a significant reduction in ecological risks and ecological deficit (URL: http://www.greenlogic.by/about_green.html About green economy, 2019). In modern economic conditions, the vector in the direction of "green economy" is decisive for a number of states such as Germany, Denmark, Sweden, South Korea, Kazakhstan, the Russian Federation and many others (URL: http://www.greenlogic.by/about_green.html, About green economy, 2019).

For example, in Russia the implementation of the mobilization "green economy" can be carried out under the economic modernization program proposed by academician S.Yu. Glazyev and based on scientific knowledge of the laws governing the development of a modern economy and an objective assessment of the economic situation in the country and abroad (Startsev, 2018).

The development of the Republic of Belarus in accordance with the principles of "green economy" is reflected in a number of documents such as the National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus for the period until 2030 as well as the National Action Plan for the Development of a "Green Economy" in the Republic of Belarus until 2020. Fundamental principles can be distinguished: improving competitiveness and ensuring growth in key sectors of the economy, as well as the relevance of using green tools and approaches in achieving the goals of sustainable and socio-economic development, and so on. Currently, a number of projects are being implemented in the Republic of Belarus in the field of "green economy": "Development of the forest sector of the Republic of Belarus", Assistance to the transition of the Republic of Belarus to a "green economy", "Greening the economy in the countries of the Eastern Partnership of the European Union" (URL: http:// www / http://www.greenlogic.by/content/files/GREENTRANSPORT/Green%20economy_Report_1stDraft.pdf, The project implementation report (2015–2017), 2017). Particularly worth mentioning is the project "Promoting the transition of the Republic of Belarus to the "green economy", funded by the European Union and implemented by the UN Development Program".

The specific examples of the implementation of the pilot initiatives under this project are presented in Table 10.2 (URL: http:// www / http://www.greenlogic.by/content/files/GREENTRANSPORT/Green%20economy_Report_1stDraft.pdf, The project implementation report (2015–2017), 2017).

So, under this project, the principles of green economy were implemented on the example of 23 pilot initiatives in various sectors of the economy.

At the same time, a number of environmental problems remain unsolved in the Republic of Belarus, the main of which are:

- climate change
- waste generation and accumulation,
- pollution of surface water bodies
- reduction of biological diversity
- high specific contribution of transport to air pollution (in Belarus – 70%, in the world – about 20%)
- land degradation with peat soils
- violation of the hydrological regime
- lack of tariff policy and infrastructure for the use of electric vehicles (URL: https://www.economy.gov.by/ru/nac_plan-ru/ National green economy plan and so on, 2019)

**Table 10.2:** Examples of pilot initiatives.

| Pilot Initiative Name | The direction of the "green economy", result |
|---|---|
| 1) Production of office paper from secondary resources (UE "Paper Factory" Goznak) | Waste management.<br>Office paper production from waste paper has been launched. New equipment is energy saving and provides savings of up to 100 kW of electricity for the production of 1 ton of paper from waste paper or 20 thousand kW per year and savings of up to 0.3 tons of steam for the production of 1 ton of paper from waste paper, which is a contraction gas consumption by 50,000 m3 per year. |
| 2) Sustainable use and commercialization of biological resources (GPU "RLZ" Naliboksky") | Biodiversity maintaining.<br>A nursery that performs two functions was created:<br>1) maintaining the sustainability of the population especially protected bird species (Western European capercaillie) on the territory of the reserve "Naliboksky";<br>2) the settlement of Western European capercaillie in reserves of other countries where the population is declining (reserves of other countries pay). |
| 3) Creating a complex for processing wood waste in biofuels in Brest (PKUP "Kommunalnik") | Waste management.<br>Capacity utilization for the processing of previously unprocessed wood residues was created including stumps, old furniture, twigs and branches after scraps of urban trees, etc. into wood chips. |
| 4) Obtaining high-performance organic fertilizers due to the deep processing of sapropel (JSC "Zhitkovichihimservis") | Organic farming.<br>The achieved ecological effects can be divided as direct (restoration of the natural ecosystem of Lake Chervone (end of killing fish in the lake, restoration of water purity in Lake Chervone, restoration of the lake hydrological regime and microclimate) and indirect (mining and recycling sapropel lead to an increase production of organic fertilizers, which in turn helps the development of organic agriculture). |

**Table 10.2** (continued)

| Pilot Initiative Name | The direction of the "green economy", result |
|---|---|
| 5) Green transport Palace and park complex Radziwill (Nesvizh District) | Green transport.<br>The development of green transport on the territory of the palace and park complex in the city of Nesvizh made it possible to implement the zone of the "green transport island", which naturally attracted tourists. Additional income due to ecotourism activities was received. |
| 6) Development of a network of environmental information centers (GPU Republican reserve "Pribuzhskoye Polesye") | Ecotourism.<br>The activities carried out led to an increase in tourists up to 50%, an increase in income from the rental of tourist equipment tenfold, an increase in revenue from tourism activities. There was the creation of a local ecotourism cluster, the development of the reserve employees potential, the creation of conditions for additional employment. |
| 7) The development of a network of environmental information centers (GPU Republican landscape reserve "Svityazansky") | Ecotourism.<br>As a result of the activities there appeared the opportunity of:<br>1) environmental education,<br>2) tourism development;<br>3) building a local ecotourism partnership and cluster;<br>4) reduction of anthropogenic burden on lake Svityaz. |

As environmental problems increase, the concept of the "green growth" has become more relevant. In terms of the "green policy" some areas have become a priority for public financing: the areas that provide GDP growth by increasing the impact of resources, conservation of ecosystems, investments in environmentally safe activities while reducing subsidies for environmentally dangerous sectors. It is also worth paying attention to the fact that the value of the "green" taxes is not reflected in the Belarusian statistics. At the same time, in the OECD countries of the EU and some other countries they are recorded. Over the past ten years, the share of "green" taxes in relation to GDP in the EU is about 2.5% (for example, in Denmark – more than 4%, Croatia, Slovenia, Italy, Greece, Netherlands – more than 3%, Lithuania, Switzerland – about 1.7%). In China, the share of "green" taxes in relation to GDP was 1.33%, in India – 0.95%, in the US – 0.72%. Of particular interest is the assessment of the level of state support of this sector by the ratio of "green" costs of the consolidated budget and GDP. For example, in the EU the costs on these purposes are 0.8–0.9% of GDP.

More than 1% was in France, Luxembourg, the Netherlands, the Czech Republic. In turn, in the Republic of Belarus, this figure was 0.1–0.2% (Derevyago, 2018).

## Results

In recent years the concept of the alternative economy is of particular interest among public administration, scientific communities, educational institutions, the Global environment facility, the United Nations economic Commission for Europe and other organizations. In light of this, there are alternative models of the economy developed by D. Rifkin, G. Pauli and others. Nowadays it is extremely important to keep the vector for the development of the "green economy". At the same time there is some educational activity to solve a number of problems in the field of ecology in the Republic of Belarus. Thus, during the period 2015–2017, three Environmental Forums were held in the Republic of Belarus, where the issues of promotion and development of the principles and ideas of the green economy were highlighted, environmental, economic and social benefits in the implementation of the ideas of the "green economy" were shown (URL: http:// www / http://www.greenlogic.by/content/files/GREENTRANSPORT/Green%20economy_Report_1stDraft.pdf The project implementation report (2015–2017), 2017). In May 2019 at the Academy of Public Administration under the President of the Republic of Belarus, an international seminar "On the way to the implementation of the 2030 Agenda for sustainable development: housing management, energy efficiency of buildings and sustainable urban development" was held. This event is significant in terms of achieving the Goals of sustainable development. Over the last two years, the UN experts and Belarusian experts have identified four platforms to accelerate the achievement of the Goals of sustainable development: green economy, digital transformation, youth and the future generation, social innovation in society, gender equality. From the point of view of Deputy Coordinator of the UN in Belarus Vyacheslav Shelegeiko the platform data are based on proportional attention to the main aspects of sustainable development. According to the National action plan for the development of the "green economy" in the Republic of Belarus until 2020 (URL: https://www.economy.gov.by/ru/nac_plan-ru/ National green economy plan, 2019), and taking into account the relevance of international obligations in this aspect, the main promising directions of development of the "green economy" in the Republic of Belarus can be identified:

- development of ecological tourism
- increasing the potential of renewable energy sources
- creating conditions for the production of organic products, and
- also the development of organic agriculture
- implementation of the concept of "smart cities"
- development of electric transport (infrastructure) and urban mobility,

- construction of energy-efficient residential buildings
- reduction of energy intensity of gross domestic product (URL: https://www.economy.gov.by/ru/nac_plan-ru/ National green economy plan, 2019).

However, of particular interest is the implementation of the ideas of the "blue economy", as well as the basic postulates of the concept of the Third industrial revolution.

## Conclusions

Thus, in the National action plan for the development of the "green economy" in the Republic of Belarus until 2020, approved by the Council of Ministers of the Republic of Belarus from 21.12.2016 No. 1061(URL: https://www.economy.gov.by/ru/nac_plan-ru/ National green economy plan, 2019) the main activities for the development of the "green economy" are determined in the aspect of institutional activities, electricity, energy-efficient construction, development of electric transport and urban mobility, the introduction of the concept of "smart cities", eco-tourism, the development of organic agriculture, information and educational activities. From our point of view, it is advisable to implement these measures systematically and comprehensively.

At the same time, according to Chapter 4 of the National action plan for the development of the "green economy" in the Republic of Belarus until 2020, for the development of the "green economy" in the Republic of Belarus, it is advisable to create a modern assessment system that will establish the degree of compliance of economic activity with the basic principles of the "green economy" (URL: https://www.economy.gov.by/ru/nac_plan-ru/ National green economy plan, 2019).

Annex 2 to the National action plan for the development of the "green economy" in the Republic of Belarus until 2020 presents the initial criteria on the basis of which the compliance of economic activity with the principles of "green economy" is assessed: the share of state budget costs on environmental protection, "the share of green taxes" in the total amount of tax revenues, the construction and commissioning of energy-efficient housing, the area of agricultural land used for the cultivation of organic products, the number of units of electric transport used in urban road transport, the number of tourists who visited the Belarusian Agroecology, nature reserves, national parks and wildlife sanctuaries and so on (URL: https://www.economy.gov.by/uploads/files/1061r2.pdf according to appendix 2 to the National Action Plan for the Development of the Green Economy in the Republic of Belarus until 2020. Criteria on the basis of which the assessment of compliance of economic activity with the principles of the "green" economy, 2019).

At the same time, these criteria should be improved and finalized in the future, taking into account the sustainable development goals and international experience.

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Alexander I. Ivanus

# 11 Cognitive Approach to the Problem of Generation of Alternative Economy Concepts

## Introduction

The need to find methods for solving such a problem by cognitive methods is dictated by the following reasons:

1. the urgent need of economics to update the fundamental concepts that meet the requirements of today's realities (these realities include political events, deformations of global world political structures, migration processes, scientific and technical achievements, climate change, etc.)
2. achievements of biological and medical sciences in terms of studying the processes of brain functioning
3. capability of the exact sciences and computer technology in terms of modelling brain functions

In this regard, it is of interest to develop new methods not only for traditional processing of data arrays, but also for methods and algorithms of specifically generating new knowledge (NK). New knowledge is not defined as just new information obtained after processing a certain sample, but fundamental knowledge at the level of concepts, scenarios and paradigms of economic development. This article presents one of the methods that can be applied for such purposes. The 2013 Nobel laureate R. Schiller, a professor at Yale University (USA), indicated the need for such an approach. He expressed this idea in the following way (Lisitsyn, 2010):

> in reality, most economic decisions are made intuitively. Another equally important thing is the urgent need to combine economics with brain science. People are now exploring how the structure of the brain and the mechanisms of its work affect economic activity. In future, their discoveries should be applied in the field of economic policy.

## Methodology

The method is, in essence, a model of the process of generating new knowledge by a human brain. The model is based on the main point about the need to ensure and

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prove the truth of new knowledge (Ivanus, 2017). The fact is that it is not technically difficult to generate NK as statements per se. The main difficulty here is to prove the truth of new knowledge. Proof of this point constitutes the main cost of producing new knowledge. In science, there has always been fierce competition and the object of this competition is precisely the monopoly of the truth of knowledge. It takes years, decades and even centuries to prove the truth. The same efforts are spent on refuting the truth of even already recognized scientific theories. On the one hand, this is a normal process, and on the other hand, it is very often extremely costly in terms of financial, material, intellectual and time resources.

Thus, the proof of the truth of knowledge is the main problem in the production of new knowledge.

The truth was in sight of the ancient scholars. In this respect, the definition of Aristotle (4th century B.C.) is the most correct and well known. His definition is reduced to the formula: truth is the correspondence between the real thing and its image in consciousness.

In the classical sense, truth is adequate information about an object, obtained through sensory and intellectual study or acceptance of a message about an object and characterized from a position of validity.

A more simplified interpretation coincides with the following thesis: truth is an adequate reflection of reality in consciousness.

However, experience has shown that this was not enough. And in 1944, a new definition of the truth of A.Tarsky was expressed (Tarsky, 1999). In accordance with its definition, the truth of an assertion is ensured by the condition primarily by the consistency condition of this assertion, while the conformity to reality occupies the second place.

Thus, we have two definitions of truth, which in principle do not correspond with each other. The following question arises: is it possible to combine these two definitions into one? Analysis has shown that this is possible. What is the result?

On the one hand, the definition of Aristotle indicates that a measure of the proximity of the investigated real object and its object model in the brain, that is, the new knowledge, must be selected. Or, in other words, this measure can still be considered a measure of the symmetry of a real object and the new knowledge. The entropy index was chosen as a measure of such symmetry (Zalichev, 1995).

On the other hand, according to A.Tarsky, the assessment of the consistency of the statement must correspond to the semantic concept of truth. The essence of it is as follows: to ensure the truth of the statement, the language of this statement should be divided into two levels:

- the object language in which the object model is described – the NK
- a metalanguage which issued to formulate the definition of truth of new knowledge

Then the statement becomes internally consistent.

In accordance with such a statement, the structure uniting in a single module the truth according to Aristotle and the truth according to A.Tarsky is formed. This structure has new interesting emergent properties. This module has the form, which is quite simply expressed by a formula (Ivanus, 2017):

$$H(I) = 4.6^{*}I^{-3.6}, \tag{11.1}$$

where $H$ is the entropy indicator of the symmetry of a real object and its object model in the human brain,

$I$ – the number of true arguments confirming the truth of the object model.

This module is, in fact, the semantic core of the truth of new knowledge (statements, object model, reflection, etc.) – SCTK (Ivanus, 2012). SCTK is at the same time machine- and human-oriented presentation of knowledge, a language convenient for a man and a machine, therefore it can serve as the basis for human-machine dialogue in human language.

In formula (11.1), the truth, which (according to Aristotle) is expressed by the entropy measure of symmetry, acquires quantum properties. It monotonously depends on the discrete value I, which is the number of true arguments (according to A.Tarsky). In this formula, the truth by definition Aristotle and the truth by definition of A.Tarsky organically merged into the SCTK. In accordance with formula (11.1), the maximum possible deviation of the truth of NK as a mental model from its real object is obtained for the minimum number of true arguments $I = 2$, and the entropic asymmetry index is equal to *0.38*. Moreover, this value is always like that for any subject area. This important result shows that the role of truth in the formation of new knowledge (or control action) may be even more significant than the subject area itself, to which the new knowledge is related. As the value of $I$ increases, the asymmetry value monotonously tends to zero (see Table 11.1).

**Table 11.1:** Entropy values for various values of the number of true arguments.

| 1 | H(I) |
|---|---|
| 2 | 0.381 |
| 3 | 0.089 |
| 4 | 0.032 |
| 5 | 0.014 |
| 6 | 0.007 |

This result is considered to be extremely important, since it allows merging into a single whole – the SCTK – two previously incompatible concepts such as Aristotle's truth and A. Tarsky's truth.

Since *I*, by its nature, can only take integer values, a highly important conclusion can be made from this: truth possesses quantum properties. And, therefore, the SCTK has a quantum structure (Ivanus, 2018).

## Results

An example of the formation of such a SCTK is presented in Figure 11.1. As the maximally simplest NK for some conventional object A, the term *system* is chosen. Figure 11.1 shows the result of the analysis of those words that are present in all the available definitions of the *system* notion. It visible that some (four on the left) are most often found in definitions. It is they who form the most stable part of the definition of the term *"system"*, which is the SCTK. As studies have shown (Ivanus, 2018), the SCTK has a Gaussian distribution law.

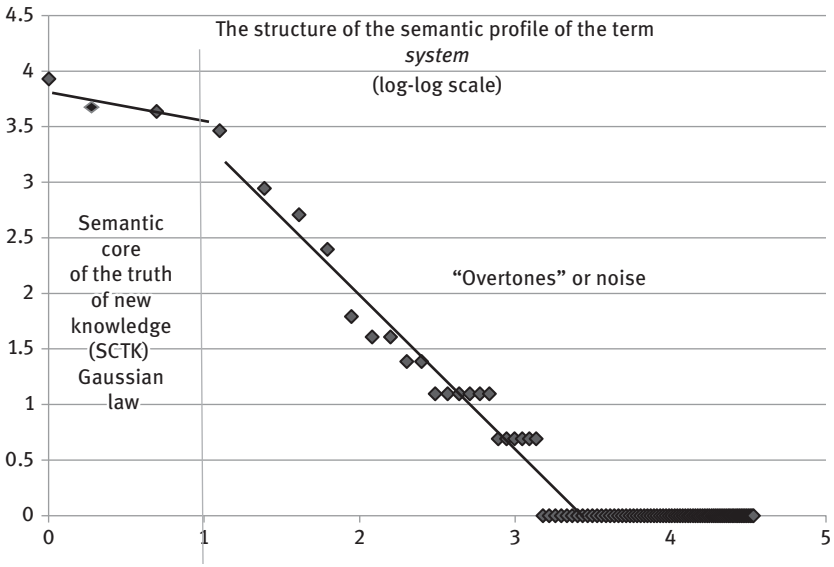


**Figure 11.1:** The semantic profile of the term *system*.

This means that truth can be determined by a vote, and can also be "imposed" by other subjects. This can always be seen in politics, the media, etc. Any process of learning is also nothing more than the "imposition" of truth by teacher on students.

Less frequent or very rare words are located to the right of the SCTK. They form something similar to noise or the notion "overtones" which is used in acoustics.

Taken together, the NRL and overtones are a structure that would be properly called a semantic profile (SP).

The truth of knowledge is a measure of the symmetry of the NK of reality, i.e. how reality and knowledge about it are symmetrical to each other. If symmetry is minimal *(H = 0.381)*, this means that modeling an object is possible only at the very minimum level of using mathematics. Therefore, complex equations, logical circuits here are not sufficiently substantiated. Although they can be used, their degree of relevance to the object will be extremely small.

But if the level of truth about the object is quite high *(I ≫ 2)*, then the mathematical apparatus here can be used reasonably enough, which we often observe in practice.

That is the meaning of the obtained results for understanding the processes of modeling reality.

However, this approach at the same time gives a hint how to generate the NC: to do this, it is necessary to generate a new SCTK, which will become the semantic basis for the NK.

How can it be formed? There exist many ways that can be offered:

1) violating the current causal relationships of the existing SCTK:
   - the method of alternatives, when statements are replaced by their negatives. In this case, the formal logic negates the truth of the new SCTK, but the fact is that if the new SCTK replaces the old, then the old one simply self-destructs, and the new, in the sense of truth, takes its place.
   - the method of "provocations", when a deliberately false new temporary SCTK is created in order to shake up the old one, but in the end the third SCTK is formed, which ultimately remains.
   - the method of random selection (manifested in children), when the choice of a new SCTK is formed randomly, without any rules and justifications.
   - the method of analogies, when a new SCTK is formed by analogy with an already some well-known statement. For example, proverbs and sayings correspond to such a rule.
   - special mathematical algorithms (game, etc.). In this case, the new SCTK is generated as a player's strategy based on considerations and criteria adopted in this game.
2) creating new cause-and-effect relationships of the new SCTK (the "Medici Effect"). This method is based on the principle of "the most fruitful new ideas are born at the interface of sciences" and has real historical roots associated with the dynasty of patrons of the Medici family (Ivanus, 2011).

Let us consider the simplest of ways – the method of alternatives. As an educational methodological example for students of economic specialties, we consider one of the concepts explaining the nature of exploitation.

This concept includes such concepts (terms) as: surplus value, wage labor, ownership, employee qualifications, and others.

These terms can be considered to form causal relationships between them and their SCTK.

After that, one can try to replace this semantics with an alternative one and get a version of the concept in which there is no exploitation (and also propose on this basis ways to implement this concept).

At the first step, we will establish the semantic links of the term *exploitation*. The result will be a semantic profile of this term, from which SCT will be distinguished.

At the second step, a similar procedure can be implemented in turn for those terms that are included in the SCT notion *exploitation*.

Continuing this procedure for any number of hierarchical levels formed this way, we end up with a hierarchy of terms having the maximum truth. This hierarchy is taken as the basis for the formation of the NK, as some alternative hierarchy with other, alternative, values. Then the truth of this new hierarchy

- remains internally consistent (as A.Tarsky wrote) according to formal logic.
- may correspond (or may not correspond) to some new reality (according to Aristotle) contrary to the formal logic.

If the verification of these components of truth shows that these two conditions are fulfilled, then this way NK can be accumulated.

The formed semantic profile of the term "exploitation" is presented in Figure 11.2.

The structure of the SCT of the term *exploitation* includes three terms: *surplus value*, *property* and *wage labor*.

Next, the SCT of these terms is defined. Their semantic profiles are presented in Figures 11.3–11.5.

The SCT structure of the term *surplus value* consists of three notions: *cost, employee and unpaid labor*.

The SCT structure of the term *ownership* includes two terms*: exclusive right* and *means of production (assets)*

The SCT structure of the term *"wage labor"* includes two terms: *selling labor and qualifications for wages and the product of labor belongs to the employer*.

If only the SCT structure of the terms *surplus value, property and wage labor* is used, the following well-known statement can be formulated on their basis:

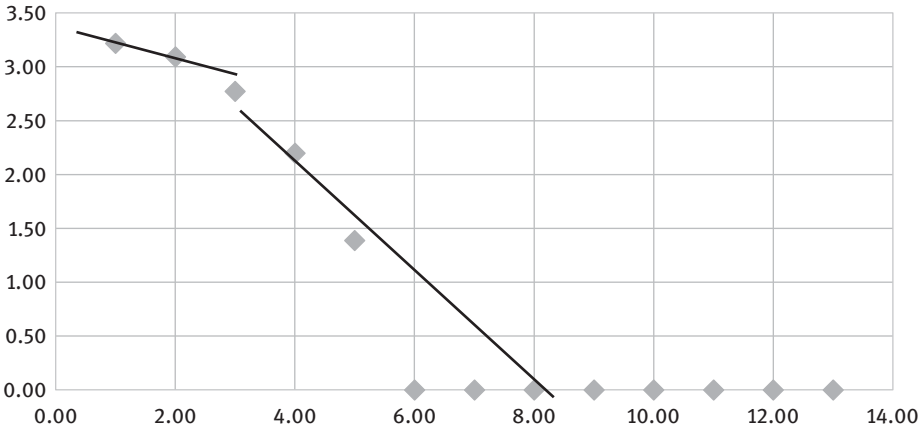


**Figure 11.2:** Semantic profile of the term *exploitation*.

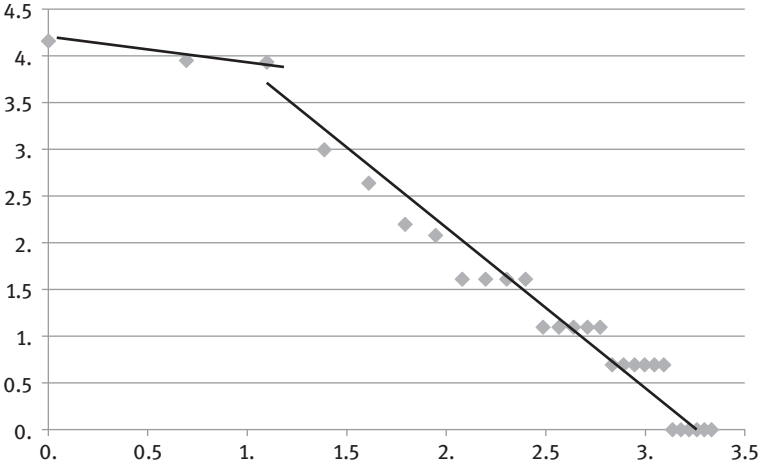


**Figure 11.3:** Semantic profile of the term *surplus value*.

> Exploitation is the appropriation by the owner of the means of production of the products of labor and the surplus value arising from the unpaid expended labor and the qualifications of the employee selling this labor and qualifications for wages.

In the flowchart in Figure 11.6, this definition is represented.

The authors use this prepared complex SCT to generate the NK based on the method of alternatives. To do this, they formulate this alternative new SCT as a logical negation of the original SCT.

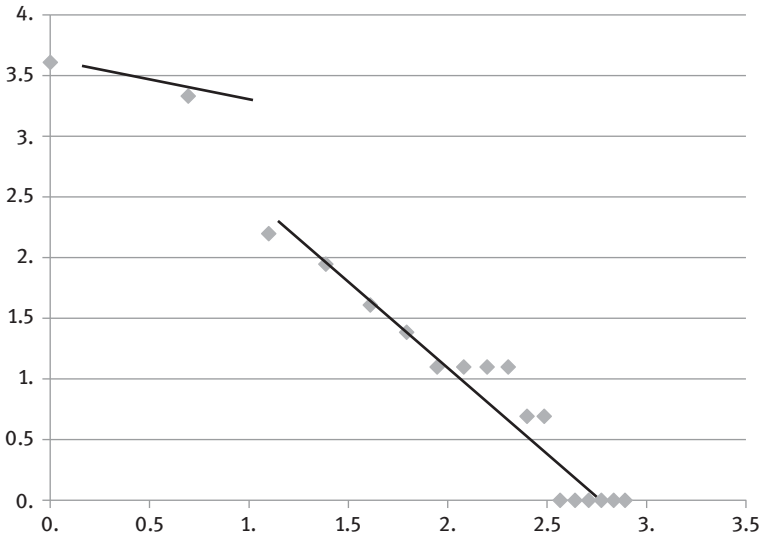


**Figure 11.4:** Semantic profile of the term *ownership*.

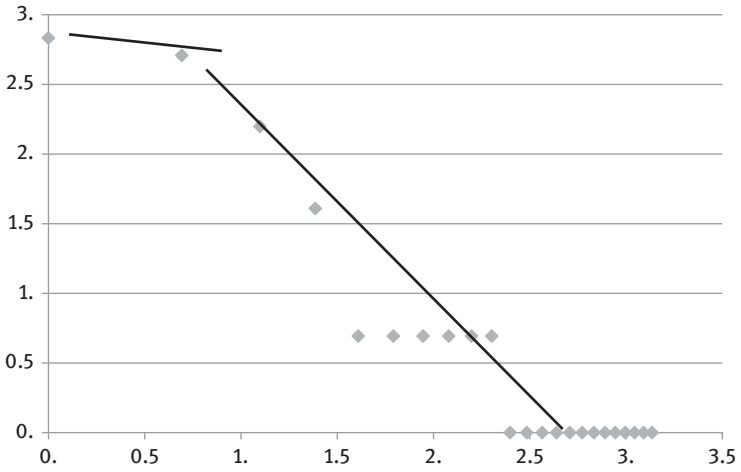


**Figure 11.5:** Semantic profile of the term *employee*.

As a result, a new statement is formed as an alternative tree:

*There is no exploitation in the absence of surplus value, and that, in turn, in the absence of unpaid wage labor, a product of labor and qualifications that can no longer be appropriated by the employer, and the product of labor, labor and qualification belong to the worker.*

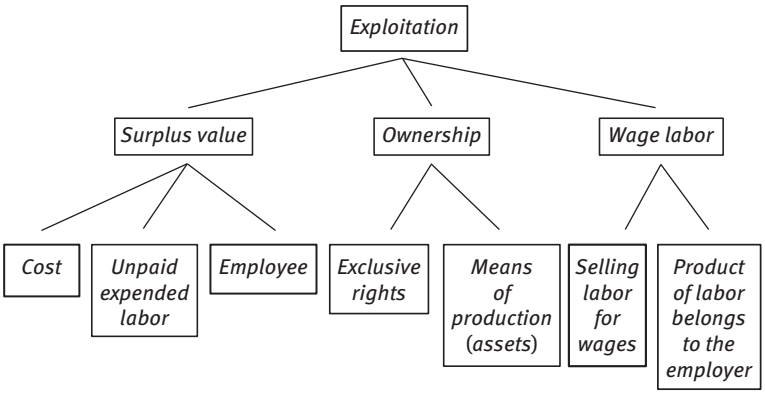


**Figure 11.6:** The SCT structure of the term *exploitation* using the SCT hierarchy of included terms.

Therefore, it is necessary to abolish the system of wage labor in order to eliminate exploitation, and for this the workforce and the qualifications of the worker need to be his property (Ivanus, 2017).

The qualification should be recognized as an employee's property, evaluated and used as intangible assets, because in the course of the economy, unrecorded qualifying assets create an unrecorded shadow management loop, which leads to stability loss and crisis phenomena.

That is, real assets huge in their mass, if not recorded, negatively affect the quality of the economy management.

This fact is understudied in the economic theory.

## Conclusion

The proposed cognitive approach allows solving the problem of generating new knowledge, which are options and scenarios for the alternative development of the economic system. These options are essentially control actions. The advantages of the method include the ability to work under the influence of uncertainty factors.

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# 12 The Triple Helix Model as Alternative Economy

## Introduction

The concept of alternative economy is multidimensional. One of the possible interpretations can be given on the basis of our long-term research on the development of a methodological approach with mathematical tools of the Triple Helix model (hereinafter referred to as the TH model) in Russia, in line with historical retrospect. But before giving such an interpretation, let us explain why we pay special attention to the TH model. In our opinion, it dovetails with the modern view of social and economic development – a vector, adopted by the Russian authorities. It is the skeleton, the basis of reasoning, of modeling. All other aspects, problems, anyway (even if it is not obvious at once, it becomes clear on closer attention) are its complicating elements, metaphorically speaking, "meat on a skeleton" or "leaves to a tree". It is this position that gives way for the development of numerous methods for calculating (brought to program execution), which could have real practical value as an auxiliary tool in decision making at different hierarchical levels, and at the same time advancing domestic digitalization, thereby boosting national power.

So, the relationship between the TH model and the concept of alternative economy, in our opinion, is as follows. If we take one of the interpretations of the alternative economy as the presence of government involvement in contrast to the state non-interference principle, defined by Adam Smith, then just the model of triple interaction "University–Business-State" can be considered as an actual hybrid model of the economy "Marketing (Business) and Planning (State)" in new civilizational environment, under terms of knowledge economy, provided by Universities.

In so doing, all three components of the TH model go hand in hand with the human factor, as if surrounded with an envelope called "staff capacity as the greatest asset of any economy", or, using common contemporary terminology, – "human capital". In that respect, it should be noted, that in 2018 Paul Romer received one of the Nobel Prizes in Economics for his explanation of the impact of innovations, inextricably linked to the human factor, on economic growth (Demchenko, Feinberg, 2018).

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Ultimately, if we give applicable branch nature to the discourse, then, as an example, we can talk about the priority life-supporting industry – energy. Moreover, taking into account the popular modern process called "clustering" (in fact, an analogue of building horizontal economic relations during the Soviet period), we can formulate stronger: the energy sector should be considered as the core of the cluster economy. Therefore, in this paper we will trace the system relationship between "the TH model" – "human capital" – "energy industry problems", emphasizing the need of developing national and regional policies, adequate to modern demands, which will contribute to overcoming existing state barriers in the formation of productive factors of development.

## Methodology

The elements of vector analysis and field theory (gradient, divergence, continuity equation); the method of analogies for the adaptation of natural science concepts to the economic field, in particular, to separate the characteristics of the development of these objects into structural and dynamic ones based on their meaningful comparison; regression analysis for approbation of methodology – the determination of innovative potential components on the example of macro-object – Russia are used as the methodological basis of the mathematical tools of the TH model and continuing the ideology developed by us in (Istomina, Lychagina, Pakhomov, Pakhomova, 2018). The developed method of determining the innovative potential of social and economic objects of different hierarchical levels in the triple interaction "University–Production–State" includes, among other things, the definition of the innovative potential of the object as an integral indicator based on the continuity equation (Istomina, Lychagina, Pakhomov, Pakhomova, 2018).

According to the mentioned method, in the field of interaction defined in the coordinate system "Knowledge–Agreement–Innovation", there was examined a scalar function expressing the innovative and economic state of the object $F(S_K, S_A, S_I)$, where scalar quantities are used as independent variables: the space of knowledge – $S_K$ (the index named from *Eng*. Knowledge), the space of consent $S_A$ (*Eng*. Agreement), the space of innovation $S_I$ (*Eng*. Innovation). The continuity equation for the economic analogue is obtained:

$$\frac{dF}{Fdt} = \sum_i \frac{\partial S_{i2}/S_{i22}}{\partial S_{i1}/S_{i1}}. \tag{12.1}$$

Moving from absolute changes to relative ones (growth rate, elasticity), for the purposes of discrete representation there was determined an integral indicator of the growth rate, which we called the innovative potential of the object $C$:

$$C = \frac{\Delta S_{K2}/S_{K2}}{\Delta S_{K1}/S_{K1}} + \frac{\Delta S_{A2}/S_{A2}}{\Delta S_{A1}/S_{A1}} + \frac{\Delta S_{I2}/S_{I2}}{\Delta S_{I1}/S_{I1}}. \quad (12.2)$$

The innovative potential of the object (12.2) is represented by three components – a science-intensive factor, a factor of profitability and a factor of production capacity. The meaningful interpretation of these three components is as follows: the science-intensive factor determines the speed of innovation emergence depending on the existing scientific content of the object; the profitability factor shows how profitable the costs of innovation development and implementation were; the factor of production capacity demonstrates the intensity of innovative production development.

The expression (12.2) shows, that the three components of the helix are represented by the tempo characteristics. In order to, so to speak, "to twirl the helix", it is necessary that the tempo characteristics would be at least proportionate, and ideally – identical. From the institutional point of view, the organizational mechanisms would be smooth, for example, without unfounded work stoppages. This, in turn, proves the impossibility of innovation management processes segregation (except for the differentiation of cost accounting) and requires creating a single mechanism that will ensure the development of intellectual resources in the first place.

Each link of the helix, each new level or "ecosystem" has its own space of parameters that determine the principles and the structure of the managing mechanism in order to ensure adequate responses to the variety of external influences and the implementation of successfully perceived, according to N.D. Kondratieff, innovation.

Therefore, the component associated with the factor of "human capital" in this paper is methodically represented by a comprehensive methodological approach to modeling the assessment of the components of regional human capital.

At the regional level, the effect of human capital depends on the employed population, on wage, on existence of centers of economic growth, on innovation activity, on infrastructure development, on development of mechanisms of networking and society's engagement, on migration flows, on environmental health, etc.

For a comprehensive study of the sectoral structure of employment with the use of the most common forecasting models and deflated official statistics for the period 2004–2015, the Moscow region (MR) was chosen (Pakhomov, Pakhomova, Rozhkova, 2017), as it is one of the most dynamically developing regions of the Russian Federation, leading in a number of indicators in the Central Federal District. On the other hand, the certain features typical for most Russian regions allow us to explore the regional labor market in order to develop a universal method of multilevel sequential analysis of factors for predicting employment as one of the components of human capital.

The first step contained the search, the analysis and the systematization of the theoretical aspects of employment and the national and international experience. The information obtained made it possible to identify the general basic factors that

most affect the employment, as well as to form the main specifications for the subsequent modeling of employment:

- *L*, pers. – an industry's average personnel
- *Y*, mln rub – an industry's gross regional product
- *K*, mln rub – an industry's fixed capital
- *I*, mln rub – an industry's fixed-asset investments
- *W/P*, rub – an industry's real wage

The purpose of the second stage was to identify the dependencies that allow to choose the model that best reflects the social and economic processes taking place in the industry, to be used later to obtain short-term and medium-term forecasts. The technique detailed in the part of econometric tools is presented in Figure 12.1.

It is noteworthy, that the use of correlation and regression analysis for such problems is theoretically justified by the significant amount of selection, by the homogeneity and quantitative expression of the data, by the ability to describe the relationships in the form of an equation. The identified factors can further become the basis for multidimensional classification using cluster analysis, which allows considering large body of social and economic information. Meaningful interpretation of similarities and differences of objects in one set allows avoiding distortions and substitution of individual characteristics by generalized ones, to take into account the specifics and to correct the result. The cyclical nature of such studies is expressed in the following: from economic theory and business practice – to econometric modeling, analysis of the mechanisms of internal and external processes and, as a consequence, to the development of proposals for improving the theory and economic policy.

## Results

In terms of modeling the TH for the Russian conditions, the studies conducted on the basis of the tools developed by the authors showed that during the period 2000–2015 the innovative potential of the country had been reduced by half, while the crisis of 2008 contributed significantly to this decline. The importance of mathematical tools is for its use permits to determine the contribution of three components of innovative potential in its behavior and to identify the reasons for its reduction, namely:

- The profitability factor keeps almost constant, which means sustainable allocation of finance for development, implementation and production.
- The stable growth of the science-intensive factor is replaced by a drop in the number of technological developments, which is related to the full exploitation

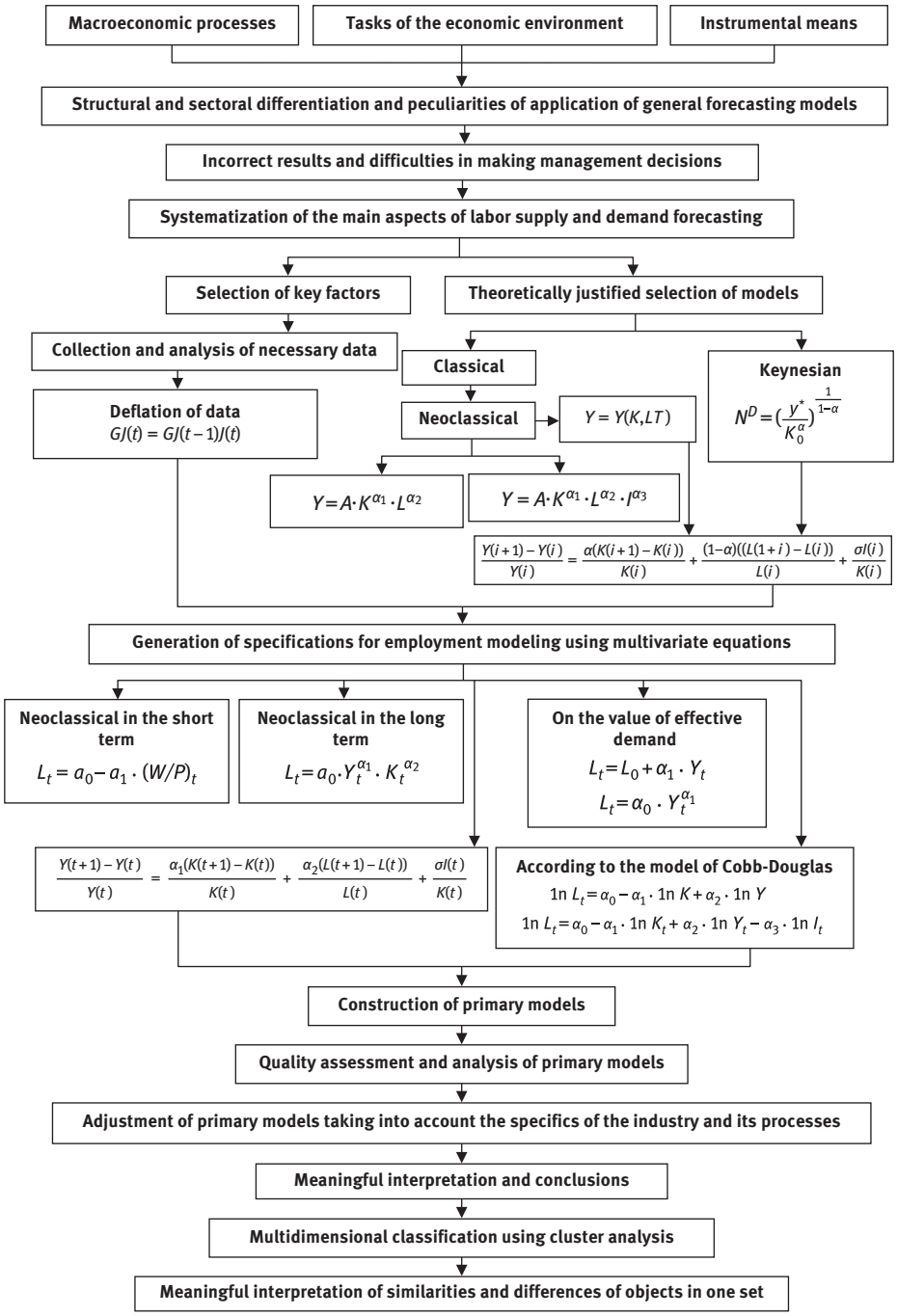


**Figure 12.1:** The general scheme of realization of methods of correlation and regression and cluster analyses in the problems of socio-economic forecasting.

of new technology of the latest technological revolution and the use of innovation in life – an increase in organizational innovation.
– The full exploitation of new technology is confirmed by the behavior of the factor of production capacity, showing a fall during the entire study cycle, which can be explained by the fact that groundbreaking technologies that triggered the revolution had been imported from other countries, as well as the practical absence of dynamics of innovation produced after 2008.

In the part of modeling the assessment of the components of regional human capital and on the example of the industry "Production and distribution of electricity, gas and water", it is concluded that there is a direct link between the number of employed and the wage (and to a lesser degree – with the fixed capital, that is, sectoral innovation will lead to an even greater shortage of qualified personnel), explaining the characteristic lack of the industry in the supply of labor and common to industries the higher quality of those models that have an independent variable W/P (real wage). As for other regions of the Russian Federation, the Moscow region is characterized by the absence of internal migration policy, resource gap, structural dysfunctions, production conversion, oversupply of staff on some specialties, the decrease of employability quality. At the same time, the deep differences in regional markets in terms of wage, occupation, unemployment, population mobility demonstrate stability and reflect the uneven territorial distribution of labor force, as well as the lack of a holistic federal concept of regulation of employment. The geo-localization of unemployment manifests itself in significant deviations of average values in a number of regions and requires a targeted approach to employment policy, providing conditions for free labor migration of citizens within the country with the preservation of the existing lifestyle. To enhance the impact of human capital is possible through territorial development by means of local clustering (the formation of self-maintaining systems and the implementation of social functions).

For its part, the simulation actually identifies the real economy (adding value) and the service sector (redistributing). Even throughout the regions, the energy sector is clearly distinguished, which encourages to talk about the considerable space of the energy industry within the global environment, in cluster model, which as part of our work can be interpreted as the construction on principle of the "triple helix" (State-Business-Science), the ultimate purpose of which is to overcome exclusion in technological development.

Our review of the literature on this issue revealed that national articles are mainly devoted to the study of the cluster economy in countries of Europe and Asia, and also the United States, from a theoretical standpoint: the mechanisms of its forming, functioning and managing (Istomina, 2015), as well as the visualization of the descriptive (verbal) model (Ksenofontova, 2015). It allows us to recognize the cluster economy as one of the areas of alternative economy. Thou, it leaves open a question of how best to apply and to adapt this experience to the Russian economy,

which has the specifics of non-stationarity as a result of the collapse of the closed macro-cluster of the USSR, in which the links between economic sectors were clearly tracked (Davtyan, Pakhomov, Pakhomova, Rozhkova, 2017).

For the moment, based on alien experience, without a thorough econometric analysis (all arguments "for" or "against" the implementation of a cluster model in Russia are built mainly on a comparative analysis of economic indicators of foreign countries), as well as the actual absence of legislation (Kazak, 2017), the Russian cluster economy is in its infancy, despite the fact that the clustering policy has been conducted since 2005. This is confirmed by the information data of the list of existing and under development technology parks and industrial clusters (List of industrial clusters and technology parks of Russia, 2019), as well as the results of the econometric analysis showing that GDP is formed mainly due to labor force (Pakhomova, Pisareva, 2018), whereas, on the contribution of GDP growth the domestic indicator of human capital gives in to many countries several times, meanwhile, outpacing per capita. However, the quality of all constituent elements of human capital has gradually declined.

Similarly, while the Russian cluster model has no face, and hence – the impact, presumably because the preference is determined by foreign cooperation framework. To date, according to the Map of clusters of Russia there are two clusters specialized in "Electricity and electrical equipment production": the Altai cluster of power plant engineering and energy-efficient technologies at the average level of organizational development and the Tula region energy cluster at the initial level of development (Map of clusters of Russia).

It should be noted, that despite Russia's mineral potential, shortage of energy resources is already sensitive (Shestov, 213), and "Russian electricity sector is in want of total modernization" (Metelnikov, 2018), while some energy companies include foreign members, for example, the Enel Group is submitted in PJSC "Enel Russia" and RUSENERGOSBYT Ltd, which equities are at 56,4% and 49,5%, respectively (Equity structure). This testifies to the fact that there are credible risks of dependence of the domestic energy sector, and hence the Russian economy, on foreign countries.

## Conclusions/Recommendations

Our comparison of the results for the three components indicated at the beginning of the article – modeling of the TH for the conditions of Russia as a macro-object, a comprehensive methodological approach to modeling the assessment of the components of regional human capital, which is one of the key factors in innovative economy formation, a summary of the problems of the energy sector – highlights their similarity in interpretation and the alarming state, that require that the country's authorities take immediate action, at least to "equalize" the situation at the national and regional levels, in life-supporting industries, together with effective

national regulation and organizational and economic mechanisms for managing, with diversified manufacturing, with competitive production, with hubs for scientific and technological development, with low inflation, etc., being the foundation for GDP growth.

With the existing differentiation, the country becomes a conglomerate of territories, while their integration into a single whole is of primordial importance not only at the level of economic development, but also in order to form and to strengthen the Russian identity and cultural homogeneity of society.

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# 13 Different Possibilities of Formation of Human Capital in the Conditions of Digitalization of the Economy: Territorial and Industrial Aspects

## Introduction

The rapidly growing influence of information and communication technologies on all spheres of life in the modern world has been called the digital transformation or digitalization. This process creates new economic opportunities for enterprises to increase production, create high-tech jobs and start innovative processes. On the other hand, digital transformation requires a change in the quality of economic resources, and in the first place – human capital, which is the main driving force of the socio-economic development of modern society.

A review of the literature shows that researchers are interested in various aspects of the formation and development of human capital in a digital economy. Thus, much attention is paid to the forecast changes in the structure of employment, the disappearance of traditional and the emergence of new professions (Rudskaia, 2019; Moses, Cheah and Tey, 2018; Ludike, 2018). Great concern of the scientists from different countries is caused by the social consequences of digitalization. The publications analyze such processes as reducing the need for labor in a high-tech economy, the growing excess of workers with higher education compared with the demand for them and the consequences of digitalization in the formation of a new working environment with an emphasis on changing the content and quality of work (Sadovaya, 2018; Means, 2018; Canetta, Barni and Montini, 2018) etc.

Considering the impact of the digital economy on labor resources, it should be borne in mind that the most important property of human capital is its inseparability from the carrier, the person himself. Consequently, the possibilities of its increment are largely determined by the conditions of life, profession and industry.

Taking advantage of digitalization is especially important in industries where there is intense global competition and a large number of buyers and sellers. Agriculture is just such an industry, and, as the researchers emphasize, digital transformation, in turn, increases competition (Pham and Stack, 2018). Publication overview shows that the directions of agrarian digitalization are very many-shaped and connected

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altogether, with the possibility of forming and processing large data arrays. This is the basis for improving the methods of production and transfer them to a higher level. The results of monitoring and analysis of data sets are used to optimize the elements of the agricultural process, taking into account the particular state of an individual animal or plant in a particular area of the field, the predicted productivity of living organisms, the expected state of the environment, climate change, etc. (Kamilaris, Kartakoullis and Prenafeta – Boldú, 2017; Shen, Basist and Howard, 2010).

Thus, the attention of researchers is more focused on the possibilities of improving business processes that arise when using new technologies. At the same time, the formation of human capital adequate to the new technological level is given much less attention, while for agriculture this question is extremely important for a number of reasons.

First, the management of agricultural production, which has living organisms as its object, even in the most technologically advanced enterprises, still requires the expenditure of living and embodied labor in traditional forms. As a result, agriculture has limitations in taking advantage of information and communication technologies (Venkata Krishna, Sivanesan, Misra and Obaidat, 2015). As experts point out, digital agriculture is not a standalone solution, but a connected system, including hardware, software, data services and external consultants. Therefore, human intervention remains and will be necessary in the near future for making key decisions. (Esenam, 2017; Shamshirietal, 2018).

Secondly, the possibilities for incrementing human capital are related to living conditions, which in many respects distinguish the agrarian sector from other industries, especially in Russia. Such features as limited employment opportunities and the underdevelopment of social infrastructure in rural areas, insufficient labor mobility, low wages and lack of state support, compared to other sectors, are an obstacle to attracting highly qualified specialists. It should be noted that the difficulties in the process of digitalization of individual industries (including agriculture) associated with low innovation activity and insufficient development of labor resources are also noted in other countries. (Panganiban, 2019; Pînzaru, Anghel and Mihalcea, 2017).

The purpose of this study is to clarify the problems and the search for opportunities for the formation of human capital in conditions of intensive digitalization for such a specific and extremely important industry for any country as agriculture.

## Methodology

The social parameters of the formation of human capital in rural areas are largely determined by the attractiveness of rural life, the problems and advantages of rural

residents, the prospects for professional growth and development, etc. The assessment of these aspects was made on the basis of a study of the personal perception of the external socioeconomic conditions by the inhabitants of the rural areas of a typical agrarian region of Russia – the Stavropol Territory.

The survey method was a selective quota survey. To ensure the representativeness of the study, the sample was formed on the basis of the structural characteristics of the rural population of the Stavropol Territory. Thus, among the survey participants there are 53% of women and 47% of men. The share of respondents under 30 years old is 24%, from 31 to 40 years old – 28%, from 41 to 55 years old – 34%, from 56 and older – 14%. More than half of the respondents are respondents up to 40 years old, that is, the most productive component of human capital, since by this age it has been fully formed. 27% of respondents had higher education, 24% had secondary vocational education, a significant proportion of respondents had primary vocational education (14%), secondary general education (27%), and professional training courses (8%). As a result of the survey 250 questionnaires were collected, analysis of which allowed to confirm or refute the hypotheses put forward at the planning stage of the study.

## Results

The theoretical substantiation of the research problem involves the refinement of the concepts used in it. In modern science and practice there are many approaches to the interpretation of the term "digital economy", which leads to the absence of a unified, harmonized understanding of this category. Digital economy, in our opinion, should be understood as its way of life, which is based on knowledge and digital technologies, thanks to which interconnectedness is ensured into a single system of all subjects, and therefore production factors, implemented in the format of fundamentally new business models that cause the economic growth. From this it follows that the formation of the digital economy is inevitably associated with a significant contradiction between the traditional factors and the innovation factor. An innovative factor in ensuring economic growth is based on the use of "end-to-end technologies", including the collection, storage, processing, search, transmission and presentation of data through certain software and hardware tools and systems that change business processes. The ratio of these factors in different industries differs significantly, besides, the human factor conventionally occupies an intermediate position between traditional and innovative factors. On the one hand, a person is a carrier of the ability to work and other components of human capital and from this point of view it can be attributed to the group of traditional factors, and on the other, only a person is able to create and ensure the implementation of innovative information technologies in all spheres of economy. This methodological message serves as the basis for studying

the possibilities of forming a new quality of human capital in various sectors of the economy. A special place among them belongs to agriculture due to unequal starting conditions of the digitalization process, the distinctive features of using end-to-end digital technologies in relation to land and biological resources, as well as living conditions in rural areas, the need to preserve and develop rural areas as the basis of the country's food security and national identities.

Innovative development of the rural economy inevitably involves capital inflows. There is a threat of violation of the principle of complementarity of factors of development of rural areas due to the priority development of one of them, in particular capital. Thus, from 2019, a multiple increase in budget expenditures is planned for the development of "cross-cutting" digital technologies: for the period up to 2024, 282 billion rubles (about 4.4 billion dollars) will be allocated from the federal budget for these purposes, and state support is growing as part of the National Technology Initiative. In order to prevent the threat of a violation of the balance of development, it is necessary to create adequate conditions for the formation of human capital in all spheres of the economy, and first of all in the agrarian sphere.

The development of priority sectors of agricultural production, which are crop and livestock, depends not only on the climatic and environmental conditions of rural areas, but also on the social situation. Life in the countryside, the level of employment, the vocational qualification and educational characteristics of human capital are largely determined by the rural way of life, traditions and standard of living.

The results of the questionnaire confirmed the hypothesis that the low level of wages still worries the respondents more than other problems of rural life. Although in recent years, in the framework of the program regulation of agricultural production and other areas of the rural economy, systematic work is being carried out in the country to improve the standard of living of people in rural areas (Figure 13.1).

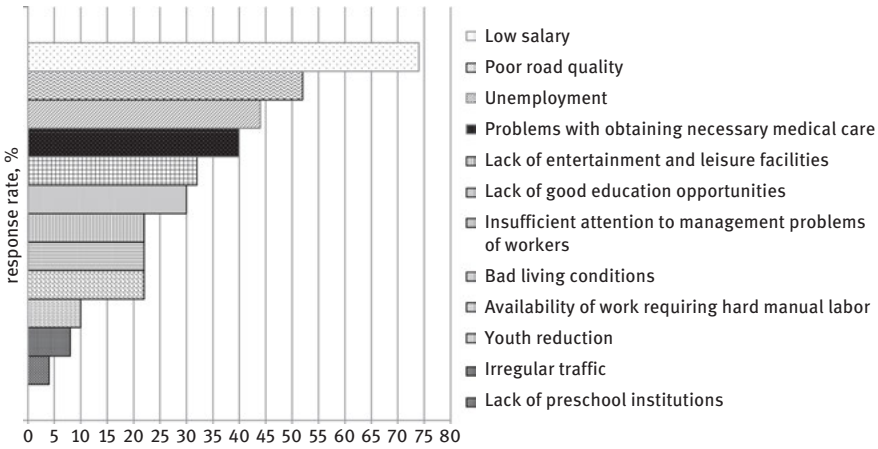


**Figure 13.1:** Assessment of the problems of rural residents by survey participants (%).

Low wages are associated with both the characteristics of the rural labor market (limited number of jobs, insufficient mobility of workers, etc.) and the nature of work itself. However, hard physical labor, which continues to be a characteristic feature of life in the countryside in comparison with the life of the townspeople, is of little concern to the villagers. At the same time, hard physical work of 25% of men and only 7% of women, with regard to young women under 35, consider this problem difficult for them. These are women of childbearing age, who are engaged in children and are not burdened with physical labor, as evidenced by the fact that only 5% of this category of respondents are anxious about the shortage of preschool institutions.

It also confirmed the hypothesis that the level of infrastructure development in rural areas is among the priority problems. Thus, more than half of the respondents note the poor quality of roads and consider the underdeveloped leisure sector. At the same time, when answering the question of what makes rural life attractive, about half of the respondents identified family traditions and proximity to the land. In particular, young people under 30 years old (20%) and residents aged 41–55 years (35%) note this. Every fifth respondent also noted a good environmental situation as a priority advantage. Therefore, despite the existing problems, the situation that is characterized by the following data is quite understandable: only 6% of respondents assume to move to the city, and 13% think about leaving; but 49% of the respondents indicated that they would never leave the rural territory.

In order to analyze the possibilities of self-development of rural residents, to improve the quality of human capital, the questionnaire included a question about the time spent on various types of activities. The answers to it were distributed as follows: at the age of 30, women spend on average 10 hours a day for work in a profession, while men spend 9 hours, i.e. time reserves for advanced training are limited. Analysis of other age groups showed an inverse relationship between age and time spent on advanced training and professional growth between women and men: the older the men are, the more time they spend acquiring professional skills and knowledge, and for women of older age, time spent on this is shortened.

In modern conditions of dynamic changes in the socio-economic situation, personal perception of changes in working conditions is of great importance (Table 13.1).

From the data in the table it follows that the majority of respondents note positive trends in changing working conditions, at the same time, a significant part of the respondents find it difficult to answer the question posed, therefore, there is no real change. Half of the respondents report positive dynamics in the development of technical labor, while the other half do not feel these changes, which makes it difficult for the digital economy to develop.

At the same time, from the point of view of the development of human capital, we are seriously bothered by the fact that only 40% of young people up to 30 years old and every third person aged between 31 and 40 years old is evaluating changes to the best with the ability to use knowledge, their qualifications, and raise it.

**Table 13.1:** Results of a survey of rural residents regarding changes in working conditions (%).

| Working conditions | Types of changes | | | Difficult to answer |
|---|---|---|---|---|
| | positive | without changes | negative | |
| Wage rate | 56 | 24 | 6 | 14 |
| Ability to use skills and knowledge | 36 | 50 | 4 | 10 |
| Opportunity to improve qualification | 42 | 34 | 4 | 20 |
| Technical support of labor | 44 | 42 | 0 | 14 |
| Relations between employees and managers | 30 | 48 | 8 | 14 |
| Relations between employees | 18 | 44 | 8 | 30 |
| Social benefits (voucher payment, help in keeping children in kindergarten, preferential meals, etc.) | 10 | 66 | 14 | 10 |

The development of the digital economy is impossible without IT training in agriculture, which is associated with the level of education of those who are employed in this field. However, survey data indicate that there are limited opportunities in education in rural areas; this problem was noted by 40% of respondents. At the same time, respondents do not see an opportunity to manifest themselves in the profession and career growth.

Survey data showed that 88% of young people under 30 years old and 64% at the age of 31–40 years old never underwent advanced training, and only 9% and 15% respectively improved their qualifications in the current year, which was possible only with the use of funds of organizations, and only half of them is based on IT technologies. The interest in self-learning through the Internet, professional publications, etc., is experienced by 15% of young people who spend their money on it, while 5% do not see this as necessary. The majority of respondents (80%) are aware of the need for self-education in the digital economy, but do not take active steps to do so.

Data on readiness for professional growth and improvement of qualification of rural residents, obtained as a result of questioning, is advised to be compared with the data of a study on the readiness of the education sector to develop "digital" competencies. The Stavropol State Agrarian University conducted such a study in order to identify the main trends, prospects and limitations in the system of personnel training for digital agriculture (Bobryshev, Khokhlova, Ivashova and Fedisko, 2018). An expert survey of the top management of 54 agricultural universities of the country was conducted in its process. More than half (53.8%) of the interviewed experts indicated that the training of personnel for agriculture in the Russian Federation in digital technologies and robotic systems requires significant changes in the education

system. The lack of readiness of educational institutions (including due to the lack of a clear order from the industry) to a certain extent is also indicated by the distribution of answers to the request to rank the competencies needed by the specialists of the agricultural sector in the context of digital transformation. Experts determined approximately equal importance of seven proposed competencies, i.e. clear priorities are not identified.

## Conclusions

Thus, the peculiarities of agriculture and life in rural areas predetermine the sluggish digitalization process as compared with other sectors of the national economy, which can aggravate the backlog of this territorial-industrial complex in the socio-economic aspect. Adjusting the situation requires using a system of measures aimed at intensifying the process of developing digital competencies of human capital from all its participants: agribusiness as a customer and partly an investor, educational institutions as an artist, a state as a regulator and a subject of support.

Creating high-paying jobs, including ones on the basis of using digital technologies, is one of the most important areas of attracting young people to rural areas, along with providing residents with comfortable housing, quality health care and education, and the development of cultural and sports leisure activities.

In modern conditions, the development of a digital economy in rural areas requires a systematic approach to solving existing problems, which is impossible without implementing targeted federal programs, local initiatives and big business with its social responsibility.

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# 14 The Influence of Industrial Clusters on the Development of the Region

## Introduction

At present, the positioning of the region's development in the Russian Federation is usually defined in the long-term socio-economic development strategy of each region, which highlights the main growth points of the region's economy, development scenarios, strategic goals and main tasks, stages and mechanisms for implementing the strategy, the main directions of improving the competitiveness of the regional economy. The strategy of socio-economic development of the regions is based on the directions of development of the national development strategy of the Russian Federation. Currently, the Ministry of Economic Development is developing a strategy for the socio-economic development of the Russian Federation until 2035. The regions began to develop a strategy for the development of regions until 2035 and to monitor the first results of the previous strategy until 2020.

In modern scientific thought, there are various approaches to grouping and informative characterization of regional development factors. The main groups of factors are: market, competitive, production. Market factors include a large array of information that can be assessed through monitoring of the market space, conditions for market entry and exit from the market, price dynamics, and interchangeability of resources. Competitive factors for the development of the region form the conditions and advantages in resource provision, the territorial location of the region, natural and climatic conditions, scientific and technical potential, the business climate in the region, infrastructural factors and many other parameters. Production factors include the industrial development of the region, the formation and functioning of territorial industrial complexes, technology parks, clusters. In 2016, a little more than 3 thousand clusters with a total staff of 54 million employees functioned in the states of the European Union (Ketels and Protsiv, 2016). A significant factor in the development of competition is the development of regional clusters (Kudryavtseva, Rodionov and Skhvediani, 2018).

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## Methodology

To achieve the goal of the study used several groups of methods. The methodological basis of the study are: theoretical methods of analysis and synthesis, generalization, concretization and formalization; empirical methods – analysis of the points of view of Russian and foreign authors, government and regional documents, strategies, cluster development programs, forecasting; comparative analysis method for evaluating the activities of the Omsk region clusters; statistical research methods to identify the main indicators of cluster development.

## Results

For the first time the term "cluster", as is known, was used in 1990 by M. Porter. Theories of regional clusters were also developed by a number of foreign authors – representatives of the American school of theories of new forms of production organization, such as: M. Enright, who explored regional differences in competitiveness; S. Rosenfeld, P. Maskell and M. Lorenzen, who drew attention to the role of relations between enterprises; M. Storper, who developed a model of the level of competition, D. Fundeanu and K. Badel defined cluster models using a triple helix, four-leaf clover and competitive advantage theory (Table 14.1).

**Table 14.1:** Factors of competitive advantages of clusters in foreign literature (compiled by sources).

| Authors | Cluster definition | Factors of cluster's competitive advantages |
|---|---|---|
| M. Porter | "It is a group of geographically related interrelated companies and related organizations operating in a particular area and characterized by a community of activities and complementary to each other" (Porter, 1998). | M. Porter's rhombus:<br>– production conditions<br>– conditions of strategic development and competition<br>– demand conditions<br>– profile and auxiliary industries |
| M. Enright | A regional cluster is a geographic agglomeration of firms operating in one or more related industries (Enright, 2000). | – the historical background of the region,<br>– production structure<br>– level of education,<br>– a variety of approaches to doing business<br>– localization of innovation (Enright, 2000) (globalization of competition and localization of sources of competitive advantages of regional clusters) |

**Table 14.1** (continued)

| Authors | Cluster definition | Factors of cluster's competitive advantages |
|---|---|---|
| S. Rosenfeld, P. Maskell, M. Lorenzen | A regional cluster is not only a geographically defined concentration of interdependent firms, they "must also have channels for production transactions, dialogue and communication between small and medium enterprises" (Regional Clusters in Europe, 2002), (Lundvall, 1998) | – active communication channels between firms for industrial contacts and information exchange between enterprises in a cluster;<br>– reliance on trust |
| M.Storper | An ideal regional cluster that goes through 6 stages of development (Storper, 1997) | – the benefits of innovation in manufacturing products.<br>– strong competition between quality-competitive firms and weak competition between valuable-competitive firms |
| D. Fundeanu, K. Badele | Groups of independent companies operating in a particular industry in order to stimulate innovation (Fundeanu and Badele, 2014) | – local innovation potential |

The essence of the industrial cluster is revealed by a number of authors: Neustroeva M.A. (Neustroeva, 2015), Ksenofontova O.L. (Ksenofontova, 2015). The industrial cluster is understood to mean the totality of industrial organizations united by resource flows, not connected by property relations, in which the finished and/or by-product industry products of one producer are the raw materials for the cooperative production. Industrial clusters, both the "growth points" of both the state economy and the regional economy and are the carriers of all three groups of factors of economic development. Therefore, at present, the attention of not only scientists, but also regional managers is drawn both to the study of various aspects of the functioning of clusters, and to the assessment of the already existing practice, both foreign and Russian.

One of the significant factors that influence the functioning of the cluster, the development of a strategy, both for the base enterprise of the cluster and for the rest of the enterprises included in the cluster partnership, is the evaluation of its development stage. The authors of the study of the cluster life cycle were M. M. Palt. (Palt, 2015), Salabaev D.I. (Salabaev, 2016), Kostenko O.V., Olenin O.A. (Kostenko and Olenin, 2018), and a number of other researchers. Summarizing the authors' approaches, it is necessary to single out such stages of the cluster life cycle, such as: agglomeration, emerging cluster, developing cluster, mature cluster, transformation, decline / stabilization / reorganization (Figure 14.1).

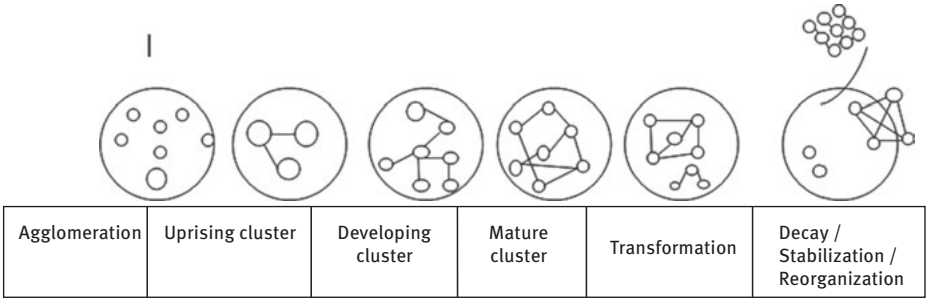


**Figure 14.1:** Stages of the cluster life cycle.

At the stage of agglomeration in the regional market, isolated organizations of industry and infrastructure are functioning. At the stage of an emerging cluster, the formation of a cluster begins, which is in its infancy, with the support enterprise of an industrial cluster singled out. At the same stage, by analogy with any organization, the disintegration of a cluster organization is possible for many reasons, but most often the supporting enterprise of the cluster influences this process. At the stage of the developing cluster, the cooperative relations of the cluster are formed. At the next stage, a mature cluster with a well-developed infrastructure dynamically functions. At the stage of transformation, cluster relations under the influence of various internal and external factors undergo significant organizational changes, including separation of cluster links. Further, as with any organizations, there are three possible options for the development of a cluster: if there is a significant reduction in resources, environmental degradation is identified, a cluster strategy is incorrectly formed, then the degradation of the cluster organization is possible. Cluster transformation measures can lead to stabilization and continued cluster maturity, or to the reorganization of cluster links when cluster boundaries expand under the influence of virtualization and globalization processes.

Many factors influence the development stages of a cluster, one of them is a cluster strategy that is closely related not only to the external and internal environment factors, but also to the regional development strategy and the development strategy of the Russian Federation (Figure 14.2).

For the development of cluster projects in the Omsk region there are the following competitive positions (advantages): the presence of a developed production base, raw materials availability, the existence of a developed educational environment, proximity and transport accessibility of domestic and foreign markets. In particular, Kazakhstan and China, a high concentration of scientific, technical and industrial potential, and a number of others. Today, in the Omsk region, two clusters are included in the register of the Ministry of Industry and Trade of Russia: petrochemical and agrobiotechnological clusters, which are the main directions for increasing the competitiveness of the Omsk region. The composition

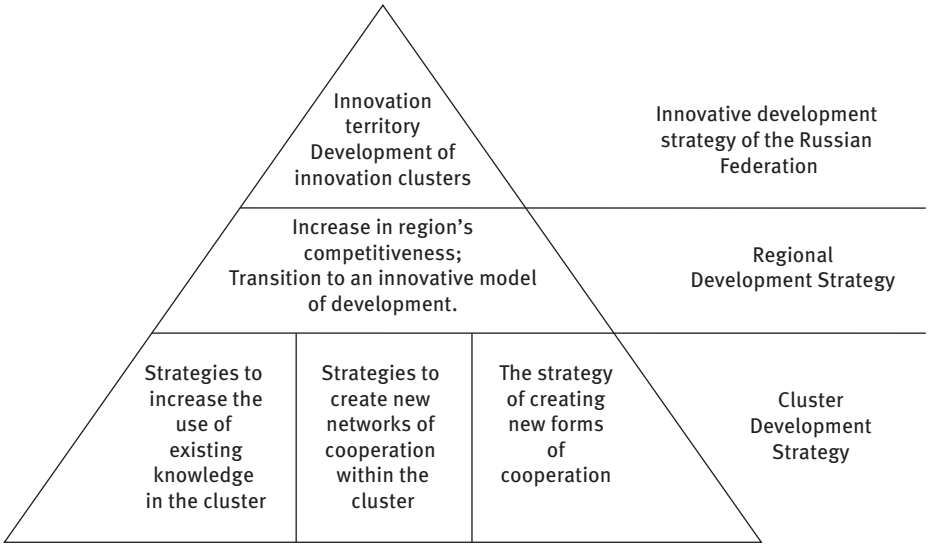


**Figure 14.2:** Interconnection of development strategies of the Russian Federation, region, cluster.

of these clusters included enterprise flagships of regional industry and small and medium enterprises.

Table 14.2 presents the main indicators of the development of clusters of the Omsk region.

**Table 14.2:** Indicators of the development of clusters of the Omsk region.

| **Indicators** | **Petrochemical cluster in 2020 to the level of 2016** | **Agrobiotechnology cluster in 2020 to the level of 2016** |
|---|---|---|
| Growth of the total volume of goods produced by the participants of the petrochemical cluster of own production, work performed and services rendered (by own forces) | not less than 19 percent | not less than 67 percent |
| increase in the volume of tax and customs payments of participants in the petrochemical cluster to the budgets of all levels of the budget system | not less than 11 percent | not less than 24 percent |
| growth in the costs of participants in the petrochemical cluster for research and development | not less than 2 times | not less than 2 times |
| growth in exports of goods produced by participants in the petrochemical cluster | not less than 58 percent | not less than 20 percent |

Source: Compiled by source (Decree of the Governor of the Omsk Region, 2013 No. 93).

Thus, we will single out the main factors influencing the clusters on the development of the region (Table 14.3).

**Table 14.3:** Factors of influence of clusters on the development of the region.

| Cluster Influences | Regional development |
|---|---|
| Technological cooperation | – development of regional cooperation<br>– investment attraction<br>– growth of competitiveness of the region<br>– development of small and medium businesses in the region<br>– development of the business climate in the region<br>– employment growth in the region |
| Information Resources Movement | – digitalization of the region<br>– integration of science and technology |
| Reducing the cost of applied research | – growth of competitive advantages and competitiveness of the region |
| Introduction of innovations | – development of the innovation infrastructure of the region<br>– development of innovative industrial production<br>– the formation of an innovative model of regional development<br>– growth of competitiveness of the region<br>– formation of R & D infrastructure<br>– development of education<br>– globalization of innovation (Islankina and Fiyaksel, 2015)<br>– intensive nature of the resource development of territories (Prokhorova, 2015) |
| Synergistic effect | – growth of GRP<br>– growth in tax revenue<br>– dynamics of growth in the region<br>– development of competitiveness<br>– formation of the region's infrastructure |
| Effect of mastering and scaling | – growth of innovation activity<br>– development of other industries<br>– development of small and medium businesses<br>– increase in the efficiency of interaction between government and business |
| Cluster Competitiveness | – growth of competitiveness of the region<br>– creation of a competitive industrial complex of the region |

**Table 14.3** (continued)

| Cluster Influences | Regional development |
|---|---|
| Growth in exports of cluster products | – development of the regional market<br>– development of relations between regions, territories, states |
| Cluster blur,<br>A reduce in the influence of territorial proximity under the influence of the processes of globalization and digitalization of economic processes (Prokhorova, 2015) | – globalization of innovation<br>– diversification of the regional economy<br>– growth of competitiveness of the region<br>– development of regional integration processes<br>– investment attraction |

Sources of financing of cluster projects at the macroeconomic level at the present time are the Industry Development Fund, subsidies for part of civilian R & D expenditures and for reimbursement of expenses for paying interest on a loan, as well as for reimbursement of expenses in connection with the implementation of import substitution projects.

Currently, slightly less than half of the regional clusters that are currently functioning and developing in the world, local and regional authorities carry out supporting cluster policy. The development of clusters of the industrial sector will contribute to the development of additional measures of state support. The role of regional authorities in the development of clustering is significant.

## Conclusion

In order to successfully form and implement a regional cluster policy, regional authorities need to take a number of organizational and ensuring measures: developing a concept for regional cluster policy, developing programs for developing industrial clusters, and identifying potential cluster members. It is also necessary to carry out assessment activities for functioning clusters, provide monitoring of industrial clusters and conduct SWOT analysis of the cluster, develop measures for regional financial support for the industrial cluster, including subsidies and grants, and create legal mechanisms for new cluster forms.

An integral part of the activities of public authorities should be the development of roadmap for the development of clusters, interaction with the Associations for the Promotion of the Industrial Cluster, ensuring effective interaction between the cluster members, ensuring coordinated actions of the regional executive body, local governments and the Association for the Promotion of the Development of Industrial Clusters and its member organizations and existing partners.

In the strategic project for the socio-economic development of the Omsk region, measures to increase the investment activity of organizations belonging to the cluster by encouraging the introduction of modern digital technologies into production through government measures of financial support, regional programs of preferential loans and incentives tax policy of the region were proposed to strengthen the industrial potential of the Omsk region and ensure its competitiveness.

The object of interest is the mechanism for managing the cluster development of the Omsk region proposed in the draft Strategy 2030 through the creation of specialized centers of competence (Center for Methodological Support, Center for Professional Competence and Center for Project Initiatives) that interact with enterprises in the cluster to ensure productivity growth, development of cooperative ties, growth of tax revenues to the budget, increase of investment activity, which in general will ensure the growth of competitiveness of the region.

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Olga V. Ignatova, Natalia L. Orlova, Olga Y. Tereshina

# 15 Clustering of Russian Economy: Resource Aspect

## Introduction

The necessity to overcome the challenges of globalization makes it crucial to take a fresh look at the resource problem in terms of finding and developing an alternative economic model. Such a model seems to be a geo-economic cluster-network. Currently, in Russia and in the world, completely new types of organizational-functional socio-economic structures are being developed in a consistent way – known as cluster-network models. World practice confirms that, first of all, clustering represents an effective tool that boosts the region's development, improves its trade balance, promotes employment, leads to increase in wages and tax revenues to budgets of all levels, enhances the competitiveness of enterprises in the region and in general it occurs to be a tool for achieving goals and solving problems of industrial policy. At the same time, the cluster assistance policy is implemented at the federal and regional levels of government.

## Methodology

In order to achieve the objectives of the study the method of comparative, institutional analysis is used. Quantitative and qualitative problems were solved using statistical and graphical methods. In addition, general scientific methods have been applied. Along with the generally accepted methodological approaches to the study of complex processes, noted above, this study attempted to describe cluster-network models from the standpoint of geogenesis – the volume-spatial method for studying the modern world.

## Results

The mechanism for forming a geo-economic cluster strongly depends on the specifics of the considered cluster. However, it also has common features that we regard as the following.

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1. Cluster is created on the basis of an efficiently functioning structure and an integrated network organization (large, medium and small business, financial and credit organizations, state and local government bodies, scientific institutions and educational facilities, human resources, and other civil society institutions). That solves the problem of the region's competitive advantages realization.
2. The next stage is the formation of energy infrastructure at the international level. It is not critical if this infrastructure is formed at the expense of local or imported energy resources. The main point is that it should be of international importance.
3. Further, it is necessary to form an extensive transport infrastructure.

Consider the marked points in detail. From a geographical position, a cluster is an agglomeration of companies operating in the same or related sectors of the economy. That means that participating companies are located at a relatively close distance from each other. For a regional cluster it is possible to identify a three-level system of competitive advantage types: supranational, national and local. A supranational competitive advantage is inherent in a regional cluster that unites large economic entities located in different neighboring countries. For example, the chemical industry cluster located along the Rhine River, where the main chemical plants of Germany are located: Bayer in Leverkusen, BASF in Frankfurt am Main, Hoechst in Ludwigshafen – and the production facilities and headquarters of three leading Swiss chemical companies in Basel: Sandoz, Siba, and Hoffman La Roche (Orlova, 2016).

Inside the clusters there exists a policy of sharing knowledge and innovations. About a quarter of all regional clusters belong to the type of so-called "generators of new technologies". This means that they are undergoing a radical innovation process and they are characterized as "world innovators". The majority of regional clusters in their development strategy are focused on "additional" innovation. In the survey of European clusters 30% of them are attributed to this very type. Approximately the same number of clusters are exclusively "users" of new technologies that are created outside the corresponding cluster. About 70% of them occur to traditional clusters and use "as is" technologies. Moreover, 18% of clusters localize external technologies, adapting them to the conditions of functioning of the corresponding cluster, partially changing their technological content[1] .

**1** Please refer to: United Kingdom, DTI (2004). The 2004 R&D Scoreboard: The Top 700 UK and 700 International Companies by R&D Investment (London: DTI) (www.innovation.gov.uk/projects/rdscoreboard/home.asp).

Consequently, the basis on which a regional cluster is formed is the possibility and / or necessity of sharing one or several unifying factors by several economic actors (Gromyko, 2017). These factors include: basic technology, know-how generation system, personnel training system, marketing promotion routes for products related to a single product line. The successful development of regional clusters is ensured by mass production oriented to the world market. Therefore, the development of clusters causes a request for the integration of its territory into an even wider economic space. Achievement of a noticeable internal dynamics by the cluster requires government support and the involvement of other interested participants to achieve a certain critical mass of its constituent entities. When the critical mass is reached, it becomes possible to form and maintain for a long time the developing links between flexible small-sized companies and large suppliers of resources. Critical mass is a kind of buffer and allows the cluster to resist to external impacts or pressures of different kinds, including the threat of loss of individual companies, even those which refer to the key ones. Conversely, the absence of such critical mass makes the cluster vulnerable to the loss of its specific resources and skills, and even its competitiveness.

Among the strategic priorities of the clustering of the Russian economy is the Northern latitude geo-economical belt. Let us consider how the northern geo-economic space was formed. Since the beginning of the 21st century, globalization processes have led to a new stage of development for Russia. Interregional relations are developing on the basis of progress in information and communication technologies and the application of network effects, thus resulting in the formation of new areas. At the same time, their borders do not coincide with administrative ones, they go beyond them, becoming part of the global space (Orlova, 2017). The definition of "geo-economic space" was fixed to these areas. The most active geo-economic space is formed in the northern regions of Europe, including its Russian part: Karelia, Arkhangelsk and Murmansk regions, the Republic of Komi. The beginning of international cooperation in the European Northern latitude geo-economical belt sector was laid by the development and adoption of a common environmental policy, which has been successfully implemented for many years, that is confirmed by the adoption of a regional program on sustainable development at the government level. Sustainable development extends to the entire global geo-economic space (Kochetov, 2006),[2] encompassing both social and economic spheres. Efficient functioning of the Northern latitude geo-economical belt is ensured by a system of meridian production and investment cycles that involve a large number of production entities united according

**2** The conceptual apparatus relating to the geo-economic space, please refer to: E. Kochetov (2006). Geoekonomicheskiy (global'nyy) tolkovyy slovar' (osnovy vysokikh geoekonomicheskikh tekhnologiy sovremennogo biznesa) [Geo-economic (global) explanatory dictionary (basics of high geo-economic technologies of modern business)]: A collection of strategic concepts – stories. Ekaterinburg: IPP Uralsky worker (in Russ.)

to a technological principle (countries of the CIS, Middle East, India, Iran, China, etc.). The northern latitude geo-economical industrial core provides for the production of goods and has a considerable weight in the world trade and production balance, which makes it a potential area of export growth. The Russian North has now become a region of vivid international cooperation in all areas of the socio-economic sphere. The northern social space is characterized by a high level of integration and merging of reproduction processes of different structures (states, regions, economic entities, global networks, etc.), which strengthens organic unity and integrity and introduces the national economy into the geo-economic space.

A multi-level structure is inherent to the Northern latitude geo-economical belt. Thus, its links include the Russian North-West, the Siberian Industrial Region (Tomsk, Novosibirsk) and the Ural Industrial Region (the Russian Industrial North). The effective functioning of these cluster systems is highly influenced by the state and development of the Russian transport infrastructure (Karachev, Sapir 2017). Hence, it seems reasonable to evaluate its quality and competitiveness of the communication lines in general.

Russian transport system is represented by all major means of transport and also includes two subsystems – industrial and urban public transport.

The competitiveness of domestic communication lines depends on a number of various factors. These are the quality of infrastructure and the preservation of cargo, the tariff policy of carriers and the geographical location of the country, etc.

The "Transport Strategy of the Russian Federation for the period till 2030" elaborates three options for the development of the transport system of Russia, depending on the goals pursued by the state.

The inertial scenario provides for accelerated modernization of communication routes, responsible for the export of raw materials and minerals, the preservation of disproportions in the development of the transport system of the European and Asian part of the country, as well as low population mobility.

The energy and raw material option determines the development of the transport network in new and promising areas of mining, as well as the formation of corridors, including the Arctic zones that provide for the export of commodities.

An innovative forecast assumes the formation of a balanced system aimed at transporting high-tech products, an increase in domestic traffic, due to the expansion of production volumes.

To improve the competitiveness of the transport system, it is sensible to solve a number of issues related to the organization of intermodal and multimodal transportation (Zubenko V.V., Ignatova O.V., Orlova N.L., Zubenko V.A. 2018). Thus, a so called "bottleneck" for a long time is the interaction of rail and road transport with seaports, airports and border crossings. The majority of the existing road and rail access roads to the ports of Novorossiysk, Makhachkala and St. Petersburg are not able to provide uninterrupted work on the transport of foreign trade goods. Most airports do not have a passenger train service. On the internal waterways, the water

level decreases and, consequently, the depth of the channel is reduced due to channel erosion, along with the fact that hydraulic structures were commissioned more than 50 years ago. Reducing the imbalances between the carrying capacity and the needs of the economy will not only allow the domestic market of transport services to develop more dynamically, moreover it will lead to an increase in its share in the international arena. The contribution of each mode of transport to the carriage of goods is shown in Figure 15.1 [3].

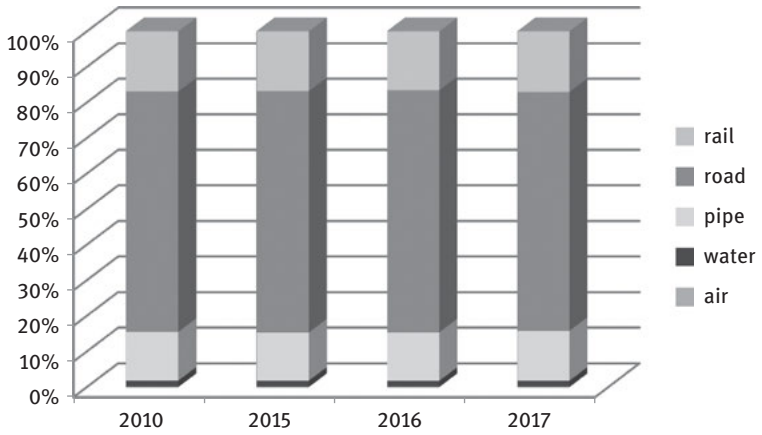


**Figure 15.1:** Distribution of commercial freight and cargo transportation by types of transport (mln. tons).

Investment projects implemented in transport at the expense of the federal budget reflect the priorities of state policy and include:

- development of intermodal and multimodal transportation
- implementation of projects for the construction of autobahns on the terms of a public-private partnership
- formation of a unified transport system in the framework of the Eurasian Economic Union (EAEU)

The implementation of an integrated approach in relation to the transport industry leads to a well-coordinated work of the entire supply chain of goods and transportation of passengers. However, consider the situation on individual modes of transport.

Railways remains to be prominent in the transport system. They represent an important link in the transport system of the CIS countries, including Russia. A special

**3** Source: compliled by author according to to the Federal State Statistics Service (official website: www.gks.ru).

role of the Russian Federation railways is determined by long transport distances, lack of inland waterways in a number of regions, cessation of navigation on rivers in winter period, remote location of the main points of raw materials extraction from the places of its processing (Ignatova, 2014).

In recent years, the structure of cargo transportation has changed in rail transport. Due to the slower pace of construction and lower prices for hydrocarbons, transportation of cement and ferrous metals, oil and petroleum products decreased. At the same time, exports saw the increase and, consequently, the volume of transportation of chemical and mineral fertilizers, non-ferrous ore and sulfur raw materials. These trends tend to be the leading ones in the assessment of turnover in the short and medium term.

Nowadays, rail transport is experiencing quite intense competition from road and air transport (Ignatova 2018). The way out of this situation is the development of high-speed communication, the advantage of which is not only saving time for the delivery of goods and passengers, but also the possibility of reducing the rolling stock, improving the quality of services provided and developing scientific and technical potential. In accordance with the Transport Strategy of the Russian Federation, the following high-speed traffic directions have been developed and should be implemented until 2030: Moscow-Krasnoe (border with Belarus), Moscow-Saratov, Ussuriysk-Khabarovsk, Moscow-Adler and others. That is exactly what the investment was aimed at. Thus, the main projects of the industry for the period up to 2019 will be the modification of the Baikal-Amur and Trans-Siberian highways, the development of the international transport corridors (ITC) of Primorye-1 and Primorye-2, the opening of new logistics centers in the area of ITC Europe-Western China North South. According to experts' forecasts, such an update of the infrastructure will make it possible in five years to double the freight turnover not only by rail, but also by water and road transport.

Over the past two years, air transport marks a decrease in both cargo and passenger traffic (Figure 15.1). Moreover, experts believe that this trend will continue in the medium term. In order to overcome it, the state implements a number of programs, including restraining the growth of tariffs for passenger air travel, reducing the VAT rate from 18% to 10%, increasing the number of flights connecting the Far East with the European part of the country.

One of the main reasons for the decline in freight traffic is the existing imbalance between the level of infrastructure development and the capabilities of operators (Eskindarov 2019). Thus, more than 80% of all work is performed by Moscow and St. Petersburg air hubs.

The attention of the state in the field of air transport in the short term will focus on the technical renovation of airports in the Far Eastern and Arctic regions. To support domestic self-piloting, PJSC "State Transport Leasing Company" signed an agreement with private limited company "Sukhoi Superjet" for the purchase of 60 air vessels with their subsequent transfer to operational leasing.

Automobile transport, which allows for "door-to-door delivery", takes 45% in the commercial volume of cargo transportation and 9% in freight turnover. The tree-like system of roads, formed back in Soviet times, does not meet the needs of carriers and hinders the increase in transit traffic flows (Figure 15.2). Currently, more than half of the roads of federal significance are working in the overload mode, which increases the transportation time and the transportation component in the price of goods up to 20%, while in developed countries this figure does not exceed 8%.

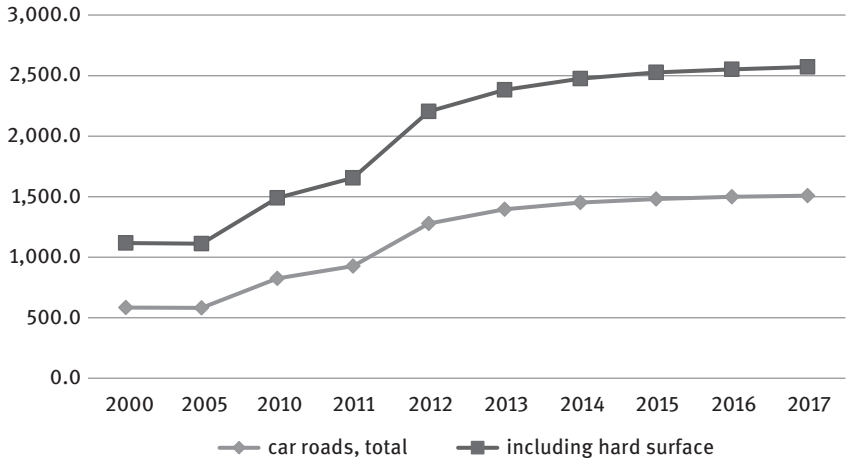


**Figure 15.2:** The length of roads (thousand km).
Source: compiled by author according to the Federal State Statistics Service (official website: www.gks.ru).

In the container shipping market the competition between auto transport and rail transport still continues to increase. Internal competition is a typical feature of the market for the transport of perishable and food goods.

The volume of commercial shipments and cargo turnover in 2019 increased by 4.2% and 8.5%, respectively, compared to the previous period. The growth factor at the meso level was the expansion of retail trade, and at the macro level – the development of intermodal transport.

The formation of the backbone network of motor roads is currently ongoing. In particular, the results of the last three years were the commissioning of the Roki tunnel in the North Caucasus Federal District, the Lena and Kolyma, Vilyui and Ussuri federal roads in the Far Eastern Federal District, the completion of the construction of the access road in the port "Ust-Luga" in the Leningrad region, etc.

In the medium term, the construction of the Central Ring Road of the Moscow Region is planned, as well as the reconstruction of the "Don" and "Ukraine" roads.

Water transport includes sea and inland water transport. Sea transport is the oldest way of transporting foreign trade goods. Nowadays, it also accounts for a considerable part of the quotations implemented in international traffic (Figure 15.3). The cargo turnover of sea transport is significantly influenced by the situation on the global freight market, the development of the Northern Sea Route.

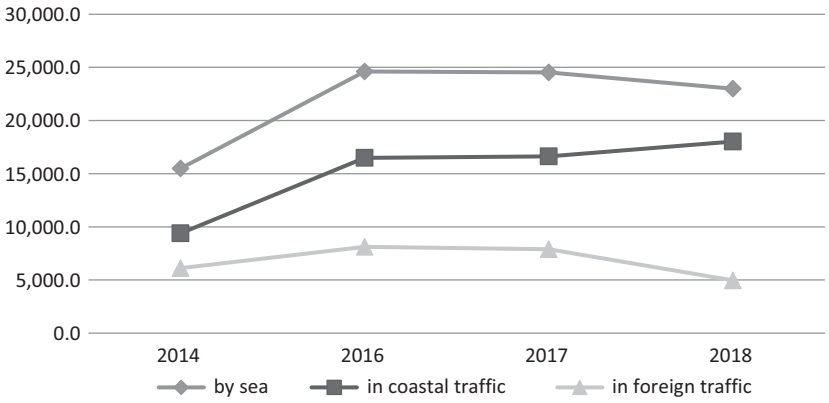


**Figure 15.3:** Departure of cargo by sea transport (thousand tons).
Source: compiled by author according to the Federal State Statistics Service (official website: www.gks.ru).

The development of oil and gas fields located in the Arctic zone, the increase in coal production and the expansion of foreign trade have a positive impact on shipping. Orientation of sea transport on the external market makes its development dependent on the cyclical nature of the world economy. In addition to external factors, marine transport is also affected by internal factors, such as the structure of the fleet recorded in the Russian maritime registry and the intermodality of the organization of transportation.

In order to increase the competitiveness of maritime transport, the government takes a number of measures: Arctic routes for transporting hydrocarbons to Southeast Asia are being developed, a new generation of tankers is being replaced by new generation vessels, new ports are being built, such as Sabetta and Bronka, and modernized, especially the ones receiving and sending shipments in containers. Equipment of the Northern Sea Route (NSR) is given special attention by the state, therefore, investments from the federal budget go precisely here. In addition, the state is financing the construction of a new port in the Far East to ensure transport accessibility for small and medium-sized coal-mining enterprises. It is planned to attract private investments for the development of export-oriented grain and coal terminals and import facilities for the handling of rolling cargo and containers.

Inland water transport (IWT) states a continuing decline in traffic. This is due both to a decrease in demand for IWT services, and to climate change, which led to a decrease in the water content of the Unified Deepwater System and the Lena River.

It is expected that both cargo turnover and the volume of freight transportation in IWT will continue to decline and by the end of 2019 they will not exceed 95% and 83% of the 2015 level respectively.[4]

To increase the competitiveness of GDP, it is planned to eliminate the "narrow" places of the Unified Deepwater System, as well as to build modernized river-sea vessels to deliver cargo to the regions of the Far North.

Thus, the strengths of the Russian transport system are an advantageous geographical position, allowing to transport cargo without transshipment for a significant part of the way, the presence of all main types of transport, an extensive railway network, a well-established legal framework for the transport of goods and passengers in international traffic and already formed international transport corridors. These points significantly contribute to the redesign of the Russian economy and form its transport and communication resource.

## Conclusion

Thus, in Russia a new direction was determined to improve the investment climate and improve the efficiency of foreign economic relations, namely, the creation of infrastructure clusters, taking into account the preliminary provision of all necessary conditions for production, in particular, stimulation of local producers and suppliers of raw materials and other resources that can be used for the production, as well as the smooth operation of the logistics component, including the possibility of a regular export of production. To improve the competitiveness of domestic communications, it is necessary to overcome technical and technological lag, update rolling stock and transport infrastructure, improve the coordination of certain types of transport with each other as well as to accelerate cargo delivery and attract additional transit flows, ensure the accelerated development of environmentally friendly subsystems – rail and water transport. It is advisable, while carrying out economic cooperation at the local, regional and global levels, to pay special attention to resource clusters, while highlighting the following basic requirements for them: the need for a certain resource in the market, a high level of competitiveness of the involved entities, the adaptation of local transport engineering infrastructure, consideration of environmental, political, civilization features.

**4** "Forecast of the socio-economic development of Russia for 2017 and for the planning period of 2018 and 2019". p. 180, available at: http:// economy.gov.ru/minecactivitysections/macro/2016261203 (Accessed 01.10.2018)

Currently, there is a process of formation and development of the newest cluster-network systems and innovation development centers in this area. Among them are Skolkovo, innovation centers of Vladivostok, Krasnoyarsk, Novosibirsk, Khabarovsk, Tomsk cluster network systems. The prior attention is given to the establishment of cooperation between these structures with European and Asian organizations. This process, consisting in the revision of accents and priorities, and associated with the structure of demand, is characterized by the strongest opportunistic shifts that occurred in 2012–2014. This trend is mostly observed in the gas and oil fields.

Today, the world relies on a cluster-network model of socio-economic development. The decisive factor is the economic permeability of political and administrative borders in the implementation of regional, national and global integration geo-economic projects. Analyzing the resource components of these projects, a special role is given to the geo-economic methodological approach as a volume-spatial method and the initial basis of the methodology for analyzing resource relations.

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# 16 Human Potential in the Context of Clusterization of Russian Economy

## Introduction

The main condition for stable growth in the current circumstances is the competitiveness of the Russian economy, based on the innovative activity of organizations. At the same time, an important role is played by clustering, as the driving force of the entire world economy.

The cluster approach involves the consolidation of competing companies, legislative bodies, scientific and educational institutions with the aim of combining efforts to ensure economic growth, while interaction within the cluster makes it possible to achieve a synergistic effect and a number of competitive advantages, including cost reduction, the implementation of human potential and social projects, combining efforts to eliminate difficulties encountered, etc.

There is considerable interest in introducing clustering in the economy, especially in recent years. There is an opinion that, in fact, the cluster approach can become a tool for the development of the Russian economy, help reduce dependence on the export of raw materials, bring it to a new, advanced level, and increase labor productivity.

Human capital as the accumulation of knowledge, the importance of education and increasing the level of professionalism, on the one hand, and the emergence of new trends in the structure of needs and pay increases, on the other, come to the fore in the system of innovative economic development. As a prerequisite for the development of a modern innovative economy, training of highly qualified specialists for the national economy, a system for obtaining and managing scientific knowledge, and the training of creative personnel for the organization and management of innovative activity can be mentioned.

## Methodology

Let us consider in more detail the history of the cluster approach, the main characteristics of the cluster, the difference in its definitions and the current state of clustering in Russia and in the world.

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The theoretical basis of the cluster approach was born in the XIX century, when it was determined that the performance of companies depends on their geographical location and proximity to other firms with which the company interacts. The founder of the clustering concept is considered to be a professor at Harvard School, Michael Porter, who viewed the cluster as a union of geographically adjacent interconnected firms and related organizations operating in a particular area and distinguished by their common activities and complementary to each other. (Porter, 2001, p. 207).

Then the theory of clusters was improved by M. Enright, who noted that the competitive advantages of countries are created at the regional, rather than at the national level, which suggests the existence of regional clusters, which means " . . . the geographical agglomeration of firms operating in one or more sectors of the economy" (Enright, 1992, p. 15).

It should be noted the classics of cluster theory, which paid particular attention to the geographical aspects of the activities of firms, among which IG Von Tyunen, V. Launhardt, A. Weber, A. Lesch, and V. Kristalller are distinguished; Of particular interest are the works of domestic representatives of economic geography, who considered spatial patterns, taking into account the specifics of the activities of enterprises – I. G. Aleksandrova, N. N. Baransky, N. N. Kolosovsky, N. N. Nekrasova, A. E. Probst, Yu. G. Saushkina and others (Melnikov, 2018, p. 63).

In the 20th century, interest in economic systems developing on the basis of economic and territorial proximity increased. As a result, thanks to the Italian economists S. Czamanski and L. Ablas, the term "industrial cluster" appears in science, i.e. " . . . a lot of industries associated with large flows of goods and services more than with other areas of the national economy" (Czamanski, Ablas, 1979).

It is necessary to clarify that the emergence and emergence of clusters in European countries began in the 1970s, and clustering came to Russia later for 20–30 years. In some developed countries, cluster strategies, which are based on the construction of business centers, have gained popularity over the past ten years. At the same time, governments not only focus their efforts on promoting existing clusters, but also pay attention to the organization of new networks of companies that are not previously interconnected, while becoming their members.

Cluster strategies are widely used in European states: in Germany, since 1995, the project on the formation of biotechnological clusters Bio Regio has been implemented; in the UK, the authorities have established areas around Oxford, Edinburgh and in South-East England as key areas for biotech companies; in Norway, the authorities provide support for inter-firm cooperation in the "marine economy" cluster; Finland has a well-established forest industry cluster, and, according to a professional assessment, this country ranks first in terms of cooperation.

So, despite the differences in approaches, most European countries have developed for themselves one or another optimal cluster strategy. The countries with the most explicit cluster strategy include the Netherlands, Denmark, Belgium, Canada, South Africa (Kudryashov, 2017, p. 17).

Today, global and domestic practice has gained considerable experience in creating and improving various cluster formations, and the need for cooperation, in the presence of structural and technological changes in the global economy, increased international competition and globalization processes, does not lose its relevance.

However, if the classics of the cluster approach focused on the real sector of the economy (for example, M. Porter specifically studied industrial clusters), then today it makes sense to talk about expanding the scope of application of the concept of cluster development.

## Results

In the literature, there are various definitions of the notion of "cluster", the subject of which differ in the scale, direction, characteristics, but the condition for the effectiveness of its creation is the same: several economic entities are more competitive together than separately (Table 16.1).

**Table 16.1:** Different definitions of the concept of "cluster".

| Author | Concept |
|---|---|
| L. Young | Cluster – an association of small and medium-sized private firms located near and near major universities |
| W. Price | Cluster – a method to use the advantages of the industry, enterprises and successful regional management, providing for a close relationship between the state and entrepreneurship |
| D. Jacobs | Cluster – geographical or spatial grouping for the purpose of organizing economic activity, implies horizontal and vertical communications, the use of common technologies, the presence of a "core", constant cooperation |
| S. Rosenfeld | A cluster is a geographically limited set of similar related or complementary companies with active distribution channels, infrastructure, human resources, which benefits both from common opportunities and joint threats. |
| K. Keteps | A cluster is a union that includes companies from interdependent industrial sectors, state authorities, educational institutions, financial and public organizations |
| M. Afanasyev, L. Myasnikova | Cluster – interconnection of production, service companies, uniting market institutions and consumers |
| M. Voynarenko | Cluster – an association with interconnections between its participants, internal cooperation and competition, focusing on market demand |

**Table 16.1** (continued)

| Author | Concept |
|---|---|
| A. Voronov<br>A. Buryak | Cluster – an established, relatively stable system of specialized enterprises that sell competitive products with regard to territorial specificity |
| A. Mitranyan | Cluster – the concentration of the most efficient economic activities carried out by competing firms, guaranteeing competitive advantages in industry, national and global markets |
| E. Monastyrnyi | An innovation cluster is a center for the generation of scientific knowledge, training and adaptation centers of highly qualified specialists that produce products with long-term competitive advantages; operating in promising markets or developing sales network |
| A. Presdnichnyh | A cluster is an organism or a "regional ecosystem" that guarantees the competitiveness of cluster members. |

Source: compiled by the author on the basis of Melnikov (2018, p. 93–94), Ershova (2014, p. 2612), Pogodina and Kataev (2014, p. 55–56).

The definition of "cluster" is also mentioned in the regulatory documents of the Russian Federation. Thus, in the Methodological Recommendations for the implementation of cluster policy prepared by the Ministry of Economic Development of Russia, the cluster is defined as "a set of companies, suppliers of equipment, components, specialized production and service services, research and educational enterprises related by local proximity and functional conditionality in production and sale of goods and services" (Guidelines for the implementation of cluster policy in the constituent entities of the Russian Federation, 2008).

Clustering continues to evolve, but there is still some ambiguity in the conceptual apparatus.

In contrast to the previously used sectoral principle of structuring the economy and managing its competitiveness, the cluster system of production management contributes to the effective management of industry, the economy, the social sphere, activating scientific discoveries, inventions, and producing competitive products.

Nevertheless, the scientific literature confirmed that clusters are formed according to sectoral and territorial factors. According to the classification by industry, distinguish industrial, construction, tourism and other clusters. Today, such a classification of clusters is inaccurate, since the industrial cluster includes not only industrial companies, but also innovative enterprises, educational institutions, consulting, marketing and other enterprises. So, it makes sense to define clusters as entrepreneurial by industry: an entrepreneurial cluster in the industrial sector, an entrepreneurial cluster in the construction industry, etc.

In addition, in scientific publications in the classification of clusters allocate an innovative cluster. However, in our opinion, in modern conditions any progressive cluster should be innovative.

Also, today there are regional, vertical and industrial cluster formations (Table 16.2).

**Table 16.2:** Cluster Classification.

| Cluster Type | Characteristic |
|---|---|
| 1. Regional (territorial) | Association takes place within one or similar industries, often confined to one or another well-established conventional model. |
| 2. Vertical production chains | Highly specialized sectors whose adjacent phases of the production process constitute the core of the cluster |
| 3. Large industrial unions | Educated under some leading industry |

Source: compiled by the author based on: Gromyko, www.innosys.spb.ru/?id=791.

As noted earlier, clustering has a synergistic, multiplicative effect on economic development. For each cluster member, this effect will manifest itself in different ways, namely:

- for companies: increase in labor productivity, increment of profits, expansion of markets for the implementation of the final product, recruitment of investors, introduction of advanced technologies etc.
- for the government: increasing the budget, reducing unemployment benefits, expanding infrastructure
- for the economy of a country (region): increase in gross domestic (regional) product, the size of investments, exports of high technology products, employment and welfare of the population, etc. (Savzikhanova, 2014, p. 100–101)

Communication of participants in the cluster is carried out through vertical (acts of sale), as well as horizontal communication (additional products or services, the use of close, narrowly focused processes or technologies). Directly from the collective work and interconnections within the cluster, the ability of each member to effectively use internal and mobilize external resources depends on the competitiveness of the cluster as a whole (Murtazina, Vesloguzova, 2015, p. 42). Key features of the cluster characteristic of the Russian economy are shown below in Figure 16.1 (Kondratieva, Rogova, 2015, p. 22).

The main document establishing the boundaries of cluster policy in Russia is the Concept of Long-Term Socio-Economic Development of the Russian Federation until 2020, which provides for the formation of cluster entities that realize the competitive potential of the regions, as well as the creation of a number of innovative high-tech clusters in the European and Asian parts of the Russian Federation.

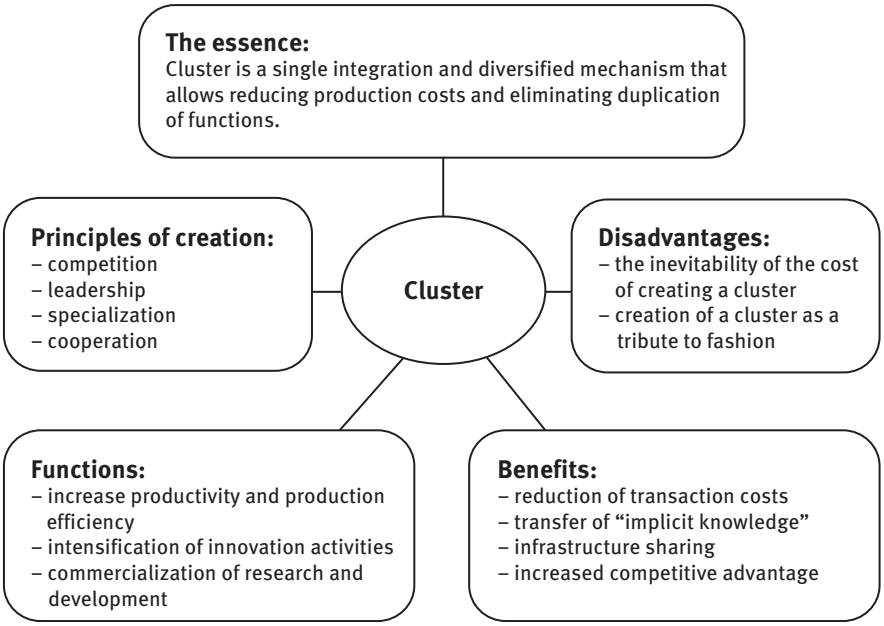


**Figure 16.1:** The main characteristics of the cluster of the Russian economy.

Speaking about modern clustering realities, nowadays textile (Ivanovo), automobile (Samara), aviation (Ulyanovsk), biopharmaceutical (Novosibirsk), and agricultural (Krasnodar) clusters are successfully developing in our country.

The Ministry of Economic Development of the Russian Federation promotes the development of innovative territorial clusters (ITCs), which are concentrated mainly in the European part of the country (18 clusters). Only 7 out of 25 clusters are located in the Asian part of Russia, while most of the clusters are in regions with a fairly high level of innovation activity, such as the Volga Region (9 ITK), Central (6 ITK) and Siberian (5 ITK) federal districts.

The country develops medicine and pharmaceuticals, information and communication technologies, nuclear and radiation technologies, the creation of aircraft and spacecraft, new materials, mechanical engineering, instrument engineering and the automotive industry, as well as the chemical industry through clusters. (Semenkov, Isakhaev, 2014, p.18).

Understanding the significance of the cluster concept throughout the world and in our country, in particular, is mainly connected with the solution of the problems of modernization and technological development of the national economy (Pogodina, T.V., Terskaya, G.A., Chuvakhina, L.G., 2017).

However, the development of domestic cluster projects is hampered by various kinds of barriers: the lack of methodological and informational and consulting,

financial support for clusters; the inconsistency of the activities of federal and regional executive bodies, local governments and subjects of cluster associations (Litvinenko, 2016, p. 88–89). Despite this, clustering is the most promising form of interaction between education, science and industry, playing the role of reference points of growth in the domestic market.

Thus, clusters, first of all, are aimed at the opportunity for entrepreneurship and for the regions to develop not by inertia, but innovatively. At the same time, for the commercial sector, clustering is a chance to secure a competitive advantage in the future, forming a long-term development strategy for 5–10 years or more. (Chorosova, Solomonova, 2017, p. 16).

In our opinion, the main directions for the development of the cluster approach in Russia should be the growth of the level and quality of life of the population and the improvement of human potential (Buevich, A.P., 2017, p. 279–291; Varvus, S.A. (2016, p. 26–34), which also becomes the source of the country's economic growth and contributes to the growth of investment not only in the production process, but also in human capital, will go further.

Using the cluster approach allows bringing together the interests and strengthen the interaction of industry, R & D sector and education. So, in the European Union there are more than 2 thousand clusters, which employ 38% of its workforce. (Murtazina, Vesloguzova, 2015, p. 41).

Improving the quality of education, the development of science and high-tech industries is considered as a resource for qualitative renewal of all components of economic growth (scientific and technical progress, labor resources, management and organization of production).

The creation and implementation of new methodological approaches to solving the problem of improving the human capital management system based on innovative development will provide an opportunity to create the basis for high-quality and stable growth of the economy (Osipov, Grivanov, Shokurova 2018, p. 24, Chuvakhina, L.G., Terskaya, G.A., Buevich, S.Y., 2018, p. 22; Krasyuk, I.A., Kobeleva, A.A., Mikhailushkin, P.V., Terskaya, G.A., Chuvakhina, L.G., 2018, p. 19).

The main aspect of the socio-economic development of society are the achievements in the field of increasing human potential, as well as meeting the needs of the population. The human development index (HDI) is a quantitative criterion of human potential, which is an integral indicator that takes into account key aspects of human development: health, knowledge and income.

Currently, the calculation of the index is based on three parameters, as reflected in Figure 16.2.

The basic principle of calculating each of the component parts is a comparison of the current situation with the maximum (desired) and minimum values.

The value of the HDI is a criterion for dividing states into groups with different levels of human development (Figure 16.3).

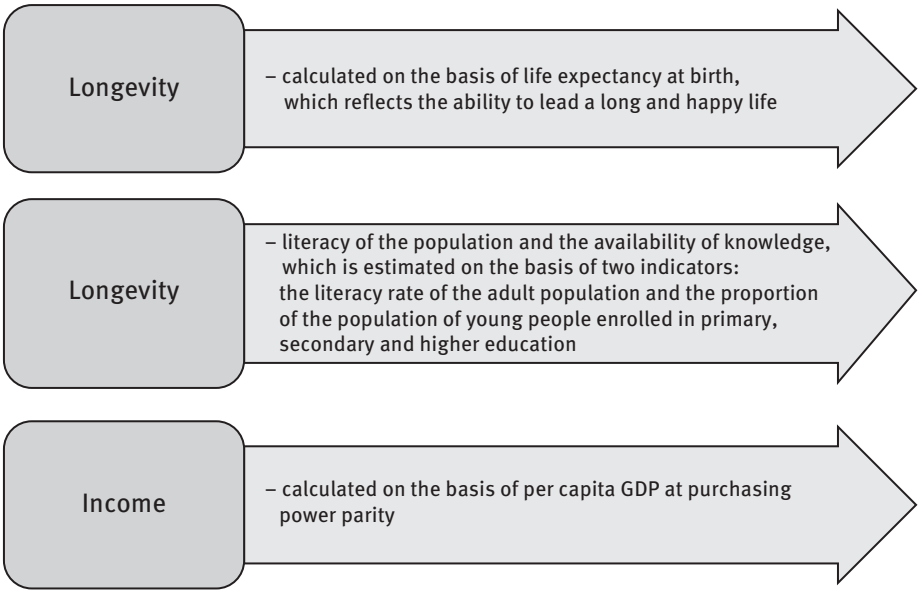


**Figure 16.2:** The parameters for calculating the human development index.
Source: Human Development Report (2017).

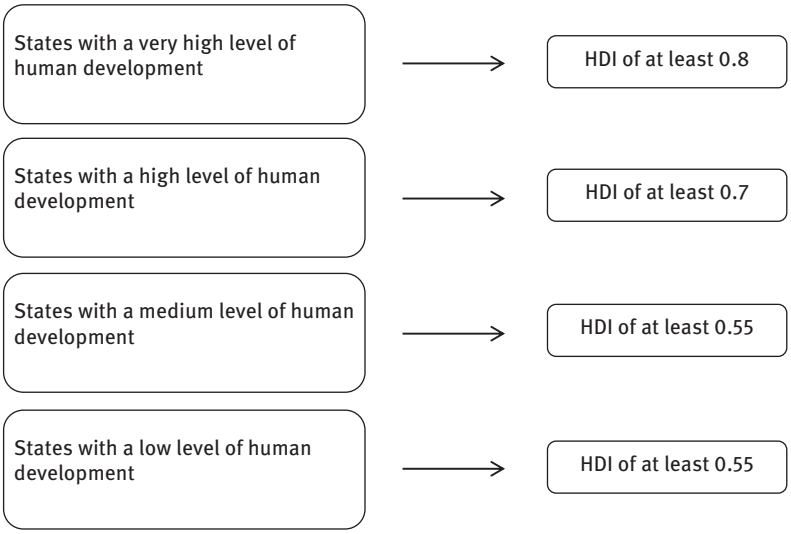


**Figure 16.3:** The division of states into groups according to the value of the human development index.
Source: Human Development Report (2017).

The rating takes into account 189 countries of the world, of which Norway, Switzerland, Australia, Ireland and Germany headed this ranking in 2018, while Niger, Central African Republic, South Sudan, Chad and Burundi have the lowest HDI ratings. (Litvinenko, 2016; Buevich, 2017; Chuvakhina et al., 2018; Krasyuk et al., 2018; Pogodina et al.,2017; Varvus, 2016).

The world average index value is 0.717, which is significantly lower than in our country. Russia ranked 49th (0.816), ahead of Montenegro and Bulgaria, but did not reach Oman and Argentina (Human Development Index, 2006–2019).

The dynamics of the level of human development in the Russian Federation to this day is reflected in Figure 16.4. Based on the data of the chart, it is clear that in general the index had a positive trend until 2016, then the value fell by 7.4%. It is necessary to point out that according to the whole range of criteria, the Russian Federation is in the group of countries with a high HDI level, however, when analyzing the particular indicators of this index, there is still a significant imbalance between the key links of human development. A high value of the index is achieved due to the high level of literacy in the country, which inherited the population of modern Russia from the USSR.

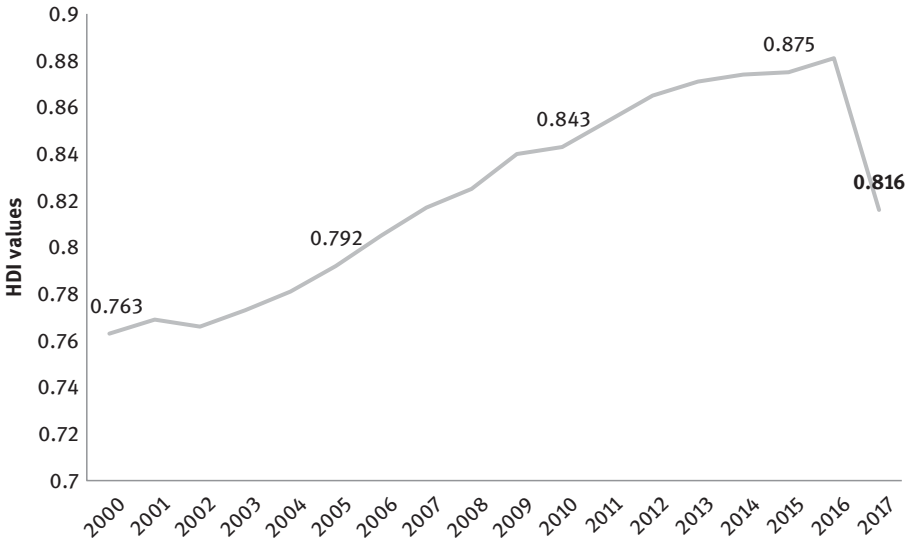


**Figure 16.4:** Dynamics of the level of human development in the Russian Federation for the period 2000–2017.
Source: Human Development Report (2017).

Regarding most other countries, Russia has a number of individual features, including: low population density and a large area, which complicate not only the delivery of goods and services to the consumer, but also significantly increases their cost, as well as territorial disunity.

However, the human development index includes not only the life expectancy index, the education index and the income index, the following indicators are also used for the most complete presentation and creation of conditions for human development (Litvinenko, 2016):

- security
- human rights
- promoting equality and social justice
- participation in the political life of society
- the environmental situation and others (Table 16.3)

**Table 16.3:** Human Development.

| Human capacity building directly | Creating conditions for human development |
|---|---|
| – Longevity and health | – Participation in political and community life |
| – Knowledge | – Environmental sustainability |
| – A decent standard of living | – Security and human rights |
| | – Promoting equity and social justice |

Source: Human Development Report (2015)

## Conclusion

Summarizing the results of this study, we note that the improvement of human potential is a crucial aspect of public policy, however, attention should be paid not only to the qualitative characteristics of human resources, but also to their formation and development.

Creating favorable conditions for the development of human potential in the future implies the need for the integration of science and production within the framework of innovative associations formed as a result of clustering, which provides an integrative approach both to innovation processes and to the development of human capital.

The development of human capital occurs throughout a person's life through continuous investment at the individual, enterprise, and state levels. From a human development perspective, genuine progress can be achieved by ensuring quality in education, health and other areas of human activity.

Investments in human capital are the most profitable compared to other forms of capital. Studies confirm a significant in volume and a long-term socio-economic effect. Innovative development of both Russia and other modern states is determined primarily by the development of human potential as a major resource.

Human potential is considered to be a significant condition for economic growth on the grounds that the level and quality of development of general labor resources sets

the prospects for the functioning of the national economy, the formation of its power and competitiveness. In accordance with this, the problem of creating, maintaining and developing human potential should be a priority state strategic task, the basis for the implementation of which can be a cluster approach.

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# 17 The Formation and Development of Human Capital of the Enterprise in the Conditions of the Formation of a Post-Industrial Society

## Introduction

The twenty-first century is characterized by the emergence and rapid development of a post-industrial society in which man, nature, and the technosphere represent a single whole (Toffler, 1980). The transition to a post-industrial society has an impact on many socio-economic systems, regardless of their scale.

The process of social transformation also affects such open complex systems as enterprises (Zakovorotny, Flek and Ugnich, 2016). The impact of the transition to a post-industrial society on these systems is manifested in the fact that, firstly, among the diversity of systemic connections that unite individual structures (subsystems) of an enterprise, informational links are increasingly becoming apparent. Secondly, the complexity and dimension of such a system (the number of elements characterizing it) increases. Elements that give an idea of the dimension of the enterprise can be, for example, workshops, auxiliary production units, distribution systems, etc. In the conditions of the formation of post-industrial society, the structure of the enterprise and the properties of the processes occurring in it are complicated. Third, the relative autonomy of a person in making management decisions, as well as his dependence on the world around him, is changing. The impact on a person and his activity occurs under the influence of the unity of social institutions, the technosphere, the nature and accessibility of information, which can contribute to its both development and degradation.

The head of the World Economic Forum, the developer of the concept of the fourth industrial revolution K. Schwab notes, that active imagination, human meaningful participation and the capabilities of smart machines must be coupled (Schwab, 2017). Of course, when analyzing the effectiveness of a modern enterprise, it is necessary to take into account the impact of the available human resources – knowledge, competencies, experience of the company's employees and their ability to continuously improve and develop, that is, the "quality" of the company's human capital. In turn, the development of the human capital of an enterprise is characterized by a set of system indicators. With the exception of directly professional characteristics, its

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level is determined, firstly, by the level of training of young personnel and their adaptation to the working conditions at the enterprise and secondly, by the organization and constant improvement of the knowledge and skills of employees at each workplace.

This study is devoted to finding mechanisms that contribute to improving the efficiency of the formation and development of the human capital of an enterprise in the conditions of the formation of a post-industrial society.

## Methodology

The basis of this study is a systematic approach (Kornai, 2002; Popkova and Tinyakova, 2013) to the formation of human capital in its close interaction with the needs of the enterprise. The synergetic concept (Zakovorotny, Gubanova and Lukyanov, 2016), which forms the basis for understanding the organization of an enterprise, allows us to describe the provision of conditions for directed interest in the results of an enterprise of all structures. This concept is based on the fact that it is necessary to form gradients (vectors) ("gradient" – from Lat. "Walking, growing"), which determine the direction of development and coherence of impacts from all subsystems of the enterprise. The formation of gradients in an enterprise means the creation of conditions for its functioning to achieve the desired result at the expense of the internal organization of labor. One of the subsystems defining gradients is the formation and development of human capital, mainly knowledge and skills of the company's employees.

In this study, attention is paid to a special resource of the enterprise – human capital. The theory of human capital (Becker, 1964; Shultz, 1968), as an independent direction of economic analysis, considers the process of qualitative improvement of human resources – knowledge, skills and abilities, which each individual has and uses for production or for consumer purposes. Since the basis of the formation of human capital is the acquisition of knowledge, but for the purposes of this study, the knowledgeable approach was used (Nonaka and Takeuchi, 1996). It allowed structuring the components of the content of the human capital of the enterprise, within the various forms of knowledge.

In order to substantiate the conclusions of this study, a method of situational analysis was used (Yin, 2003), which allowed to study the experience of a specific basic department – a single educational site of an enterprise and a university. The sociological survey of the heads of the structural units of the base enterprise, the teachers of the base department, its graduates (who became the employees of this enterprise) using the questionnaire method made it possible to conduct a qualitative analysis of the effectiveness of the formation of the human capital of the enterprise.

## Results

The effectiveness of the enterprise's employees depends on the complexity of the tasks assigned to them and the degree of responsibility for the performance of the work. This task, in turn, actualizes the problem of the content of training of the enterprise employees. It should be remembered that the process of training workers should be included in their production activities, and the content of their knowledge should be coordinated with new progressive technologies. The continuous need for the development of new knowledge and the ability to apply it in practice is particularly acute in the conditions of digital transformation (Geliskhanov and Yudina, 2018), based on the constant replenishment of modern technologies. Under these conditions, the notion of "knowledge worker", introduced by P. Drucker (Drucker, 1959), becomes relevant. "Knowledge workers" are employees who not only gain and share knowledge, but also generate new unique knowledge, make their intellectual contribution to improving the efficiency of the enterprise. The presence of "knowledgeable" workers in an enterprise depends, firstly, on clear guidelines, targets for certain knowledge and competencies that are expected at the "exit" of the learning process. Secondly, from the approaches and training methods, their coordination with the technological processes of the enterprise.

Two groups of factors influence the achievement of the targets of certain knowledge and competences. On the one hand, the knowledge and competencies expected at the "exit" of the learning process depend on the "input" initial knowledge that must be diagnosed before starting the training (Figure 17.1). On the other hand, these are certain requirements of this professional activity, which were formed under the influence of this stage of scientific and technical progress.

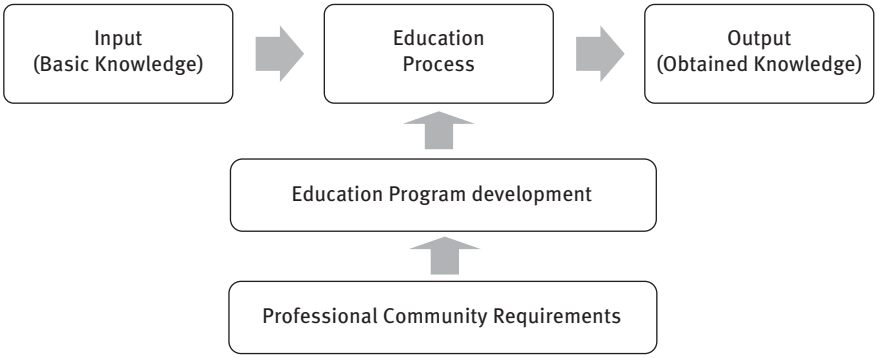


**Figure 17.1:** The integrated process of formation of knowledge of employees in the process of learning.

The learning process itself is built on the basis of educational programs that must be formed by the expert community, that is, by specialists working in this professional field. The clearly formulated goal of the educational program, corresponding to professional standards, makes it possible to determine the knowledge and skills that should be acquired as a result of training.

One of the problems of the relationship of training future workers in universities with the needs of enterprises is the inconsistency of requirements for employees of the enterprise. The educational process in the universities is based on the formation of certain competencies among future professionals, and the requirements of professional standards for employees of enterprises consist of the necessary skills and knowledge. A step towards eliminating this contradiction and harmonizing the requirements for a university graduate and an employee of an enterprise is to build a graph of learning in the process of learning. At the same time, the process of training and retraining of specialists should be focused on the interrelation of the level and content of knowledge and skills of the company's employees with the dynamic development of the enterprise itself and the individual areas of its activity that the employee one way or another encounters. Since in the conditions of a post-industrial society, the content of the necessary knowledge dynamically changes and develops. The construction of a training program is impossible without expert groups capable of formulating requirements for the knowledge of employees. This will be the initial information for building a graph of learning in the process of learning. In general, the graph characterizes the system of connections between different objects represented as a set of vertices (nodes). In the graph built for the training program, the various knowledge gained in the training process for this program will act as nodes. Let us characterize the algorithm for constructing such a graph for the retraining program for programmer-specialists of the systems of numerical programmed control of the process of manufacturing parts of complex geometric shape. Such specialist retraining programs are necessary for aviation industry enterprises. There is a twofold task for such specialists. First, it is necessary to carry out processing while minimizing the reduced costs of manufacturing a batch of parts, and secondly, to ensure the specified indicators of the quality of manufacturing parts.

Let us state the output knowledge in the form of a vector $X^{(k)} = \{X_1^{(k)}, X_2^{(k)}, \ldots X_{n(\pi)}^{(k)}\}^T$ (Figure 17.2). Where $X_1{}^{(k)}, X_2^{(k)}, \ldots X_{n(\pi)}^{(k)}$ represent the knowledge obtained in the process of the education program. These components of the vector are:

- knowledge of geometry interpolation methods $X_1{}^{(k)}$
- knowledge of methods for ensuring the specified indicators of quality manufacturing of parts based on the analysis of the space of technological regimes $X_2{}^{(k)}$
- knowledge of methods for analyzing and ensuring the accuracy of toolpaths $X_3{}^{(k)}$
- knowledge of the transformation of the trajectories of actuators to technological modes $X_4{}^{(k)}$
- knowledge of methods for analyzing the dynamics of the cutting process $X_5{}^{(k)}$

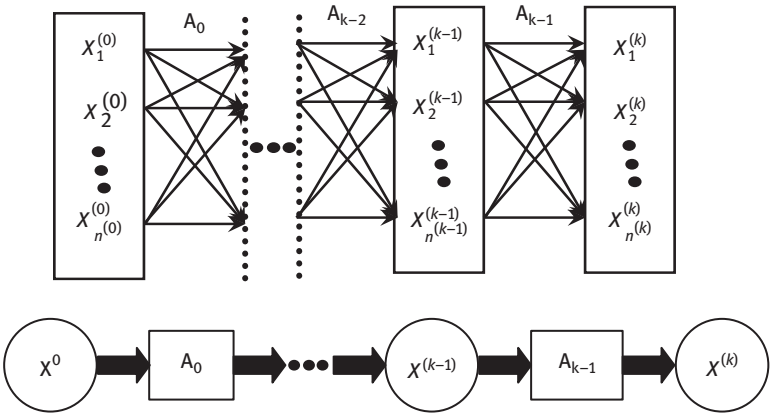


**Figure 17.2:** Graphic revealing the relationship of successive stages of learning.

- knowledge of methods for analyzing the transformation of the trajectories of the executive elements of the machine into the trajectories of the formative movements $X_6{}^{(k)}$
- knowledge of motion stability analysis methods $X_7{}^{(k)}$
- knowledge of methods for analyzing the conversion of trajectories of shaping movements into the quality indicators of parts $X_8{}^{(k)}$ etc.

At the output (as a result of training), in general we have $n^{(k)}$ substantive assessments of knowledge obtained on the basis of expert evaluation. The learning cycle consists of $k$ learning blocks, with each subsequent block of knowledge being formed on the basis of the knowledge gained in the previous block. The relationship between the blocks is characterized by weight coefficients, presented in the form of transition matrices (Figure 17.2). These are the matrix $A^{(0)}$, $A^{(1)}$, . . . $A^{(k-1)}$.

The system transition matrix contains weights that indicate the conditional probability that, with some effect, the system will move from one state to another (for example, a transformation $X^0 \to X^1$ ; $X^{(k-1)} \to X^k$). Particularly, to provide an $X^{(k)}$ output vector, prior knowledge developed at the previous stage of preparation is required. For example, to analyze the stability of trajectories of shape-generating movements, it is necessary to know the theory of stability to its full extent (the stability theory of linear systems with constant parameters, the stability theory of nonlinear systems, systems with periodically changing parameters, etc.).

In order to know the transformation of the trajectories of the executive elements of the machine into the trajectories of formative movements, it is necessary to know the theory of linear and nonlinear differential equations, metrology and the theory of random processes, etc. Thus, the output knowledge system is subject to knowledge at each previous stage.

Presentation of the training program in the form of a graph allows finding out all the essential connections, identifying unnecessary / "redundant" subjects (disciplines) and ensuring the process of adapting the training program to the student population and the changing needs of the practice. It is necessary to take into account that the subjects and sections of disciplines that are not further used in the achievement of terminal (final, output) competencies must be removed from the curriculum. Such a presentation allows the process of evolution of the enterprise to adapt the content of all interrelated disciplines to the changing conditions of the enterprise. In addition, the transition matrices Ai actually characterize the weight coefficients of the influence of knowledge obtained at the previous stage on the knowledge obtained at the next stage. Their ranking allows us to evaluate the priority of disciplines for learning. Finally, representation in the form of a graph lets us to designate the learning process as a kind of dynamic knowledge transformation system aimed at achieving terminal requirements formulated as a terminal (output) $X^{(k)} = \{X_1{}^{(k)}, X_2^{(k)}, ...X_{n(\pi)}^{(k)}\}^T$ knowledge and skills vector.

However, the content of the program and the items included in it is characterized only by the framework that must be filled. Therefore, firstly, it is necessary to ensure the process of training for teachers of the appropriate level. It is necessary to take into account the fact that even a high-level specialist, whose knowledge and skills are somewhat different from the requirements of production, in the learning process, in one way or another, deviates from these requirements in his area of competence. Secondly, it is necessary to create conditions for students' interest. This is a systemic problem of the relationship of each employee and the company, the understanding that the work of each employee is aimed at improving the efficiency of the enterprise, is at the same time a work aimed at their well-being. Thirdly, it is necessary to ensure control over the level of acquired knowledge and skills in the process of training and retraining (for example, in the process of post-higher engineering education). The organization of such a constant increase in the level of knowledge and skills is possible on the basis of creating interconnected relations between an enterprise and a higher education institution, which graduates specialists of this profile. Finally, such a view gives birth to the adaptive management of the training and retraining process (Figures 17.3 and 17.4). Assessment of knowledge and skills is carried out after each block of training, characterized by a $X^{(i)} = \{X_1{}^{(i)}, X_2^{(i)}, ...X_{n(\pi)}^{(i)}\}^T$ vector.

Such assessment is carried out according to the principle of expert assessments and is carried out by interested specialists, but not by instructors performing the training. Expert assessments are the basis for the correction of program content and the ratio of levels of knowledge and skills. Thus, the process of retraining and advanced training is based on the following scheme. At the first stage, the purpose of training and the content of the output knowledge and skills are formulated. Interested managers of the enterprise and its divisions perform this work. At the second stage, the experts, together with the specialists in design of

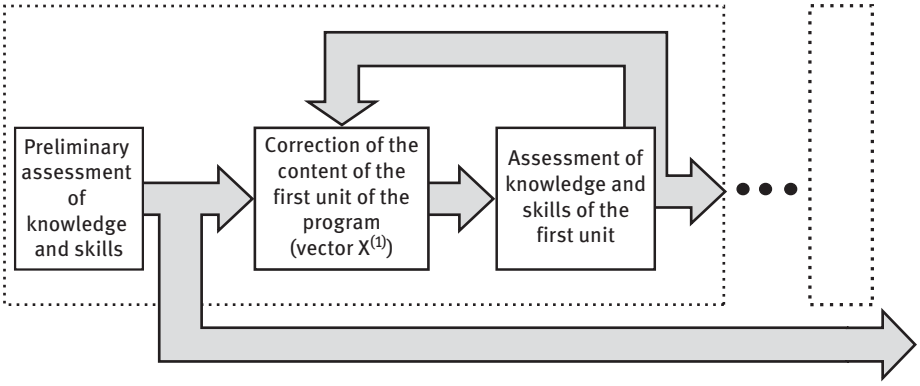


**Figure 17.3:** Unit of organization of training for $X^{(1)} = \{X_1^{(1)}, X_2^{(1)}, \ldots X_{n^{(\pi)}}^{(1)}\}^T$.

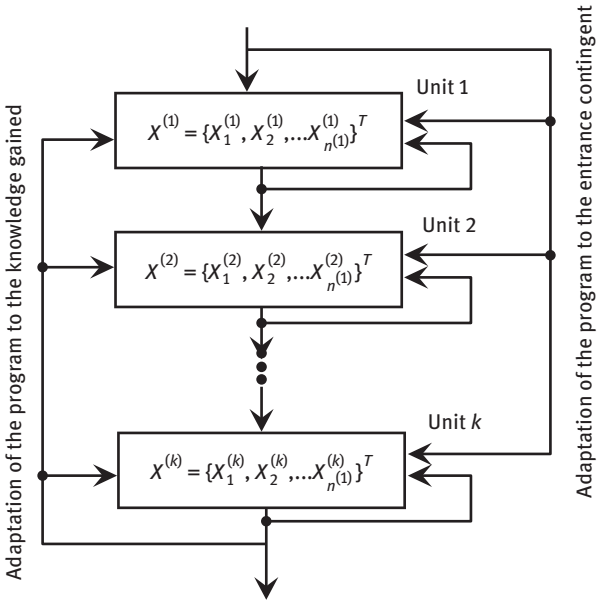


**Figure 17.4:** Adaptive Learning Management Scheme.

educational programs, determine the content of the courses and the links between the individual sections. At the third stage, the content and structure are adapted to the level of knowledge of the contingent of students. At the fourth stage, the correction of the content of lecture courses, practical classes and content of final works is carried out, depending on the obtained real knowledge and skills after training.

Adaptation of the content and deepening of knowledge within each course is organized in the learning process (Figure 17.4). This is the daily work of the teacher. The process of targeted training of specialists at various levels is carried out through the university/company integration.

To illustrate the target training of specialists for specific enterprises, let us turn to the experience of basic departments of universities. The creation of a system of basic departments at a university allows for the best way to combine the implementation of the educational process with the needs of specific enterprises. The main task of enterprises when interacting with a university is to prepare their own promising personnel adapted to work in specific production conditions (Flek and Ugnich, 2018). An example of a basic department that rather effectively forms human capital for a particular enterprise, in our opinion, is the Aviation Engineering Department, created in 2002 on the basis of DGTU and Rostvertol PJSC. The base enterprise has the ability to select the most capable students, future specialists, already from the first course and to invest in them all the necessary knowledge and skills. Development and implementation of educational programs in the direction of training implemented at the department, is held with the participation of leading specialists of the company who participate in the management of graduation qualification works of students and their work experience. Currently, the company employs more than 79% of the graduates of the department; many of them are already heads of various production departments of Rostvertol PJSC (Flek and Ugnich, 2018a). The result of the functioning of the basic department is an accelerated period of adaptation of new employees (graduates of the department) and their acquisition of the necessary skills to work in a particular enterprise.

The curriculum, drawn up in accordance with the requirements of the Federal State Educational Standard of Higher Education, is regularly reviewed by the staff of the department, experts who are employees of the enterprise, and, if necessary, adjusted in the variable part. When analyzing the curriculum, experts take into account not only the requirements for knowledge and skills that are contained in the professional standard for specialists in the field of aviation, but also the development prospects of both the enterprise and the industry. In accordance with the mechanism described earlier, the curriculum graph is compiled, presented in the form of the interrelation of disciplines and their component competencies. In the form of output components of the vector, the competencies that students should receive in the learning process are indicated. The employees of the base enterprise, acting as experts, evaluate the disciplines in terms of achieving the necessary competencies. As a result, the curriculum is adjusted: some disciplines are added, others are removed. Only the variable part may be a subject to adjustment. For example, in 2014, the discipline “Economics and Management of an Aircraft Manufacturing Enterprise” was introduced into the curriculum. This discipline forms the ability to analyze information, to make management decisions and to use the basic provisions of economic analysis in solving professional problems. In particular, the feasibility study of the

project and the compilation and understanding of which is necessary for future engineers, are impossible without an understanding of the economic mechanisms of the enterprise and the basic categories of the economy of the enterprise. To make various kinds of managerial and business decisions, future specialists need knowledge of business processes and, in general, the mechanism of enterprise management.

In order to confirm the effectiveness of the system of education and training of specialists for Rostvertol PJSC, in November 2018, there was conducted a survey of the heads of structural divisions of the enterprise, teachers and graduates of the basic department working at the enterprise in order to discover the importance of professional knowledge obtained in the process of learning and satisfaction with them. The importance and satisfaction of knowledge was assessed for each subject of the training program on a five-point scale. In general, the importance and satisfaction of the knowledge gained was assessed by all groups as satisfactory (at least 3 points). The heads of departments (average value – 4.92) with a satisfaction value of 4.31 noted the high importance of special professional knowledge (provided by the disciplines of the variable part). The graduates of the basic department and employees of the enterprise (values 3.39 and 3.56, respectively) noted the least satisfaction with both general professional (it provides basic disciplines) and special knowledge. The results of a survey of different groups of respondents about the importance of knowledge obtained as a result of training at the basic department and satisfaction with them are presented in Table 17.1.

**Table 17.1:** Survey results on the importance and satisfaction of knowledge obtained as a result of training at the basic department.

| | Importance | | | Satisfaction | | |
|---|---|---|---|---|---|---|
| | **Heads of departments** | **Teachers of the basic pulpit** | **Graduates of the basic pulpit** | **Heads of departments** | **Teachers of the basic pulpit** | **Graduates of the basic pulpit** |
| General professional knowledge | 4.65 | 4.26 | 4.02 | 4.58 | 3.99 | 3.39 |
| Special professional knowledge | 4.92 | 4.48 | 4.27 | 4.31 | 4.24 | 3.56 |

Note: The table shows the average values of the total body of knowledge, based on the respondents' assessment of their importance and satisfaction on a five-point scale (5 – very important / absolutely satisfied; 1 – does not matter / absolutely not satisfied). At the same time, leaders noted the importance and satisfaction of this knowledge for their subordinates; teachers – for students; graduates of the department (employees of the enterprise) – own knowledge.

Regularly conducting such a monitoring of the importance and satisfaction of the knowledge gained from managers, teachers and employees of the enterprise can be used as a basis for correcting the content of programs and the correlation of levels of knowledge and skills. Monitoring with the involvement of various expert groups is also advisable when evaluating and adjusting retraining and advanced training programs.

## Conclusions

Understanding the enterprise as a complex system, and identifying the interactions between its constituent parts allows us to take a fresh look at its effectiveness and emphasize the importance of developing human capital. It is human capital and the knowledge concentrated in it that are the most important and necessary resource for the successful functioning of enterprises. The role of knowledge is especially growing in the conditions of the formation of a post-industrial society. Moreover, if knowledge becomes a source of human capital, then the education is the main way of its formation. The process of specialist training should be focused on the relationship of the level and content of knowledge and skills of the company's employees with the dynamic development of society, the enterprise itself and individual areas of its activity that the employee encounters in one way or another. One of the effective ways to solve this problem is to build a graph of knowledge in the learning process. Presentation of the training program in the form of a graph allows us to find out all the essential links between different areas of knowledge and to ensure the process of adaptation of the training program to the student population and the changing needs of the practice.

Of course, for the development of the human capital of an enterprise, a merely creating an actual training program is not enough. In addition, it is necessary to ensure the process of training teachers of the appropriate level, to create conditions for students' interest and to ensure control of the level of knowledge and skills obtained in the process of training and retraining. In addition, the formation of a post-industrial society also puts forward demands for the transformation of the approaches to learning. As for the general approaches to training and their coordination with technological processes, in our opinion, interdisciplinary, systematic and practice-oriented ones are necessary. Of course, these approaches have both advantages and limitations, but all of them form gradients in the direction of human capital development due to the internal organization of the learning process and its content.

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# 18 Man, Science and Technologies in the Development of Corporations of Modern Russia

## Introduction

Corporate capital, dominant in the domestic economy, shares its fate in all processes of modern transformations. Together with the system of national economy, it is trying to integrate into the process of deep technological changes and to adapt to the conditions of tough spatial competition, "new protectionism", the mechanism of restricting access to financial and technological development resources. Profound technological changes and the associated socio-economic transformations reinforce the unevenness of the evolutionary process, which leads to the formation of significant gaps between various economic systems, territories, spheres and sectors of the social economy. This fully applies to the reproduction of corporate capital, in which there are gaps between cycles, separate phases and the interests of reproduction participants. The analysis of these phenomena suggests an appeal to the cognitive resources of the theory of reproduction and the theory of corporate capital, which began in the works of Karl Marx (Marx, 1974). The article examines the moments of reproduction of corporate capital in the process of deep technological shifts, indicating the formation of the sixth technological mode. Under the influence of the totality of the transformational processes of the Russian economy, this process is accompanied by the dominance of inertia forces over the renewal forces, which undermines the systemic development, restrains the reaction of corporate capital to changes in the external environment and requires adjusting the economic policy of the state.

## Methodology

In their research, the authors rely on the possibilities of a reproduction approach formed on the methodological platform of Marxist political economy, the theory of system economics, the resources of competence and institutional approaches. The authors strive for a realistic assessment of the reproduction potential that the corporate capital of the Russian economy has at the present stage of development. The study used the

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dialectical approach, the system method, institutional analysis, statistical and financial analysis and the method of structural and comparative analysis.

## Results

We will focus on two opposite moments of reproduction of corporate capital, the interaction of which reveals the dualism of this process: the moment of inertia and the moment of renewal.

The moment of inertia ensures the reproduction of the corporate capital of a certain constancy, the accumulation of previous experience, economic and business culture. The moment of renewal, on the contrary, brings changes both in corporate capital and in the economy as a whole, causing readiness for timely transformations (new technologies, innovations, new mechanisms of organization, etc.) under the influence of external impulses informing about their need (Treschevsky, Risin, Tabachnikova, Plugatireva, 2016).

The resolution of the internal contradiction in the field of reproduction of corporate capital is the synthesis of moments of inertia and renewal in changing the cycles of reproduction of the capital.

The impact of deep technological shifts on the reproduction of corporate capital and its integration into the economic system gives rise to scenarios of the dynamic and inhibited transformation of the latter.

A. The scenario of the dynamic transformation of corporate capital and the way it is embedded in the economy is characterized by the appearance of qualitatively new technologies; qualitatively new demand for products, qualitatively new competencies of employees, etc. The implementation of this scenario is possible if corporate capital operates in the central (nuclear) zone of technological transformations corresponding to the sixth technological structure with an emphasis on the predominance of the update moment over the moment of inertia (Glazyev, 2009).

First, the reproduction of corporate capital in the nuclear zone of transformations is based on replacing the outdated technologies and equipment with a high degree of wear and tear, displacing noncompetitive and unprofitable industries, the prevalence of investment motives over consumption motives, tax preferences and a high proportion of investment from profits.

The second moment of renewal in the reproduction of corporate capital is the emergence of qualitatively new competencies of the human factor, adequate to the emergence of new technologies used by corporate capital. In this vein, new forms of training, interaction of educational organizations and corporations that form the demand for qualitatively new competencies of workers, their integration and conduction of a systematic policy of retraining and staff development, the fulfillment of the task of

preparing specialists are demanded. (Senge, 2003; Sapir, Deyzer, Bogomolov, 2011; Gorodetsky, 2017; Grinberg, 2016; Prokhorova, Klochko, 2017)

The third moment of renewal in the reproduction of corporate capital are the organizational innovations, particularly – new structures of the organization, breakthroughs in the promotion of new technologies and products – from marketing ideas to supplying qualitatively new needs and demand components.

At the same time, the scenario of dynamic transformation of corporate capital and the way it is embedded in the economic system is accompanied by certain costs, risks and threats of disrupting the dynamics of economic processes, because during the update the relationships between the conjuncture periods of corporate capital reproduction are broken, reproductive phases may not match, there is a shortage of competencies corresponding to the labor factor, etc. In this case, the new models of corporate capital development become the exit from the trap of renewal in the reproduction of corporate capital.

The scenario of the dynamic transformation of corporate capital and the way it is embedded in the economy is implemented in countries that are at the forefront of scientific and technological progress. However, a different scenario characterizes the Russian economy, which is gradually moving to the periphery of non-competitive development.

B. The scenario of a hindered transformation of corporate capital and the way it is embedded in the economy, demonstrating a slow and inappropriate response of corporate capital to technological change. Within the framework of this scenario, the phenomenon of the "innovation immunity of the economy" became widespread. (Gubanov S., 2012; Glazyev S., 2009; Gilyano A., 2009; Ermolenko A., 2015) It appeared in the following:

- in the cycles of the reproductive process of corporate capital, the inertia forces dominate over the renewal forces, which does not correspond to deep technological shifts and displaces the corporate capital from the economy to peripheral positions
- technological transformations are targeted; the inertia of such transformations necessitates their targeted advancement
- low valuation and often lack of demand for intellectual capital creates obstacles in the mechanisms of functioning and development of the reproduction of this capital

We present some results of the factual analysis of the reproduction of corporate capital in line with the scenario of inhibited transformation of corporate capital for a number of companies in the corporate sector from a sample of participants (Brizhak, 2018) (Tables 18.1–18.2).

**Table 18.1:** Share of depreciation expense in the revenue of the leading corporations of the Russian economy, %.

| Company | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alrosa | 6.9 | 6.7 | 5.8 | 10.5 | 11.3 | 8.1 | 6.2 | 7.1 | 8.2 | 8.9 | 8.7 |
| Aeroflot | 3.1 | 3.2 | 3.7 | 4.1 | 4.2 | 4.3 | 4.5 | 3.3 | 3.7 | 3.8 | 3.6 |
| Bashneft | – | – | – | – | 9.3 | 6.7 | 5.0 | 4.7 | 5.0 | 5.4 | 5.8 |
| Gazprom | 9.0 | 7.8 | 7.7 | 5.7 | 7.5 | 9.4 | 5.9 | 4.9 | 8.1 | 8.6 | 8.9 |
| Evraz | 3.8 | 3.6 | 5.6 | 7.0 | 7.6 | 6.9 | 7.7 | 8.3 | 6.8 | 4.6 | 4.4 |
| Ilim | – | – | – | 3.9 | 5.4 | 4.4 | 3.9 | 5.5 | 7.8 | 8.2 | 8.1 |
| MTS | 2.4 | 3.3 | 3.1 | 2.7 | 5.5 | 3.0 | 1.7 | 1.7 | 4.9 | 6.1 | 6.0 |
| Norilsky Nikel | – | – | – | – | – | 18.2 | 17.7 | 17.5 | 18.4 | 18.2 | 18.0 |
| RZhD | – | – | – | 11.2 | 7.6 | 6.3 | 5.4 | 6.4 | 8.0 | 5.8 | 6.2 |
| Rosseti | 9.0 | 7.4 | 7.5 | 6.9 | 9.1 | 12.2 | 13.1 | 13.6 | 11.6 | 12.3 | 12.5 |
| Rostekh | – | – | – | – | 8.7 | 8.2 | 8.5 | 9.9 | 15.3 | 16.6 | 16.8 |
| Sibur | – | – | – | – | 2.7 | 3.1 | 3.3 | 3.8 | 5.0 | 4.4 | 4.5 |
| SUEK | – | – | – | – | – | 11.8 | 7.4 | 6.7 | 11.3 | 11.6 | 11.8 |
| Uralvagonzavod | – | – | – | – | – | 8.7 | 6.6 | 7.9 | 10.9 | 6.3 | 6.7 |
| Cherkizovo | 6.0 | 3.5 | 3.6 | 4.5 | 4.1 | 4.2 | 5.3 | 1.0 | 5.7 | 4.3 | 4.4 |
| Energiya | – | – | – | – | – | 8.3 | 7.5 | 7.7 | 6.3 | 8.2 | 8.4 |

**Table 18.2:** The share of investments in the revenue of the leading corporations of the Russian economy, %.

| Company | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alrosa | 19.6 | 17.2 | 14.7 | 23.0 | 25.6 | 17.7 | 15.5 | 19.9 | 22.6 | 16.1 | 14.2 |
| Aeroflot | 1.7 | 1.2 | 2.5 | 2.6 | 1.4 | 0.7 | 1.0 | 2.1 | 1.5 | 0.1 | 0.1 |
| Bashneft | – | – | – | 9.6 | 8.7 | 6.6 | 6.9 | 7.9 | 7.5 | 11.0 | 9.1 |
| Gazprom | 19.8 | 20.5 | 22.7 | 20.3 | 26.6 | 40.1 | 28.8 | 25.0 | 27.2 | 23.0 | 20.1 |
| Ilim | – | – | – | 11.3 | 11.8 | 18.1 | 29.5 | 32.6 | 21.1 | 6.1 | 6.1 |
| MTS | – | – | – | – | – | 18.4 | 20.1 | 22.7 | 20.5 | 22.5 | 18.2 |
| Norilskiy Nikel | – | – | 16.5 | 9.6 | 16.4 | 16.7 | 19.6 | 14.6 | 17.7 | 15.7 | 13.8 |
| RZhD | 25.5 | 24.6 | 30.2 | 34.0 | 31.7 | 31.0 | 32.7 | 37.6 | 31.1 | 25.7 | 22.3 |

**Table 18.2** (continued)

| Company | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rosseti | – | – | – | – | – | 17.6 | 19.7 | 21.1 | 35.1 | 26.9 | 24.5 |
| Sibur | – | – | – | – | 4.9 | 6.2 | 6.8 | 8.0 | 7.0 | 7.0 | 6.2 |
| SUEK | – | – | – | – | – | 10.2 | 10.7 | 10.0 | 9.2 | 6.1 | 6.0 |
| Uralvagonzavod | – | – | – | – | 0.9 | 10.3 | 4.7 | 6.4 | 21.7 | 31.0 | 26.7 |
| Cherkisovo | 8.8 | 10.7 | 11.0 | 12.9 | 13.6 | 9.5 | 6.2 | 7.6 | 7.8 | 7.7 | 7.1 |
| Energiya | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.6 | 3.5 | 8.0 | 0.4 | 3.3 | 3.1 |

The results of the analysis allow us to draw the following conclusions (Table 18.1):

- The majority of corporations in the sample have low rates of the share of depreciation expenses in revenue, which indicates that the moments of inertia prevail over the moments of renewal of fixed capital, which does not correspond to modern trends of technological transformation.
- Only four companies from the sample – OJSC "Rosseti", GC "Rostekh", PJSC MMC "Norilsky Nikel", JSC "SUEK" – are able to create conditions for the renewal of fixed capital at the expense of funds from the amortization fund for six to eight years, which twice the period of capital renovation in companies of "advanced" countries, which also corresponds to the scenario of a slow transformation of corporate capital and the way it is embedded in the economy. Most of the corporations in the sample have low rates of the share of depreciation deductions in the proceeds, which means that the reproduction of fixed capital is in short supply of investment funds necessary for its renewal. These companies need resources from the outside for immediate replacement of physically and morally worn out equipment, machinery, tools and new elements of the capital.
  - Some corporations do not have actual data for individual years, which characterizes possible changes in the form of their functioning, scale, degree of independence and time spent on the market.
  - Let us continue the analysis of the dynamics of development of the reproduction of corporate capital in the real sector of the Russian economy, using the indicators of the share of investments in the revenue of companies in the sample (Brizhak O., 2018) (Table 18.2).
  - The actual analysis of this indicator demonstrates a high degree of instability, which confirms a wide range of fluctuations.
  - The lack of indicators for individual years in the taken companies ascertains changes in the form of their functioning, scale, degree of independence, time of appearance on the market.

– For the analyzed period, only four companies – JSC NPC "Ural-vagonzavod", PJSC "Gazprom", OJSC "RZhD", OJSC "Rosseti" have provided investments at a level exceeding 20% of revenues, which partly meets the requirements of modern technological transformations while the rest of the sampling participants were able to satisfy these requirements by only 30–60%.

Along with the technological parameters of the reproduction of corporate capital, we will assess the process of human factor involvement in the implementation of the inhibited transformation scenario and the way it is embedded in the economy for a group of Russian corporations from the sample using the method of calculating the deviations of the average monthly labor productivity fees (Brizhak, 2018) (Table 18.3).

**Table 18.3:** Calculation of deviations of the increase in average monthly labor productivity from wage growth for a group of leading companies in the corporate sector of the Russian economy, % compared to the previous year.

| Company | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Alrosa | –2 | 7 | –37 | 18 | 39 | –11 | –20 | –16 | 18 | 15 |
| Aeroflot | 4 | –12 | –2 | –6 | 5 | –17 | –28 | –20 | –5 | –3 |
| Bashneft | – | – | 121 | 126 | 133 | 25 | –28 | 73 | –30 | –8 |
| Gazprom | 33 | –17 | 63 | –21 | –45 | 69 | –16 | –3 | 3 | –8 |
| Ilim | – | – | – | –10 | –26 | –13 | –18 | 1 | 18 | 14 |
| MTS | – | – | – | – | – | –3 | –6 | –9 | –4 | 2 |
| Norilskiy Nikel | – | – | – | –115 | 9 | 0 | –23 | –4 | 23 | 11 |
| RZhD | –30 | –9 | –20 | 1 | 83 | 0 | –3 | –49 | 3 | 1 |
| Rosseti | – | – | – | – | 113 | –8 | –10 | –9 | –7 | –2 |
| Rostekh | – | – | – | – | – | –111 | 10 | –27 | –8 | –7 |
| Sibur | – | – | – | – | – | 61 | 18 | –29 | 26 | 12 |
| SUEK | 0 | 0 | 119 | 24 | –91 | 14 | 91 | –42 | –49 | –12 |
| Uralvagonzavod | 0 | 0 | 0 | 0 | 0 | 27 | –25 | –39 | 83 | 31 |
| Cherkizovo | –3 | 21 | –57 | 24 | –7 | –17 | 6 | –19 | –19 | –3 |
| Energiya | – | – | – | – | – | –22 | –15 | 50 | 5 | 2 |

The results of the analysis show the following:

- In the studied corporations, there is a lack of indicators for individual years, which may be due to a change in the form of their functioning, degree of independence, time spent in the market; in some corporations, there is a temporary balance between wage growth and labor productivity.
- Analysis data show that there is no stable relationship between the increments in average monthly labor productivity and the increments in average monthly wages for selected corporations, which is a conclusion that the human factor is a key factor in moving towards a new quality of the economy and society in the era of technological transformations beyond the limits of reproduction of corporate capital, it is demonetized and not interested in its implementation;
- The relation of income distribution and their hard polarization in the domestic economy is a statement of previous conclusions about the alienation of the human factor from the reproduction processes in the corporate sector (Voyeykov M., 2017).

## Conclusion/Recommendations

Summing up our research, let us formulate a number of conclusions confirming the consolidation of the scenario of a hindered transformation of corporate capital and the way it is embedded in the domestic economy:

- First, the core capital of corporations is reproduced according to this scenario in the conditions of severe investment restrictions, balancing on the brink of survival, physical and moral depletion, alienated from the trajectory of modern development due to low investment attractiveness. In such conditions, the impulses of post-industrial transformations, penetrating from the external environment, are weakened or completely attenuated.
- Secondly, the human factor practically does not participate in the reproduction of corporate capital, limited to a secondary role, alienated from transformations, it is not interested in generating new ideas, technologies, organizational innovations, hence the inertia of behavior, which is confirmed by the ratio between the movement of wages and labor productivity movement.
- Thirdly, organizational transformations are carried out non-temporarily, they do not correspond to the changes taking place and are implemented with delay, partially, they`re carried out outside the system, which forms the basis for further loss of competitiveness of corporate capital, as indicated by the global index data competitiveness for modern Russia. Of 137 countries on this indicator, Russia ranks 38th from the list of rankings according to its criteria, including (“Technological level” (57th place), “Innovation potential” (49th place),

"Competitiveness of companies" (71st place), "Independence of the courts" (90th place), "Securing property rights" (109th place)) (https://www.weforum.org/ – World Economic Forum website, 2018; Popkova, 2018).

Let us pay attention to the fact that within the limits of the scenario of hindered preformation of corporate capital, the reproduction of this capital is not separable from the general trajectory of the modern development of the entire system of the national economy; Corporate capital, in the reproduction of which the moment of inertia prevails over the moments of renewal, is naturally built into the economy, focusing on extracting the rent from the extraction and sale of natural resources (Gubanov S., 2015). Thus, the core of the reproduction process of the national economy – corporate capital and the entire system of the national economy in conditions of profound technological changes produces a scenario of inhibited development; it reinforces the phenomenon of "innovation immunity of the economy" and makes attempts to implement the modernization policy of economies on the innovation path of development, chronic structural backwardness and large-scale capital outflows (31.3 billion dol. for 2017), not finding themselves effective application.

How is such inefficiency expressed? It manifests itself in the following:

- The state, first creates autonomous economic entities, large corporations that are able to independently manage their economic activities, including appropriating the flow of raw materials through the privatization of spheres and industries that generate these incomes, and then returns a part of rental flows through restitution (indicative of the example are "Ukos", "Bashneft", etc.) (Khubiev K., 2017).
- Rental strategic orientation and inhibition of technological changes apply to all sectors of the economy, and even to those where conditions for obtaining natural rental flows are not formed, where corporate capital is in the nuclear zone of technological changes; in this plane, the fundamental non-competitiveness of the products created in such conditions is determined, which creates a negative form of embedding corporate capital in the stream of systemic transformations.
- The economy in which the vertical of state power dominates the orientation towards the extraction of natural rent is complemented by the orientation towards the attraction of administrative rent from the bureaucratic apparatus and the corporate technostructure; consequently, the formed bond "rental economy – corporate capital" under the scenario of a hindered transformation of the economic system cannot be eliminated without overcoming it.

On the basis of scientific results obtained in the course of research on issues of reproduction of corporate capital in the process of profound technological changes within the scenario of inhibited development of the economic system, we will make proposals for eliminating this link, and also assume the expected effects and obstacles to their realization (Table 18.4).

**Table 18.4:** Evaluation of proposals to eliminate the bond "rental economy – corporate capital" in the domestic economy.

| Offers | Expected effects | Obstacles |
|---|---|---|
| Investment to innovation projects by large corporations, with the provision of government guarantees for the return of investment resources | Development of public-private partnerships; the creation of new growth areas; Specified Corporation Contracting with Small and Medium Enterprises | Corporate distrust of small and medium businesses; the insufficiency of preferential regimes for investors of innovation projects; dominance of potential clusters in the regions |
| Participation of resource corporations in the development of innovative spatial loci | The development of growing innovation loci; elimination of obligations for territorial resource supplies; consolidation of corporate capital relations with spatial systems of the economy | Lack of innovation zones in spatial economic systems; inertia of the state economic policy |

In accordance with the above considerations, the need arises to correct the state's economic policy, which should be aimed at:

- granting preferential regimes for investors of large innovation projects related to advanced loci of technological transformations
- creation of an additional demand for innovations from the state and municipalities, providing conditions for the innovative growth of small and medium-sized businesses, strengthening and developing its relations with large corporations with investment resources
- supporting the competitive environment, orienting corporate capital to market interaction, but not to the funds of state support and the state team
- support of corporate demand for intellectual capital, including tax and pension preferences and support for the integration of this capital into corporate capital with the help of accreditation requirements for potential recipients of government orders

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# 19 Problems of the Organization of TIF Areas to Create Innovation Infrastructure

## Introduction

In this article, the infrastructure is considered as a long-term capital-intensive asset tied to a specific territory and having a long period of return on investment. Many studies prove the multiplier effect of infrastructure investments (Easterly and Revelo, 1993; Calderón et al., 2011; IMF, 2014; McKinsey, 2016).

As a result of the specific territory's infrastructure development, economic actors receive new opportunities: for example, such as cost reduction, expanded access to labor resources, investment flows, production growth, access to remote areas (The Canadian Center for Economic Analysis, 2016; McKinsey Quarterly, 2013). The overall result of infrastructure investments is an increase in productivity and growth of the gross regional product in the long-term period.

The state represented by federal and regional (municipal) authorities is responsible for the creation and development of public infrastructure. However, the insufficiency of budget funds limits the ability of the state to finance infrastructure investments. Attracting a private investor allows for the infrastructure development and at the same time prevents tax and public debt increase through borrowing (The World Bank, 2018). This determines the relevance of studying modern instruments of financing infrastructure projects.

## Methodology

Using the macroeconomic and spatial-statistical analysis methods, a study of the infrastructure investment system in Russia has been conducted. The method of grouping and comparing within the framework of the comparative approach allowed the authors to identify the most adequate method for assessing the possibilities for the Russian regions to use such a tool as the organization of a TIF territory. The use of tax potential assessment methods and the calculation of the infrastructure development index allowed the authors to formulate a comprehensive assessment of the possibility of using the TIF-territory organization tool in Russian conditions.

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# Results

## Infrastructure as an Investment

Infrastructure Investments demonstrate stable growth all over the world: the volume of infrastructure investments from 2007 to 2017 increased by 38% (from 1.8 trillion dollars to 2.5 trillion dollars). The transport infrastructure (50% of all investments) remains the priority object of investment in most countries, investments in the energy sector (32%) come second, followed by investments in telecommunications (11%) and water supply (7%). Despite the increase in infrastructure projects investment, the gap between investment demand and its real volume remains. According to experts, by 2020 this gap could reach 0.5 trillion. dollars (Global Infrastructure Hub, 2018).

Modern infrastructure is becoming an attractive option for private investment. The following factors contribute to this:

- The acceleration of technological development ensures the innovative infrastructure establishing: new technologies can solve many problems in the infrastructure field (acceptable cost, minimization of environmental damage, operational efficiency, etc.).
- Public infrastructure digitalization allows increasing the solutions efficiency and to obtain an additional "value" from infrastructure facilities.
- The global economy's demand for decarbonization stimulates the transition to new eco-sustainable infrastructure technologies (PwC, 2018).
- The economy urbanization makes new demand on the urban infrastructure, which should, above all, stimulate and support economic growth in the considered territory (Bielenberg et al., 2016).

Over the recent 10–20 years, there has been a low level of investment in infrastructure in Russia (3.1–3.5% of GDP). A comparative analysis of the countries showed that the indicator of infrastructure spending in the budget of Russia is much lower than in the budgets of China and South Africa. The share of the private sector in total infrastructure investment in Russia remains at 16%, while in India this figure is 40%, in Chile – 66, in the US – 29%, in the new EU member States – 44%, and in the EU of the older generation – 64% (The World Bank, 2016).

Thus, the challenge is to transform the financial system to achieve a global goal – the volume growth and the improvement of infrastructure investment quality by the private sector of the economy. It is necessary to offer potential investors financial instruments that reduce the cost of long-term capital and the risks of managing an infrastructure project. The authors consider tax increment financing (TIF) as such a tool.

## Infrastructure Financing in the Russian Federation Regions

Currently, the development of infrastructure in the regions is being studied by various public and specialized organizations. The most representative is the infrastructure development index, calculated by INFRAone, which includes transport, energy, municipal, social and telecommunication infrastructure of the regions. The index shows the state of funds and the level of their development in the regional context. The driver of investment activity in infrastructure projects is transport infrastructure, investments in social projects lag far behind.

Figure 19.1 shows the infrastructure development index of all entities of the Russian Federation. The maximum possible index value is 10, but no region has approached this value in either industry or integral indices. The average index of the Russian Federation regions is 5.7. The integral index of infrastructure development in most regions (46 out of 85) is in the range from 5.5 to 6.0. It means that the infrastructure in most of the Russian Federation regions is at about the same level and has significant potential for development. The leaders in infrastructure development are Moscow (the index is 7.78), St. Petersburg (the index is 7.11) and Khanty-Mansi Autonomous Area (the index is 6.82).

According to the infrastructure development index, it is possible to predict the investment demand in the region's infrastructure for the coming period. The predicted demand reflects the asymmetry of the regions' development, since the bulk of the demand falls on the needs of the regions that are most actively developing the infrastructure (Moscow, St. Petersburg, Khanty-Mansi Autonomous Area, etc.). Due to the fact that the capacity of the infrastructure market is determined by the development degree of institutional, economic and financial conditions in the region, which leads to imbalance: high demand for infrastructure investments are characteristic of infrastructural developed regions and reduced demand for regions with poor infrastructure. Russia's minimum additional demand for infrastructure investments in 2019 is estimated at 2.6 trillion. rub. More than half of this volume (52.6%) is the demand of 27 regions with already developed infrastructure. Low demand for infrastructure investments in other regions of the Russian Federation shows a poor state of economy and the demand for large-scale investments not only in infrastructure, but also in the manufacture sector (Infra ONE Research, 2019).

## Features of TIF Application

An important condition for using the TIF tool is to define clear boundaries of the territory in which the infrastructure project will be implemented. The next step is to fix the level of tax revenues generated within the TIF-territory as the project start date. All tax revenues above the fixed level (tax increments), including income from the infrastructure project itself, are sent from the regional budget to


**Figure 19.1:** Infrastructure development index in Russian regions.
Source: Infra ONE Research (2019).

the TIF-project budget and are used to return the initial investment. The life cycle of a TIF-project is defined in advance and, as a rule, is 20–25 years. Once the project is completed, tax revenues will be credited to the budget.

Legal regulation of the use of TIF and the established practice of implementing TIF projects exist in the USA, Canada, Great Britain and India. The study of foreign experience in the application of this mechanism allowed us to identify the key factors that determine the possibilities of using TIF-tools (Carroll and Sachse, 2004; Found, 2016; Haider and Donaldson, 2016).

The authors conducted a study of the characteristics of existing instruments for the infrastructure investment stimulation, identifying specific criterial factors groups for modeling the necessary conditions to introduce the TIF tool (Grigorieva and Karpova, 2018).

The criteria-based comparison allowed the authors to clarify the characteristics of TIF-tool that must be considered in the legal consolidation and determination of financial and economic parameters of its use.

Let us note the most significant positions that will need to be considered when TIF tool is being implemented:

By criteria group "budget criteria":

- The focus of the TIF-tool on solving problems of a specific territory allows recommending it for use for the implementation of federal target programs (FTP) related to the development of regions: it is possible to create several TIF-territories at once, for example, according to programs such as the Federal Program "Development of the Kuril Islands", FTP "Development of the Republic of Sakhalin Region" and others.
- The period of the TIF instrument use significantly exceeds the budget cycle (three years), therefore, an important condition for its implementation is long-term stability (predictability) of fiscal policy.
- The state participation in implemented infrastructure projects in TIF-territories is not practiced, infrastructure investments are financed only by the private investors' capital.
- The ensuring the cash flow of the project with the return of tax revenues stimulates the economic entities of the organized TIF-territory to invest and does not require additional guarantees from the state.

By criteria group "organizational and economic criteria":

- the lack of competitive procedures, as the region itself is the initiator of the TIF-tool use
- High efficiency of PR and GR returns, which is determined by the ability of regional authorities to organize TIF-territory and use the further results of the accomplished modernization of the infrastructure when building long-term, stable and predictable relations with the federal authorities, based on the success of the TIF-territory.

- Effective risk management of projects in TIF territories is ensured by the owners (private investors) interest in the efficiency of the created infrastructure facilities.
- Ownership of infrastructure facilities in TIF territories belong to private investors, and their commercial exploitation provides income.
- Due to the complex improvement of the TIF territory, the more effective development of the sectoral structure of the region as a whole is possible.

By criteria group "financial and economic criteria":

- Nowadays the attractiveness for investors is low, as the conditions of such projects are not definitively defined and there was no experience in organizing the TIF territory in the country.
- Credit institutions in the country under the regulatory framework try not to issue loans below the second quality category, therefore it is logical to assume that during developing the financial architecture of projects within the TIF territory, borrowers will try to ensure the level of risk through collateral related to the second quality category.
- The securitization of projects are the original the project assets, or assets offered by investors, which is predetermined in the contract documentation, which should define the financing sources.
- The financial responsibility level for projects in TIF territories is not fixed by legal acts and is conditioned only by the initial degree of elaboration of the strategy and financial plan of the infrastructure project.

The criteria group, which defines the contractual structure and legal support for TIF instruments, is made up considering foreign experience and reflects the high level of stability of this instrument, which is directly related to fixing most of the conditions at the stage of TIF allocation, before investing.

## Assessment of the Possibility of TIF Territories Implementing in Russia

Regions can initiate the institutional environment implementing for the TIF use on the basis of local legislation, justifying their financial demand and opportunities according to the federal budget. At present, there is a practice of determining budget subsidies for leveling budgets, based on the tax potential assessment methodology, which allows determining the ability of regions to return funds to the federal budget in the future.

The assessment of the tax potential of the regions is sufficiently developed and can be calculated using various approaches. Table 19.1 presents two groups of assessment methods: the first group of methods is based on a macroeconomic

**Table 19.1:** Grouping of approaches to assessing the tax potential of the region.

| Approach | Title |
|---|---|
| Macroeconomic approach | The estimation method based on gross regional product |
| | The method of total taxable resources |
| | Method of evaluation using the index of tax potential |
| | Method of estimation based on the average per capita income |
| | Method of assessment of actually collected tax revenues of the region |
| | Method of drawing up the tax passport of the region |
| Representativeness of the tax system | Regression analysis method |
| | Method based on additive property of tax potential |
| | Method of estimation of hidden activity in industry |

Source: Davydova and Fokin (2010).

approach; the second group is based on an approach based on the representativeness of the tax system.

In Russian practice, the tax potential index (TPI) methodology is used for fiscal policy. The authors propose to take this methodology as a basis for studying the potential possibilities of regions to organize TIF territories to create an innovation infrastructure that meets modern global challenges.

The index of the tax potential of the subject of the Russian Federation is calculated by the formula (Decree of the Government of the Russian Federation, 2014):

$$\mathrm{TPI}_i = \frac{TP_i}{P_i} / \frac{\sum^T P_i}{\sum^P i}$$

where $TP_i$ is the tax potential of the subject of the Russian Federation;

$P_i$ is the number of resident population of the Russian Federation.

The tax potential of a constituent entity of the Russian Federation is calculated as the sum of tax potentials by type of tax income tax, personal income tax, corporate property tax, excise taxes, mineral extraction tax, other tax revenues (Decree of the Government of the Russian Federation, 2015).

The tax potential of the region characterizes the maximum amount of taxes collected, taking into account the existing sectoral structure and the results of production activities of economic entities. The quantitative value of the tax potential for the purpose of this work describes the potential size of future cash flows, which will serve as a guarantee for the return of investment infrastructure projects implemented in the region as TIF-territory.

The tax potential index has a more socially-oriented focus and characterizes the maximum amount of tax revenues of a region per resident compared with the average level of total tax revenues of the budget per resident of the country.

The calculation of the tax potential index in the context of republics, territories, regions is made on the basis of data from the Ministry of Finance of the Russian Federation (Ministry of Finance of the Russian Federation, 2018). Figure 19.2 shows the regions where the TPI value is higher than the average Russian.

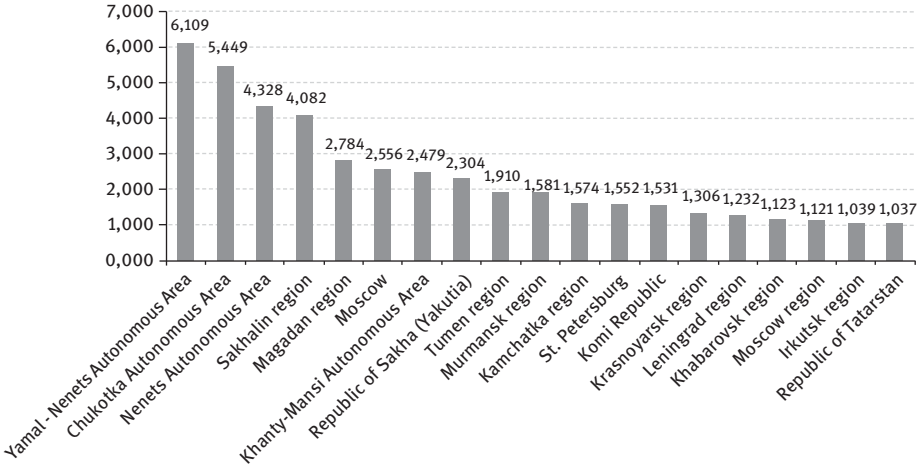


**Figure 19.2:** The subjects of the Russian leaders on the value of TPI 2018.

Of the total number of constituent entities of the Russian Federation, 19 regions have an TPI above the average Russian. Using data from rating agencies analyzing the level of debt burden of constituent entities of the Russian Federation, it can be stated that there is no correlation between the indicator of the region's debt load and TPI (National Rating Agency, 2018).

The Tax Increment Financing (TIF) is a tool at the intersection of tax and budget policy, and was recognized by the Russian government as a tool to stimulate economic growth in terms of regional interest in developing a tax base, increasing tax potential, and as a result, encouraging investment activity of all entities economic system (Decree of the Government of the Russian Federation, 2014). From the point of view of regional infrastructure development, the TIF-territory implementing can be a convenient tool for creating an innovation infrastructure within such a territory.

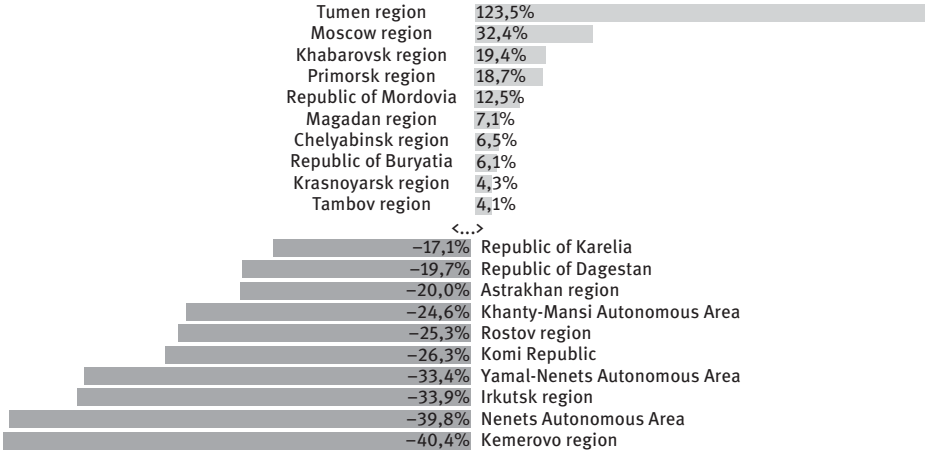


**Figure 19.3:** Top 10 regions in terms of growth / decline in public debt in 2018.
Source: National Rating Agency (2018).

## Conclusions/Recommendations

In general, the practice of making decisions about the implementation of special economic areas is well developed in both theoretical and practical terms. Managers have at their disposal a number of well-established international and domestic approaches, which in most cases are methodically and legislatively set.

In domestic practice, discounting based techniques are used: the indicator "discounted annual budget effects (net present budget revenues)", "discounted annual commercial effects (net present operating revenues)". So, you can give an example of methodologies for evaluating the effectiveness of organizing projects with elements of the fiscal component in PPP projects, an organizational and economic approach to evaluating the effectiveness of PPP projects (Decree of the Government of the Russian Federation, 2018), methods for evaluating the performance indicators of state programs, and independent ratings of regions – rating credit rating investment rating.

Methods of expert estimates are used, for example, when calculating the public effectiveness of the Program, expert and statistical estimates are made of the total public income – cash flows, reflecting the increase in the gross domestic product of the country.

In assessing the effectiveness of state programs, the process and project approaches have recently become widespread. We can give an example of the Methodology laid down in the "Procedure for monitoring and managing changes in projects of the National Technology Initiative" (Interdepartmental Working Group, 2018). The methodology provides for the management of changes in the

event of fluctuations in the external and internal conjuncture. The documents of the program "Digital Economy of the Russian Federation" laid down the principle of a project-based approach to management, i.e. a project analysis will be used in evaluating performance (Decree of the Government of the Russian Federation, 2017). Also, in practice, a process approach is used, which enables the operational adjustment of project conditions to achieve the most effective targets. Some documents use the method of control points: specific quantitative control indicators of programs are fixed (for example, in the National Technology Initiative).

Thus, the decision on the implementing of TIF territories at the present stage of the set of tools used to stimulate infrastructure development has a real basis, provided that this tool is used in the format of an existing project mechanism, for example, as part of an ongoing state program.

The consolidation in the tax legislation of provisions that would make it possible to apply TIF as a tool for developing the infrastructure of a specific region (territory) is undoubtedly necessary. However, the regions can initiate the organization of the institutional environment for the use of TIF on the basis of local legislation, justifying their financial capabilities to the federal budget. At present, there is a practice of determining budget subsidies for leveling budgets, based on the tax potential assessment methodology, which allows determining the ability of regions to return funds to the federal budget in the future. The authors propose to take this methodology as a basis for studying the potential possibilities of regions to organize TIF territories to create an innovation infrastructure that meets modern global challenges.

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# 20 Innovative Clusters as Growth Points of Russian Economy: Regional Accents

## Introduction

Modern economy of developed countries is largely based on strong positions of individual economic clusters, where innovative products based on breakthrough basic technologies of the fifth Kondratiev cycle – microelectronics, robotics, computer and telecommunications equipment are created. In the first quarter of the 21st century cluster approach can be considered as generally accepted, although the hypothesis of clusters effectiveness was formulated a century ago. It is considered that clusters in national economy play the role of peculiar growth drivers and are vectors of innovative development. Considering clusters as the most effective system of economic organization, A. Marshall revealed a close relationship between concentration of specialized industries in a certain area and sustainable economic growth of territory. This allowed the economist to formulate one of the most important cluster properties – the presence of a synergetic effect (Marshall, 1920). The economist proved that the synergetic effect generates much greater productivity of companies operating within the cluster compared to functioning of individual firms and is the result of companies' territorial proximity. Another property of clusters is formulated in the works of J. Schumpeter. He highlighted the unique ability of cluster to process of generation and rapid spread of innovation. According to J. Schumpeter, innovation is the main driver of economic growth (Schumpeter, 1939).

M. Porter, whose name is now associated with the concept of "cluster", managed to note the mechanism of clusters of industries formation that depend on each other (in contrast to sectoral clusters of A. Marshall): successful industries are usually associated with relationships of vertical or horizontal nature (Porter, 2000).

## Methodology

Clusters which are considered as a type of agglomeration, are essentially a dynamic structure, based on innovation in a broad sense. In line with these views, research

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approaches over the past 20 years have focused on importance of innovation as a means of explaining emergence and sustainability of agglomerations. In this regard, innovative clusters are traditionally understood as clusters, the core of which are scientific and research and development organizations. New economic activities (new industries) are emerging in the environment of these clusters. Products of innovative clusters are technologies, software, design and design solutions. Contribution of these clusters to regional economy is insignificant. Official statistics may not even "notice" them, since industries emerging in cluster are not yet reflected in national classifications. In fact, we are not talking about product clusters, but technological ones. To reflect the results of such clusters in real economy it is necessary that they (the results) were in demand by business clusters through introduction of their results in mass output of final products. Thus, mass production enterprises can gradually stand out from the environment of innovative clusters and become significant for economy of region/country. Export orientation of goods and services of these clusters is possible.

Popularization of cluster policy in the 1990s intensified processes of cluster formation in many countries of the world (Fattakhov, Stroyev, 2012). Cluster approach to economy development was recognized as one of the most effective and promising, because it links the growth of national economy competitiveness with strong positions of individual (innovative) clusters that can broadcast best practices of successful business (Golichenko, 2006).

The most important advantage of cluster approach is that it focuses on the links between industries – activities and between economic entities. Secondly, this approach emphasizes the importance of competitiveness prerequisites, allows concentrating information about production factors and competitive conditions, opportunities for managing transaction costs, productivity, information exchange improvement between elements of this spatial structure.

The choice of cluster approach in Russia was dictated by presence of a deformed structure of gross regional product in a number of Russian regions and desire to increase the importance of high-tech manufacturing in the structure of regional economy.

In context of innovative economy development in the first decade of the 21st century, Russian researchers introduced the concept of information and industrial cluster as a complex of systems: object, process, environmental, project (Kleiner, Kachalov, Nagrudnaya, 2007). in Russian studies cluster is considered both as a complex and as a system formation (Makar, 2013). Components of this structure include both objects themselves and relations between them, as well as qualities and properties of the space itself (Markov, Yagoltsiner, 2006; Makar, 2012; Sergi et al., 2019a; Sergi et al., 2019b). The process of strategic planning has become the core of cluster effective functioning.

In the second half of 2012 a practical program for creation and development of territorial innovative clusters in Russia was launched. The list includes 25 territorial clusters determined on the basis of competitive selection carried out in accordance

with the order of the President of the Russian Federation, following the meeting of the Presidium of the State Council of the Russian Federation from November 11, 2011, as well as decision of the Government Commission on high technologies and innovations from January 30, 2012. Clusters included in the list were located in areas with different models of territorial organization and proportional relations of scientific, technical and industrial activities. Formation of innovative territorial clusters is aimed at solving problems of improving competitiveness of enterprises and organizations; promoting investment; business development, as well as international scientific, technical and industrial cooperation. Thus, the tasks assigned to innovative territorial clusters were of a general nature and were aimed at formation and promotion of objects that are part of clusters. The main areas where pilot programs were planned to achieve significant results are expansion of research and development sector, production intensification and investment activities.

Thus, the basic idea of creating innovative territorial clusters reflects a well-known assumption that cluster spatial structure is the best form for connecting innovation with industrial production: when around one technological direction (or several complementary ones) public and business investment, science, education, industrial capacities are concentrated. At the same time, various management structures, both at regional and Federal levels, help to solve emerging problems. Territory of such a cluster should be limited for greater work efficiency, so that participants invest in projects, located within transport accessibility. It is essential that enterprises in cluster interact (cooperate) and compete. The main idea of such development is concentration of common efforts in a particular area to solve the tasks. Clusters creation should help to solve the problem of domestic products low competitiveness.

## Results

Considering the process of innovative clusters formation in Russia several key stages can be distinguished. The starting point was development of documents package of cluster formation regulating processes. In most Russian regions cluster approach became a priority and took one of leading positions in socio-economic development strategies of most territories. Development of legal framework allowed regions to carry out cluster formation processes in close connection with territories industrial policy.

The competition “Innovative clusters development – world level leaders of investment attractiveness”, developed by the Ministry of economic development of the Russian Federation in 2016, can be considered an important stage to assess regions achievements. Twelve regional innovative clusters became its winners:

- Innovative cluster of Kaluga region “Pharmaceuticals, biotechnology and biomedicine” (medicine and pharma)

- Research and production cluster “Siberian science polis”, Novosibirsk region (information technologies, biotechnologies, pharma, biomedicine)
- Innovative territorial cluster “Smart Technologies” of Tomsk region (information and communication technologies, medicine, pharma)
- Kama territorial and production innovative cluster of the Republic of Tatarstan (petrochemistry, mechanics)
- Oil territorial cluster of the Republic of Bashkortostan (petrochemistry);
- Innovative cluster “Technopolis Yenisei” of Krasnoyarsk region (nuclear technologies, aerospace)
- Innovative territorial cluster of mechanical engineering and metalworking “Valley of mechanical engineering” of Lipetsk region (mechanical engineering)
- Consortium of innovative clusters of the Moscow region (new materials, medicine, pharma, information and communication technologies, engineering, nuclear technologies, aerospace)
- Innovative cluster of the Republic of Mordovia (effective lighting, optical fiber and optoelectronics)
- Innovative territorial aerospace cluster of the Samara region (aerospace)
- Innovative city of science and technology of St. Petersburg city (advanced manufacturing technologies, information technologies)
- Innovative cluster of Ulyanovsk region (nuclear technologies, aerospace, new materials, renewable energy, e-Health)

The competition not only identified the winning clusters, but also revealed measures of support from the state. Support for innovative clusters is carried out in the form of direct subsidies from the Federal budget and through cooperation with development Institute represented by “Rusnano”. Participation of “Rusnano” in company’s capital in the most difficult period, when launching the production of innovative products and bringing it to market, helps to reduce implementation risks.

The results of innovative territorial clusters monitoring in Russia are presented in Table 20.1.

Volga and Central Federal district are among leaders in concentration of clusters, having innovative and territorial status (ITC) (2015–2017). Industry areas that cover ITC are represented by the following:

- nuclear and radiation technologies (Moscow, Nizhny Novgorod, Ulyanovsk, Krasnoyarsk region)
- aircraft and spacecraft manufacturing, shipbuilding (Samara, Ulyanovsk, Arkhangelsk region, Perm, Khabarovsk Krai)
- pharmaceuticals, biotechnology and medical industry (St. Petersburg, Tomsk, Novosibirsk, Kaluga, Moscow region, Altai Krai)
- new materials (Moscow, Moscow region, Sverdlovsk region)
- chemistry and petrochemistry (Republic of Tatarstan, Bashkortostan, Nizhny Novgorod, Kemerovo region)

**Table 20.1:** Results of innovative territorial clusters monitoring in Russia.

| No. | Region – subject of the Russian Federation | Industry branch | Status | Cluster name | Number of participants |
|---|---|---|---|---|---|
| 1 | Sverdlovsk region | New materials | Innovative-territorial cluster (ITC) | Titanium cluster of Sverdlovsk region | 9 |
| 2 | Kalugaregion | Pharmaceuticals, biotechnology and medical industry | ITC | Cluster of pharmaceuticals, biotechnology and Biomedicine (Obninsk) | 23 |
| 3 | Krasnoyarsk Krai | Nuclearandradiationtechnologies | ITC | Cluster of innovative technologies CATF (Zheleznogorsk) | 6 |
| 4 | Moscow | Informationtechnologiesandelectronics | ITC | “Zelenograd” cluster | 11 |
| 5 | Moscow | New materials | ITC | New materials, laser and radiation technologies (Troitsk) | 25 |
| 6 | Moscow region | Nuclearandradiationtechnologies | ITC | Innovative territorial cluster of nuclear physics and nanotechnology in Dubna city | 8 |
| 7 | Moscow region | Pharmaceuticals, biotechnology and medical industry | ITC | Biotechnological innovative territorial cluster in Pushchino | 38 |
| 8 | Moscow region | New materials | ITC | “Physico-technological XXI”cluster (Dolgoprudny, Khimki) | 25 |
| 9 | Nizhny Novgorod Region | Nuclearandradiationtechnologies | ITC | Sarovinnovativecluster | 22 |
| 10 | Novosibirsk region | Information technologies and electronics / Pharmaceuticals, biotechnology and medical industry | ITC | Innovative cluster of information and biopharmaceutical technologiesofNovosibirskregion | 143 |

(continued)

**Table 20.1** (continued)

| No. | Region – subject of the Russian Federation | Industry branch | Status | Cluster name | Number of participants |
|---|---|---|---|---|---|
| 11 | Republic of Mordovia | New materials | ITC | Energy-efficient lighting engineering and intelligent lighting control systems | 20 |
| 12 | Republic of Tatarstan | Chemistryandpetrochemistry | ITC | Kama innovative territorial-production cluster of the Republic of Tatarstan | 33 |
| 13 | Leningrad Region | Information technologies and electronics / Pharmaceuticals, biotechnology and medical industry | ITC | Cluster of medical, pharmaceutical industry, radiation technologies of St. Petersburg | 27 |
| 14 | Samara region | Aircraft and spacecraft manufacturing, shipbuilding | ITC | Innovative territorial Aerospace cluster of Samara region | 14 |
| 15 | Tomsk region | Information technologies and electronics / Pharmaceuticals, biotechnology and medical industry | ITC | Pharmaceuticals, medical equipment and information technologies of Tomsk region | 20 |
| 16 | Altai Krai | Pharmaceuticals, biotechnology and medical industry | ITC | Altaibiopharmaceuticalcluster | 15 |
| 17 | Arkhangelsk region | Aircraft and spacecraft manufacturing, shipbuilding | ITC | Shipbuilding innovative cluster of Arkhangelsk region | 19 |
| 18 | Kemerovo region | Chemistryandpetrochemistry | ITC | Complex processing of coal and industrial waste in Kemerovo region | 16 |

| | | | | | |
|---|---|---|---|---|---|
| 19 | Nizhny Novgorod Region | Chemistryandpetrochemistry | ITC | Nizhny Novgorod industrial innovative cluster in the field of automotive and petrochemical industry | More than 92 |
| 20 | Republic of Bashkortostan | Chemistryandpetrochemistry | ITC | Petrochemicalterritorialcluster | 16 |
| 21 | Saint-Petersburg | Informationtechnologiesandelectronics | ITC | Development of information technologies, radio electronics, instrument engineering, communication and infotelecommunications of St. Petersburg | 15 |
| 22 | Ulyanovsk region | Aircraft and spacecraft manufacturing, shipbuilding | ITC | Consortium"Scientific-educational-production cluster "Ulyanovsk-Avia" | 7 |
| 23 | Ulyanovsk region | Nuclearandradiationtechnologies | ITC | Nuclear innovative cluster of Dimitrovgrad, Ulyanovsk region | 26 |
| 24 | Khabarovsk Krai | Aircraft and spacecraft manufacturing, shipbuilding | ITC | Innovative territorial cluster of aircraft and shipbuilding in Khabarovsk Krai | 6 |

Source: according to the Russian cluster Observatory (2017).

– information technologies and electronics (Moscow, St. Petersburg, Novosibirsk, Tomsk regions, Republic of Mordovia)

Let us consider the features of the most successful innovative clusters formation in modern Russian economy. The most striking example is Kaluga region. The region is distinguished by a constellation of clusters, the crown of which is innovative pharmaceutical cluster "Pharmaceuticals, biotechnology and biomedicine". It consists of more than 60 participants, including manufacturers of well-known brands of pharmaceutical industry. These are companies: "Stada", "Berlin-Chemie/Menarini", "NiarmedikPlus", "Novo Nordiks", "Astra Zeneca". A community of small innovative firms, whose share exceeds 70% of total number of companies, has formed around large pharma producers. Implementation of creation and diffusion of innovations process became possible due to diversity of cluster members. Along with manufacturers research institutes, specialized universities, corporate training centers and specialists in the field of pharmaceuticals, manufacturers of medical equipment, engineering companies are also participants of Kaluga pharmaceutical cluster. Well-coordinated work of cluster participants concentrated on a single territory allows achieving a synergetic effect. Cluster participants set a goal to become one of the three leaders in terms of production of innovative pharmaceuticals in Russia by 2020 and to increase the market share to 10% (Kaluga pharma cluster, 2019).

If in Kaluga region the work of innovative pharmaceutical cluster is carried out for several years, Ulyanovsk region is at the very beginning of innovative cluster "Technocampus 2.0" formation. Creation of a new cluster is based on the merger of two high-tech clusters: aviation and nuclear. New cluster will significantly expand the range of previously implemented competencies. The specialization of "Technocampus 2.0" cluster in the field of nuclear technologies and aerospace was supplemented by production of new materials, renewable energy and e-Health. This became possible due to presence of advanced industrial production and effectively functioning sphere of small innovative business in the region. To a large extent, the process of creation and diffusion of innovations can be achieved through the expansion of cluster members. Engineering centers, pilot productions and advanced educational institutions of region, including universities, pre-school institutions and schools became participants of new cluster. Mandatory creation on the platform of innovative cluster "Technocampus-2" of infrastructure for life and recreation is provided (The Website of the Development Corporation of Ulyanovsk Region, 2019). The leadership of Ulyanovsk region considers creation of a new innovative cluster as a main tool to solve the problem of region's economy transformation – to ensure transition from currently prevailing industrial model, focused on traditional markets, to a model with significant share of new high-tech economy.

In Tomsk region, formation of a new innovative cluster "SMART Technologies Tomsk" was carried out in a similar way – on the basis of previously functioning six clusters operating in the field of petrochemistry, nuclear technologies, forestry,

pharmaceuticals, medical equipment, IT, renewable resources. The purpose of innovative cluster is to grow global players in the field of telemedicine, industrial robotics, probiotics, production of pharmaceutical ingredients. The principle of synergy is provided by diversity and coordinated work of cluster members Dynamically developing small and medium-sized businesses, scientific and educational companies along with flagship companies, which are called mature participants are participants of new cluster. The cluster has more than 115 organizations with more than 150 thousand employees, about 90 thousand of which are engaged in higher education (Ermoshin, 2016).

As part of innovative cluster "SMART Technologies Tomsk" implementation, 11 promising areas with a growth rate of markets from 7 to 40% per year were identified: technical vision, telemedicine, industrial robotics, probiotics, pharmaceutical instruments and others (Ermoshin, 2016).

## Conclusions

Current trends of cluster development in Russia can be described as follows.

1. Shift of the model focus for clusters: from market allocation model to planning and design model (Larionova, Yalyalieva, Napolskikh, 2018)
2. Maintaining the focus on innovative territorial clusters, from which large enterprises of mass production can grow (Nosova et al., 2019). According to experts, 2018 marks the change of the fifth 50-year Kondratiev cycle by the next – the sixth, the technological core of which are nano-, bio-, info- and cognitive technologies. They will determine the emergence of new industries (Nosonov, Letkina, 2019), economic recovery in 2020–2030 and diffusion of innovative products to markets.
3. There are two results of cluster process interaction in Russia and the process of development and distribution of productive forces at regional level (Makar, Khasheva, Yarasheva, 2019). Firstly, innovative and modernization clusters, which, in fact, represent territorial and sectoral clusters, including scientific and educational institutions, regional enterprises and organizations. Such cluster structure can be inter-regional, based on "activity" (industry) poles of growth with a global reach. Secondly, regional clusters formed strictly within the borders of regions-subjects of the Russian Federation. Municipalities are combined in regional clusters on the following grounds: territorial community, attraction to highways, relative uniformity of economy specialization, transport and economic relations direction between municipalities, economic potential, level and quality of life. The need for formation of such regional clusters is obvious: it is necessary to create and support viable points of growth throughout the Russian Federation territory. Such formations can be called "quasi-clusters" because they do not meet the essential features of cluster – value added chain formation. However,

they are based on principles of interconnectedness, interdependence (Makar, 2013).

4. Formation of information-industrial clusters will continue. Its elements include not only objects and their relationships, but also quality and properties of space (Makar, Nosonov, 2017).
5. Cluster creation should help to solve the problem of domestic products low competitiveness (Nosova, Makar, Chaplyuk, Medvedeva and Semenova, 2018).

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# 21 Innovation and Educational Clusters as an Alternative Model of Scientific and Technical Growth of the Regional Economy

## Introduction

The macroeconomic dynamics of the post-crisis development of Russia shows that after the global financial and economic crisis of 2008 the domestic economy did not manage to recover and move to a phase of economic growth. The continuing stagnating macrodynamics in 2010–2014, when the growth of the national economy was close to zero rates and was not more than 0.7%, followed by an inert economic growth of 1.6% and 1.5% in 2017 and 2018 accordingly, while the world economy was growing at a rate of at least 3.9%, demonstrates weak performance of the economic policy instruments used by the Government of Russian Federation. As a cumulative result, the Russian economy grew by 6% (2008–2017) versus 35% of the global growth over the same period (Figure 21.1). The medium-term economic development forecasts of the leading Russian and international expert agencies that assessed the potential growth of Russia's GDP for the future 2019–2024 look pessimistic in the range of 0.8–1.7% in 2019–2020 and no more than 3% in 2024, subject to favorable global market conditions and the prevention of domestic and foreign threats to the security of the national economy. In any case, the forecast of the Ministry of Economic Development for 2019–2020 (1.4% and 2.0%, respectively) is clearly overestimated (*Forecast of the socio-economic development*).

The low projected rates of potential growth in Russia's GDP are due to possible risks and threats (to which Gaidar Forum attracted considerable attention – 2019), among them the following should be noted:

- excessive role of the state in investing. Public investments are planned in the amount of 12–15%, which is clearly not enough to stimulate economic growth, taking into account the growth of interest rates on loans.
- strong correlation dependence of GDP on oil prices for the Russian economy, which increases in the conditions of a fall

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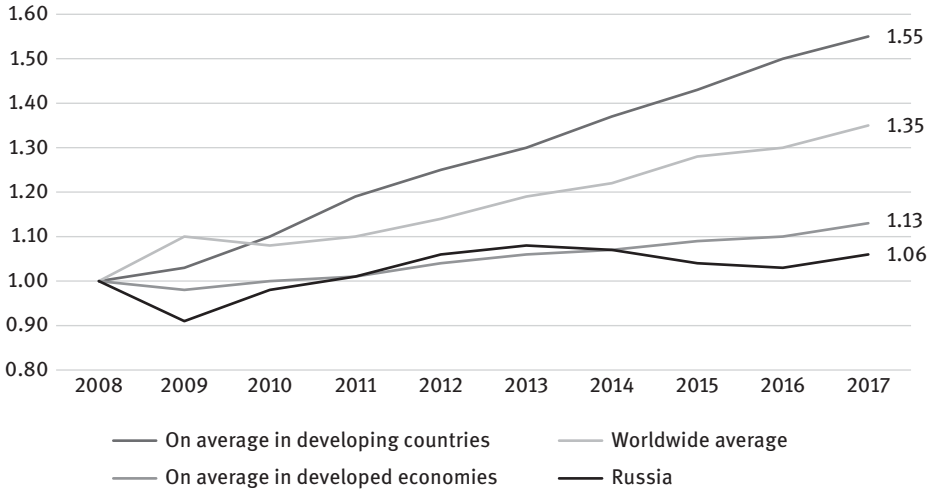


**Figure 21.1:** Russia's GDP growth rate compared with individual groups of countries in 2008–2017. Source: GDP per capita of the world 2018.

- debt burden on the population, which reduces the stimulating effect on the economy from the demand side
- slowdown in the growth of the global economy by 2021, which will slow down economic growth at the national level

In fact, the Russian economy demonstrates the exhaustion of sources of post-crisis recovery based on the addition of existing capacity, and therefore it is necessary to revise the model of Russia's economic development and its transformation in order to increase national competitiveness. Such an approach implies a reassessment of available resources and factorial constraints of the Russian economy, as well as the search for new institutional entities capable of leveling the latter and ensuring the country's transition to innovative development (Alpidovskaya and Tsikin, 2017). These circumstances actualize the importance of using the new stimulation tools of public policy both by the federal center and by regional authorities.

## Cluster Analysis Methodology

M. Porter can be considered the founder of methodology of cluster policy. He developed the ideas of clustering within the framework of the theory of international competition and competitive advantages that new integration associations had, in particular, "economy on scale", reduced transaction costs and increased financial sustainability. M. Porter offered one of the first definitions of a cluster as a group of

"geographically neighboring interconnected companies and related organizations of a certain sphere, characterized by common activities and complementary to each other" (Porter, 2000). Despite the fact that the development of the theory of cluster structures by M. Porter started back in the 90s of he twentieth century, however, its' provisions and recipes remain relevant today.

Further, cluster theory was developed in the works of modern foreign authors (Estrella, 2011; Braunerhjelm and Feldman, 2006; Mariussen, 2001) and a number of Russian scientists (Osipov, 2012; Shastitko, 2009), whom considered cluster policy from the point of view of creating necessary conditions for the formation of regional clusters in order to stimulate the accelerated development of territories.

## World Experience of Cluster Policy of Stimulating Scientific and Technological Growth in the Region

A striking example of the successful regional clustering of the United States in the field of innovation is "Silicon Valley" (California) as a collaboration of venture capital and research centers. This agglomeration is a collection of 87,000 different companies that interact with more than 50 research organizations and universities as well as about 200 venture funds and 800 commercial banks (Solvell, Lindqvis and Ketels, 2003).

The peculiarity of Japanese regional clustering is the configuration of the cluster organizational system. Its core is a large corporation around which many medium and small firms are concentrated. The competitive advantage of such a cluster structure is the ability of a large corporation to provide technological economy on scale. The leadership of Japan focuses on creating regional conditions for the interaction of large regional industrial enterprises with state research organizations and higher education implementing the state policy of regional clustering. Example of successful regional-industrial clusters in Japan is Toyota company, which produces cars. This cluster is a network of about 130 large supplier companies and 36 thousand medium and small subcontracting organizations (Cherkasova and Cherkasov, 2018).

The experience of a number of developing countries led by India and China is of particular interest, because it shows annual growth rates of 6.7% versus 2.5% in EU countries (Bulletin on Current Trends in the Global Economy).

Analysis of the reform of science management system in China has demonstrated significant changes. As a result of its modernization, a new mechanism has been created to transfer scientific and technological developments and innovations to the national economy. Since the end of the 1970s, after a long stagnation of the Chinese economy, the country's leadership was developed by state program of "four modernizations" aimed at the intensive development of science and technology, the agricultural sector, industry and defense. Science and technology since 1978 became the main factors production, and the management of the NTR – the main instrument of public administration. From 1978 to 2000, three waves of the "three-step modernization"

strategy by Deng Xiaoping were implemented, the main priorities of which were 12 directions of scientific and technological revolution, including the development of microelectronics, computer science and genetic engineering, biotechnology, energy, space and laser technology, the creation of new software and information technologies, the implementation of major technological changes in the agricultural sector (Osipov, Sinelnikov and Antropov, 2014).

One of the tools for implementing the strategy in the first step of the third wave (2000–2020) is technology parks and innovation-industrial clusters. But this toolkit in China has its own specifics. In the People's Republic of China a specific model for the creation and development of technology parks has been formed, in which the state played a key role. In particular, the state fully assumed the burden of covering all costs of maintenance and development of technology parks. The experience of using the model of a private-state partnership shows that the state provides private investors with land plots both for the construction of technoparks themselves and for the implementation of development projects. "As for the issue of creating industrial clusters, in China this process is natural when large enterprises independently make decisions on improving quality and reducing production costs by optimizing and bringing together cooperative chains" (Chinese experience of development of clusters and technology parks).

Indian instrument for accelerating economic development is based also on the policy of clustering. The basic principles of its implementation are formulated by the Department of Industrial Policy and Development of the Ministry of Commerce and Industry of India, created to accelerate the economic development of the national economy on the industrial-technological base in 1995. Today there are 106 successfully operating clusters with a specialization in computer technology in India. (Global Economic Summit). The total turnover of the Indian IT industry in 2017 is 70 billion US dollars. In India, as in the rest of the world, techno-regions are projected on the principle of Silicon Valley in an attempt to replicate its success. In particular, a Silicon Plateau was created in Bangalore, demonstrating a positive experience in the field of IT industry clustering policy. Clusters in India have strong support from the state. Thus, the government provides high-tech companies with tax breaks, in particular, exemption from their payment for up to 5 years for companies operating in technology parks. At the same time, the form of ownership of IT company and its' size does not matter, only its belonging to the IT industry is important.

## Domestic Model of Regional Innovation and Educational Clusters

In Russia the cluster policy began to be implemented in 2010. In 2011, the non-profit partnership "Association of High-Tech Technoparks" was created, renamed in 2015 as the Association of Cluster and Technopark Assistance Organizations, which was supposed to ensure the implementation of the state program of technology parks

development, and then to coordinate the development of established technology parks and industrial clusters. In accordance with the data of the Association, in 2017 137 clusters operated in Russia in 52 regions of the country, of which 25 are industrial clusters that have confirmed their compliance with the requirements of the Ministry of Industry and Trade of Russia and are included in its register. The participants of these clusters present more than 400 industrial enterprises among which about 75% belong to small and medium-sized businesses. As it was noted in the analytical review of the Association, "from year to year industrial clusters continued to be a driver of growth in the real sector of the Russian economy. In particular, labor productivity in average in industrial clusters is 30% higher than the average value in the manufacturing industry of Russia, and amounts to 4.2 million rubles per person. The total volume of products shipped by cluster members by the end of 2016 amounted to 714.8 billion rubles, and in 2017 it is projected to increase to 760 billion rubles" (III annual review "Clusters of Russia" 2017).

Since 2015 the implementation of cluster policy has been carried out on the territory of Rostov region. For its successful implementation Government of Rostov region created the necessary legal framework and developed policy documents, the "Concept of cluster development of the Rostov region for 2015–2020" was approved and set of main activities in the development strategies of six priority territorial clusters of the Rostov region for 2016–2020 was determined (Decree of the Government of the Rostov Region. February 18, 2016, No. 104). Among the six main regional clusters are: the Southern Constellation innovation and technology cluster; innovation and territorial cluster of marine instrumentation "Marine Systems"; innovative territorial machine tool cluster; biotechnology innovation cluster; innovation-regional cluster "Don milk products"; cluster of information and communication technologies (Cherkasova and Akimova, 2018).

The basis for the design of regional clusters lays on a principle of consolidation of the production potential of a municipality around specialized universities or research institutes that serve as a point of growth and formation of urban agglomeration. In fact, it means an innovative educational cluster.

Innovation and education cluster is a set of interrelated institutions of higher education, united by industry based on partnerships with enterprises of the municipality of one or more related industries (Cherkasova, Nuvakhov and Akimova, 2017). The principles of the functioning of the innovation-educational cluster are: joint educational, scientific and innovative process in conjunction with the economy and the social sphere; continuity of the educational process and the relationship of educational programs at various levels; organizational, educational and methodical, scientific and informational interaction between all subjects of the cluster. Then the essence of the educational cluster is "connecting the employer and educational institutions with the help of a complex of cross-cutting programs" (Kravtsov and Mihelkevich, 2015). An educational cluster is significantly different from a fairly widespread industrial cluster, the result of the operation of which is a

particular product, while the result of the educational cluster is an educational or research and development service.

In fact, the innovation and education cluster implement the partnership within the framework of the innovation chain "education-science-technology-business", based mainly on the chain of internal horizontal links. Such a partnership can provide a synergistic effect, which consists in the training of personnel of the required level of quality and competence of the customer (business) for a specific workplace. In this situation institutional traps are eliminated due to the gap between the educational market and the labor market, on one hand, and the relevance of university research for businesses, on the other. The latter is solved by the fact that training for a specific workplace allows students, undergoing practical training and internship at a particular enterprise, to research in the framework of university creative teams for urging problems of business. Therefore, educational clusters allow to solve the problem of the development of the municipal community of a specific territory through fundamental scientific and applied research, educational projects, new technologies and methods for designing and producing an intellectual product.

In this case, the innovation-educational cluster becomes investment-attractive for business partners, because while investing in personnel training they receive not only specialists in accordance with a given competency model, but specific intellectual products obtained by personnel retrained.

The general algorithm for the formation of educational clusters can be represented as a diagram (Figure 21.2).

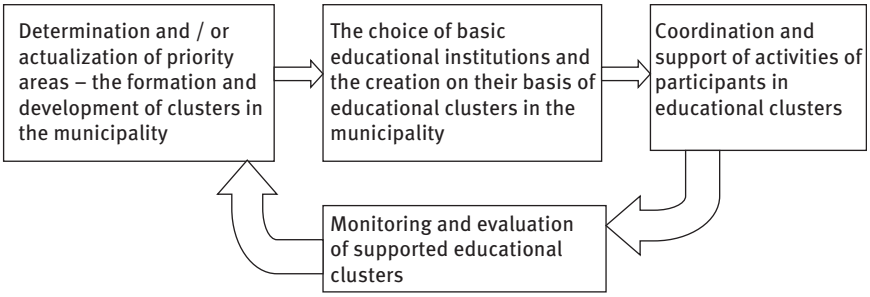


**Figure 21.2:** Scheme of creation and development of an educational cluster.

For example, the core of the cluster "Southern Constellation" was formed by two organizations: Rostov-on-Don FSAEI HE "Southern Federal University" and the city of Taganrog PJSC "Taganrog Aviation Scientific and Technical Complex. Gm Beriev". This made possible to form around them an innovative industrial belt of small and medium-sized business, in particular, it included OJSC Kvant Scientific-Production Enterprise of Space Instrument Engineering, Azov Optical Mechanical Plant OJSC,

Almaz OJSC, Granit PJSC, FGANU Research Institute "Specialized computing protection devices and automation" and others. The formation of regional educational clusters through such a scenario is accompanied by the development of transport, energy, information and communication infrastructure facilities that ensure the coherence of municipalities, thus becoming an additional stimulus for the economic growth of the region.

## Results

The implemented approach of the regional government to clustering is consistent with the spatial development strategy of the Russian Federation for the period up to 2025 and allows us to identify key areas of urban and rural development that contribute to a cumulative effect on the economic development of the region. In particular, in accordance with the spatial development strategy, the city of Rostov-on-Don has already been assigned to the current centers of economic growth in the Russian Federation, along with 13 other "cores" of urban agglomerations, including Moscow, St. Petersburg, Yekaterinburg, Chelyabinsk, Novosibirsk, etc.

It should be noted that starting from 2016, the GRP of the Rostov Region has been steadily growing. So, if in 2016, the growth of GRP on the Don was 2.7% and in 2017–2.9%, then in 2018 it increased to 7.5%. If we evaluate the investment attractiveness, the rating of the Rostov region by investment attractiveness increased by 8 pp. in 2017 compared to 2016 and this was confirmed also in 2018 according to National investment agency. Such data allows us to consider the Rostov region as a region with an average level of investment attractiveness of the first grade. An important role in the revitalization of the region and the growth of its investment attractiveness was played by a balanced and consistent regional clustering policy.

## Recommendations

However, despite the results achieved, more efforts in this direction remain to be done. The analysis of the first results of the work of six main innovation-industrial clusters of the Rostov region made it possible to identify problem areas that still need to be worked on. Among the problematic moments of the implementation of cluster policies the following should be noted:

- need to create developed cluster infrastructure
- importance of creating an effective mechanism to stimulate commercialization of innovations
- importance of creating institutional conditions to stimulate productivity growth within the cluster entities
- need to provide consulting in the field of clustering

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# 22 Pattern for Digital Transformation of Project Implementation in the Regional Public Management

## Introduction

Modelling is one of the most common methods of cognition, employed in economics. It is indispensable for understanding all the variety of the economic phenomena and processes, if they emerge simultaneously and their existence is interrelated. When modelling, the researcher focuses on essential properties and behavior patterns of the objects, occurrences and processes under study, and that allows simplifying their descriptions, identify cause-effect relations and logic in behavior and cooperation, explain causes and consequences, work out appropriate managerial decisions.

Scientific-and-technological advance in the public management facilitates automatization. As a result, many functions and powers of public authorities are carried out electronically, including those, belonging to the project approach implementation.

V.A. Plotnikov argues that during scientific-and-technological advance, when innovative growth patterns are quite common, the state and, consequently, public authorities have turned out to be the most efficient tool to influence these processes (Bodrunov, 2018).

Nowadays there are two ways of project approach implementation in the public management: to achieve strategic goals through national, federal and regional projects; to involve public authorities in the management of projects that require intersectoral interaction: public–private partnership, concession, special investment contract, participatory budgeting (Tsurkan, Sotskova, Aksinina, Lyubarskaya and Tkacheva, 2016).

Most projects of the public management system have mid or long-term objective fulfilment period and require the monitoring system that will consider the digital transformation lines, specified for the public authorities in the strategic agenda up to 2024.

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"The digital transformation" as a result of scientific-and-technological advances in its broad sense is defined as the change, associated with the digital technologies use that affects all the aspects of society (Dobrolubova et al., 2019).

According to the definition, given by V.M. Bondarenko: "the objective of the digital economics is to find an integral, systemic and comprehensive human relations pattern, which, in cooperation with the fourth industrial revolution technologies, is able to ensure the attainment of the fairy set goals" (Bondarenko, 2017).

The researchers Dobrolubova E.I, Yuzhakov V.N., Efremov A.A., Klotchkova E.N, Talapina E.V. and Strartsev Ya. Yu [3] point out that the strategical development center experts give the following definition of the digital transformation: "this is a deep reorganization of business processes reengineering, in which digital tools act as special process enforcement mechanisms. Such reorganization results in substantial improvement of process features (process execution time reduction, elimination of some sub-processes groups, output increase, drop in resources, spent on processes execution etc.) and/or emergence of traits and properties that are crucially new for these processes (automatic decision-making without human participation etc)." (Konyagin, 2017).

In this light it is too early to discuss digital transformation implementation into the public management, due to the existing degree of automatization, regarding monitoring process. The issue is burning at the regional and municipal level.

Resources, technological and institutional aspects have always been burning issues in this light.

Just a few regions have managed to create conditions, enabling proper media support for national projects, carried out on their territory, i.e. they began to effectuate technological transformation of project management media support. This is considered to be the first stage of the digital transformation, for the digital economics implies the system of economic relations "between objects, state, and objects that can generate accumulate, process and exchange information through networks due to IT technologies" (Dyachenko, 2019).

The objective of this paper is to develop a flexible pattern in order to carry out efficient digital transformation for project implementation monitoring in the regional public management. This pattern should take into account institutional, technological and resource aspects.

## Methodology

Systemic analysis is the main method, employed during this study. It allows regarding digital transformation of project implementation monitoring in the regional public management as a part of managerial mechanism, involved in media support process for the corresponding project management branch.

The simulation approach was employed to make a formal description of the practical use of digital transformation of project implementation monitoring in the regional public management.

The data sample includes information, hosted on official web-sites of the regional authorities, as well as provided by Russian data systems developers and the Analytical Centre, affiliated to the Government of the Russian Federation.

# Results

## Pattern for Digital Transformation of Project Implementation Monitoring in the Regional Public Management: Notion and Essence

In a broad sense, a pattern is an object-substitute for the original, designed for studying some of its properties (Sovetov and Yakovlev, 2001).

Economic pattern is a simplified form of economic landscape expression, i.e. this is an abstract, formal description of different economic processes and occurrences that exist in the real economy and are interrelated with each other in some way (Bazhenova, 2016).

Various sources have different interpretations of the interdisciplinary term "monitoring".

As per GOST R ISO 9000-2015 "National standard of the Russian Federation. Quality management systems. Fundamentals and glossary" monitoring is the determination of the system status, process, goods, services or activity.

As a rule, monitoring is the process of object status determination that is performed at different work stages or in different work periods.

A. N. Mayorov argues that if we consider the notion of monitoring as a general scientific category, then we should give the following definition: "Monitoring is the system of collection, processing, storage and distribution of information about any other system or its elements. Monitoring provides data support in order to manage other systems, it helps to evaluate their state at any time point and to predict their development" (Mayorov, 2005).

Borovkina T.I. and Morev I.A. put forward the idea that the approaches to the definition of the term "monitoring" should be classified, taking into consideration various features. The key feature in this case is the area of application, for it allows determining various kinds of the object in question. (Borovkina and Morev, 2008).

Economics possesses the maximum variety of the monitoring kinds: socio-economic one; institutions' financial state monitoring, including credit organizations, taxpayer monitoring; bank monitoring etc.

Project implementation monitoring in the regional public management should be regarded both political and economic, if the projects help to attain national goals and preserve national interests and only as economic one, if we speak about public–private partnership or participatory budgeting projects.

This statement corresponds to S.S. Sulakshin's point of view, according to which "state policy monitoring implies measurement of values that are relevant to the state policy goal. These values should characterize control object state" (Sulakshin, 2008).

Charles S. Wasson argues that the monitoring helps to identify trends for certain values. These trends give the possibility to predict indicator values and foresee further system state. In such a case there is no need to bring the system into more stable state by means of retarded and uncertain data (Wasson, 2005).

Thus, project implementation monitoring in the regional public management is the system of collection and systematization of information, regarding the implementation of projects that require intersectoral interaction, involving regional authorities or regional projects, aimed at attaining national goals in order to identify deviations from planned values and work out project risks mitigation measures.

Thus, the established regional monitoring system should be able to identify public–private partnership projects risks. The process should involve regional authorities

Nowadays, if we want to preserve national interests and attain national goals, we should monitor their implementation and fulfilment at the national level from the very beginning. This is a crucial point.

It is worth mentioning that nowadays there are 12 national projects in Russia. Regions have worked out from 3 to 11 federal projects to fulfill each national one. The essence of these federal projects should be reflected at the regional level.

Regional project offices should monthly summarize and check data about regional project implementation. This information is indispensable for the federal project reports, which are compiled by the participants of the corresponding regional projects. The regional offices should submit this data to the federal project manager and to the project office of the Government of the Russian Federation not later than on the 4$^{th}$ working day of the following accounting month.

This data should be systematized and taken into account during federal and national projects monitoring.

National and federal projects implementation monitoring should represent a system of activities, aimed at evaluating actual parameters of these projects, at calculating the deviations of actual parameters from planned ones, at analyzing root causes of such deviations, at forecasting the progress of the project implementation, at making managerial decisions on determination, approval and making possible corrective actions.

As for the federal level, compilation, coordination, approval and submission of documents and data, drafted during project activities should be done within state integrated management information system for public finance distribution that is

called “Electronic budget”. The monitoring of these processes should be carried out under this program as well.

Every constituent of the Russian Federation has its own regional project information management system.

Digital transformation of the monitoring in question is the simplest way to describe the changes in the system of collection and classification of data on the projects, implemented by the regional public authorities, considering current digital agenda, specified in regulatory acts, as well as existing technological, resource and institutional aspects.

As per purpose, this model can be classified as a prescriptive one, i.e. it is designed to determine desirable state of the object and is based on the developmental possibilities of the system.

## Technological, Resource and Institutional Aspects in Digital Transformation of Project Implementation Monitoring in the Regional Public Management

The scientists from Institute of Economics Russian Academy of Sciences argue that the essence of modern economics is distribution of innovative technologies that affects both formation of new economic sectors and industries, primarily, manufacturing industry, which produce these technologies and particularly, their spread into traditional economic sectors and industries. Therefore, we should dwell on several interrelated aspects of this process: macroeconomic, structural, technological, resource and institutional (Lenchuk, 2016).

Under this study such aspects as technological, resource and institutional are of particular interest. Considering the studies of N.V. Novikova (N. Novikova, 2018) and the author’s point of view, the mentioned aspects can be defined as follows:

Technological aspect touches on technological essence of development projects in different sectors and industries, when upgrading their systems and diversifying possibilities.

Resource aspect is about needs and possibilities of resource allocation for different structures, meaning both financial and nonfinancial sources, taking into consideration existing scientific-technological and human resources. This aspect also deals with proposals on overcoming existing resource limitations.

Institutional aspect includes formal and informal rules and standards (mechanisms) of functioning and cooperation for main process constituents, tools for evaluation of established rules and standards, for generation of proposals on quality improvement for institutional environment in terms of monitoring implementation, considering innovations.

We have already dwelt on the fundamentals of technological aspect in terms of current digital agenda for public management structures. Now we should clarify something about the resource aspect.

The main burning issues of monitoring resources allocation are human resource development and training project skills for government agencies employees in the regions that deal with digital constituent.

Nowadays in the Russian Federation there are several project skills evaluation systems, operating under voluntary certification. The most famous among them are: IPMA and SOVNET; PMI; PM Standard; International project certification (IPC).

In February 2018 the Ministry of Labor and Social Protection of the Russian Federation approved guidelines on qualification evaluation procedure for employees, which should certify that the government officials, who are involved in project management, have necessary skills. It is worth mentioning that proposed guidelines are for civil employees only, while people, who take non-state positions in the state agency also, may be involved in the project implementation in public management.

Neither of existing systems supposes project skills digital constituent evaluation.

Project approach for regional public management proposes the following definition for the notion of "project competences" – are the kind of professional competences, which form knowledge and skills of the civil employees and people, who take non-state positions in the regional public management structures. These skills are indispensable for management of projects, aimed at attaining the national interests of the Russian Federation in particular regions, including operating strategic planning system for socio-economic development and (or) managing projects that require intersectoral interaction according to the assigned project role.

Digital component of project competences in the process in question is related to the notions "individual digital competence" and "individual occupational mobility", resulting from the synergy of the following definitions:

- relation of individual information competence with the aptitude of individual to networking cooperation and mutual information activity, with work skills in terms of information, with the ability to create and keep online content as an independent and active element, with the ability to surf through information and communications technologies (Tabachuk, 2017)
- relation of occupational mobility with inner personal resources, aimed at performing current professional tasks, adapting to quickly changing digital society (Tabachuk and Kazinets, 2019)

Institutional aspects of the monitoring in question include formal and informal rules and standards (mechanisms) of functioning and cooperation for main process constituents (regional and federal structures), including those, specified in the RF Government Decree, dated 31.10.2018 No. 1288 "On organization of project activities in the Government of the Russian Federation", Federal laws of the Russian

Federation 224-FL, 115-FL, 488-FL and legal acts, regulating participatory projects implementation.

## Pattern for Digital Transformation of Project Implementation Monitoring in the Regional Public Management

The pattern for digital transformation of the process in question is presented in Figure 22.1. It is based on the analysis of the academic sources, as well as experiences of information technologies practical use during the project implementation monitoring in the regional public management.

This pattern reflects the authors' point of view, according to which the technological transformation is the first stage of the digital transformation that can also be regarded as an independent element.

The crucial difference between technological and digital transformation resides in the levels of the monitoring processes automatization and human participation in these processes.

Besides, the successful transition from technological to digital transformation should be accompanied by the increase in labor costs reduction rate for monitoring implementation.

In other words, we should maintain the following inequation:

$$K_t = \frac{\Delta T}{T_0} < K_{t1} = \frac{\Delta T_1}{T_{01}}, \tag{22.1}$$

Where, $K_t$ is the annual labor costs reduction rate, resulting from technological transformation of project implementation monitoring in the regional public management;

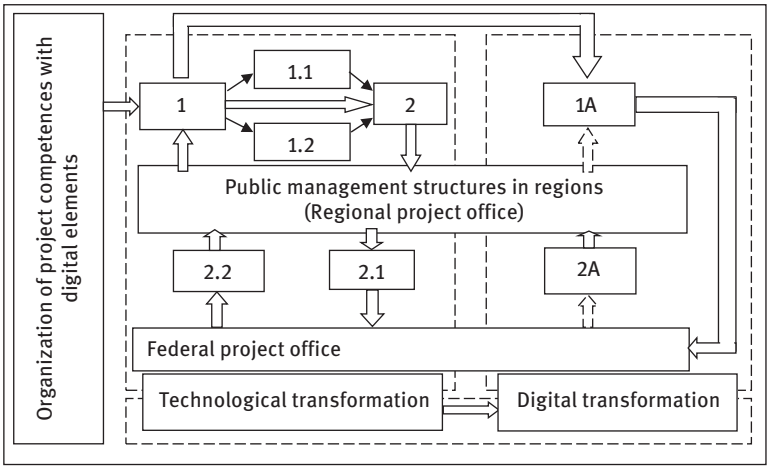
$\Delta$T – Annual absolute value of labor costs reduction for regional projects monitoring in public management structures after and before the PIMS implementation;

$T_o$ – Basic annual labor costs for project implementation monitoring in the regional public management before the PIMS launching;

Where $K_{t1}$ – annual labor costs reduction rate, resulting from digital transformation of project implementation monitoring in the regional public management;

$\Delta T_1$ – Annual absolute value of labor costs reduction for regional projects monitoring in public management structures after and before digital transformation;

$T_{01}$ – Basic annual labor costs for project implementation monitoring in the regional public management under technological transformation;




| | |
|---|---|
| ⇨ | Process lines |
| → | Object constituents |
| ⇨ | Indirect human participation (observation) |
| **1** | PIMS implementation |
| **1.1** | Information support for management of projects that require inter-sectoral interaction |
| **1.2** | Information support for management of projects, aimed at reaching national goals |
| **2** | Collection and processing of information about regional projects implementation, elaboration of reports on monthly monitoring values |
| **2.1** | Submission of regional monitoring values for federal projects, aimed at reaching national goals |
| **2.2** | |
| **1A** | Automatic compilation and submission of regional project monitoring values on a monthly basis |
| **2A** | Automatic compilation and submission of documents that contain responses on regional monitoring values for federal projects, aimed at reaching national goals |

**Figure 22.1:** Pattern for digital transformation of project implementation monitoring in the regional public management.

## Conclusions

We can conclude that nowadays, it is too early to speak about full digital transformation of the process in question.

The regional public management structures in Russia should start with the first stage – they ought to carry out technological transformation, which can provide sufficient media support for public-private partnership, concession, special investment contracts, participatory budgeting and regional projects, aimed at reaching national goals.

The project implementation management system in the regional public structures should fulfil at least the following functions:

- to manage projects that require intersectoral interaction
- to manage projects of ministries and agencies of the constituents of the Russian Federation, which are of providing nature, if compared to the regional projects, but are also complementary
- comply with the project motivation system, approved by the regional authorities and consider performance ratios for project activity participants
- systematize values of project activity implementation monitoring, submitted at the federal level
- to create databases that contain the best examples of regional project implementation and consider the experience of these regions
- ensure interlevel and interagency interaction

The authors of this paper proposed a pattern that takes into account all the peculiarities of the process in question. It can be employed to launch and boost the process in regions and for further investigations as well.

The results of the study are practically relevant for the government, project managers and scientists, engaged in digital economics and management.

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# 23 The Socio-Economic Situation in the Regions of the Russian Federation in 2018 (Case Study: the Republic of North Ossetia – Alania)

## Introduction

Despite the fact that last year the economy grew by 2.3%, the real incomes of the population, according to data updated by Rosstat, increased only by 0.9% (if the authors take into account the lump sum payment to pensioners in 2017, and without it – by 1,3%). The first estimate showed a decline in real income for the fifth consecutive year – by 0.2%.

These average figures demonstrate a widening gap between lagging and successful regions (Balaeva et al., 2013; Dzobelova, 2017; Eichfelder and Schorn, 2012; Hauptman et al., 2014; Khapsaeva et al., 2018; Ryndina et al., 2010; Sugarova, 2015; Weidong, 2014).

According to Rosstat, the Orenburg, Sverdlovsk, Rostov and Voronezh regions showed a significant acceleration in terms of economic indicators. The stability of regional budgets has strengthened. Industrial production has seen a revival in the Urals and in the center of Russia, has grown in 60 regions. For the first time in many years, the unemployment rate has dropped below 5 percent; in large centers, there already exists a shortage of personnel, but in the North Caucasus and in some regions beyond the Urals this figure is two to three times higher. Differentiation in price growth rates persisted – inflation ranged from 1.9% in Ingushetia to 6% in the Ryazan Region.

The figures of Rosstat show that growth points are appearing in places where any federal projects and programs are being implemented, the influence of regional components of economic development turns out to be insignificant. Not least, this was due to the limited capabilities of the regional authorities within the framework of tight budget constraints.

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## Methodology

The results of 2018 have shown that the financial situation of the regions stabilized, the budget surplus (without the budgets of the territorial FCMIFs) was formed in 65 regions of the Russian Federation, having exceeded half a trillion rubles. The share of transfers from the federal budget in regional revenues fell down to 17%, and the compensation of regional expenditures with their own revenues increased to 87% – these have been the best results over the past decade.

However, the price for this stabilization was stagnation of real expenditures of budgets in 2014–2018, this could not but affect the contribution of budget expenditures to the economic dynamics and level of social support.

The list of the most financially prosperous (Tyumen Oblast, Moscow, Kemerovo Oblast, Bashkortostan, Primorsky and Krasnodar Krai, Samara Oblast) includes regions with a high share of the export-oriented commodity sector in the structure of the economy, as well as the capital, where a significant portion of foreign economic activity is concentrated.

In ten regions, transfers from the federal budget still provide more than half of revenues: these are the Kamchatka Krai, the Kaliningrad Krai, the Altai Republic, the Republic of North Ossetia-Alania (the RNO-A), Tyva, Karachay-Cherkessia, Kabardino-Balkaria, Ingushetia, Chechnya, and Dagestan.

## Results

Industrial production. In general, good dynamics in the extractive sector, mainly due to increased gas and coal production, contributed to the growth in industrial production throughout Russia. The manufacturing industries have made their contribution. Here, growth was associated either with a favorable world market situation, or with direct government support, while in other cases the production stagnated or decreased.

One of the leaders in the growth of industrial production was the Yamalo-Nenets Autonomous Okrug – with a surplus of 17% by 2017. The largest contribution was made by the mining sector, as well as separately – the implementation of the export-oriented Yamal LNG project (the second and third lines were launched 6–12 months ahead of schedule, as a result, by the end of 2018, the plant reached full capacity). In general, over the past five years, the industrial production index in the region has been characterized by a positive trend (a growth rate of about 30%).

Astrakhan region, where industrial production increased by 16.2% over the year, also turned out to be in positive territory due to the mining sector. In 2017, the Filanovsky field, which is being developed by Lukoil, was put into operation in the

region, and the first results have become visible in 2018 (the second phase of field development was introduced just to maintain a stable level of production).

In early October, the first phase of the new Sakskaya CHP was finally put into trial operation and delivered the first portions of electricity to Crimean power grid, and in November, the combined-cycle plant reached its estimated capacity. As a result, growth in the production of electricity alone was 7.8%. Transport engineering has also experienced a growth – by more than 30%- and instrument-making – by 6.5%. One of the reasons for the intensification of the work of industrialists in the regional Ministry of Economic Development and Trade was also said to be state support (concessional loans and subsidies).

Another record-breaker is the Tambov Oblast, and here the reasons for growth are slightly more diverse. The growth of industrial production by the end of the year amounted to 14.4%, and the contribution of the manufacturing industries was higher than that one of the mining sector. The greatest growth was achieved in the production of vehicles and equipment, in metallurgy, the production of computers, electronic and optical products, repair and installation of machinery and equipment, as well as in the chemical industry.

Despite the success of industrialists in most regions, according to surveys, the past year turned out to be difficult: on the one hand, there were no obvious crisis changes, and on the other hand, the positive trends that emerged in 2017 slowed down. This is indicated by experts from the RANEPA and the Gaidar Institute with reference to the industrial optimism index calculated by them. So, last year this indicator retained the values of 2017, that is, the Russian industry could not overcome the stagnation of recent years. Deterioration in the dynamics of demand for industrial products was the determining factor.

Estimates of the financial and economic situation of enterprises have also slightly worsened, but this indicator still leads in the degree of satisfaction of companies. 90% of enterprises in 2017 and 88% in 2018 rated their financial and economic position as “good” or “satisfactory”, while satisfaction with other indicators has always been lower since 2003, experts conclude.

Industrial production in the Republic of North Ossetia-Alania is characterized by the following indicators. In the first quarter of 2018, the volume of shipped goods of own production, works and services performed by own resources by all organizations in the extraction of minerals was 105.7 million rubles (in current prices), or 160.7% to the level of 2017, in manufacturing industries it reached 4559.1 million rubles (139.7%), in the industries providing electric energy, gas and steam; air conditioning – 1650.6 million rubles (108.5%), in water supply; wastewater disposal, organization of waste collection and disposal, pollution control activities was 293.9 million rubles (108.6%).

The industrial production index in the first quarter of 2018 to the level of 2017 in the full range of organizations amounted to 97.0%.

In mining, the production index did not reach the level of last year and stood at 89.5% as a result of a decrease in the production of dolomite and limestone.

In the processing industries for the past 3 months of 2018, the production index was 100.5% as a result of the growth in milk production – by 2.2%, cheese – by 19.5%, butter – by 1.8 times, ice cream – by 14, 2%, confectionery products – by 53.3%, vodka – by 16.3%, sparkling and champaign wines – by 58.8%, beer – by 57.4%, soft drinks – by 9.5%, sulfuric acid – by 24.8%, plastic door blocks – by 2.2 times, plastic window blocks – by 2.3 times, blocks and other prefabricated building products – by 67.9%, cold-rolled sheet metal – by 23.9%, ready-mixed concrete – by 2.7 times, asphalt concrete – by 12.1%, tables – by 57.4%, chairs – by 39.6%.

The production of poultry meat decreased by 28.3%, semi-finished products from meat by 4.7%, sausage products by 0.4%, fermented milk products by 7.8%, alcohol by 37.9%, cognac by 22,8%, mineral water – by 45.8%, tulle cloth – by 25.5%, polymer films – by 10.6%, other semiconductor devices – by 47.8%, ceramic bricks – by 23.8%.

Electricity, gas and steam supplies; air conditioning. The production index in the first quarter of 2018 compared to the same period in 2017 was 92.7%. The production of electrical energy increased by 6.8%, and the generation of thermal energy decreased by 8.3%.

Water supply; water disposal, organization of collection and disposal of waste, pollution control activities. The production index in the first quarter of 2018 compared to the corresponding period of last year reached 89.6%.

Construction. In some regions of Russia there was a real construction boom. The increase in volumes also happened in other regions where not so much is being built – Komi (by 30.3%), Primorsky Krai (29.5%), Altai Krai (24.8%), Karelia (19.1%). "Markets-giants" also grew in the following cities: in St. Petersburg (by 11.7%) and in Moscow (3.6%). Most housing in the country was built in the Moscow region – 8.7 million square meters. The region has not lost its leadership even with a decrease in construction by 3.2%. Most of all, this indicator fell in Chukotka (by 61.7%), in Dagestan (55.4%) and the Jewish Autonomous Region (54.2%).

At the same time, new buildings on average in the country increased by 6.3%, secondary housing by 4.1%. Most significantly, the prices rose on new buildings in Sakhalin (by 21.9%), Chelyabinsk (14.9%) and Tyumen (11.9%) Oblast – where the value of real estate fell sharply in previous years. The prices in the places with the most expensive housing rose more moderately: by 6.1% in Moscow, 7.7% in the Moscow region and 6.5% in St. Petersburg.

Prices in new buildings increased on average across Russia by 3.14%, to 55.6 thousand rubles per square meter in the first two months. The increase in the VAT rate, news about the transfer of developers to escrow accounts, which urge buyers to make a choice, played its role.

In Moscow, the average prices for the first two months increased by 8% and reached 226.5 thousand rubles per square meter. The second place in the cost per

square meter occupies Yalta (120.3 thousand rubles), ahead of St. Petersburg, which is now on the third place (120.3 thousand rubles). New buildings are the cheapest in Nalchik (29.6 thousand rubles). In Saratov and Bryansk the price per square meter does not exceed 34 thousand rubles.

In the secondary market, the price of real estate increased by more than 10% only in Adygea (by 15.5%). Secondary apartments showed an explosive price increase in the fall of 2018, immediately after the increase in mortgage rates.

In the Republic of North Ossetia-Alania for January-March 2018, investments in fixed assets in current prices of 3,290.6 million rubles were used by enterprises and organizations of all forms of ownership to develop the economy and social sphere, which is 148.6% compared to January-March level in 2017.

The volume of work performed by the type of activity "Construction" in January-March 2018 amounted to 2,073.4 million rubles, or 2.2 times more than the level of January-March 2017.

In January-March 2018, 700 apartments with a total area of 52 thousand square meters were commissioned, which is higher than the level of January-March in 2017 by 11.1%.

The share of individual housing construction was 15.8% of the total volume of commissioned housing (8.2 thousand square meters or 124.1% compared to January-March 2017).

In January-March 2018, the following facilities were put into operation: in the Digorsky District, premises for cattle for 500 animals; in Alagirsky District – 1 bridge crossing 14.1linear meters long and 1 radio and television repeater.

8.1 thousand square meters of retail space, 1 road service complex, 1 gas station, 8.2 km of water supply networks after reconstruction became operational.

The standard of living and incomes of the population. The real income of the population is a complex indicator, it takes into account not only wages (they grew by 6.8%, on average, up to 43.4 thousand rubles), but also benefits, pensions, part of income not monitored by wage statistics, and then adjusted for obligatory payments, for example, on loans. In the Southern Federal District alone, real incomes grew by 2%, near-zero dynamics was noted in the Volga, Ural and Far Eastern Federal Districts.

Only six of the 18 regions of the Central Federal District, only two out of 12 in the Northwestern Federal District, one out of 10 in Siberia had a positive dynamic. Such a situation developed against the background of negative real income dynamics of people receiving social benefits, working in the informal sector, and also increases in mandatory payments.

The highest rates of growth in real incomes were observed in Adygea (+ 9.6%), but this is partly due to the low base effect. Among the outsiders are the regions of the Nechernozem'ye: Kostroma (-8.2%), Yaroslavl (-6.7%) and Ivanovo (-6.3%) Oblast. Population is also rapidly decreasing there.

"Against the background of not quite brilliant level of economic development of these regions, such results are alarming, Alexander Shirov says. – For example, the average wages in Ivanovo (25.7 thousand rubles) and Kostroma (27.7 thousand rubles) Oblast do not even reach the median level in Russia (33 thousand rubles – in one half of the regions of salary is higher than this level, in the other – lower). It seems that a number of regions of middle Russia turned out to be on the periphery of both large national projects and programs, as well as in general spatial development strategies of the country".

Consumer demand outpaced income growth: against the background of wage growth in the first half of the year, the population actively took consumer loans. This is a completely rational behavior, reflecting optimism about future earnings. Another thing is that the rapid growth of wages affected mainly the budget sector and lasted relatively short, Shirovoutlined. According to the dynamics of retail trade, the North Caucasus Federal District was leading (4.7%), but this is largely due to the effect of a low comparison base. Only in 8 regions, the physical dynamics of retail was negative, and only in one – Karachay-Cherkessia – the decline was significant (–4.1%).

In January-March 2018, real disposable incomes of the population of the Republic of North Ossetia-Alania (income minus mandatory payments, adjusted for the consumer price index) amounted to 92.3%, taking into account the lump sum cash payment to pensioners in January 2017 in the amount of 5 thousand rubles in accordance with the Federal Law of November 22, 2016 No. 385-FZ., real disposable cash income totaled 94.8%, excluding the lump sum payment (Dzobelova and Olisaeva, 2018).

In January-March 2018, monetary income amounted to 18,951.7 rubles per month on average per person.

The nominal monetary incomes of the population in January-March 2018 amounted to 39898.9 million rubles and decreased compared to January-March 2017 by 5.4%, cash expenditures of the population, respectively, totaled 37052.4 million rubles and fell by 6%. The excess of cash income over expenditure amounted to 2846.5 million rubles.

In January-March 2018, the population used 84.5% of the total cash income to buy goods and services, 7.5% to conduct obligatory payments and fees, 1% to purchase currency. The growth of deposits and securities of the population in credit institutions amounted to 0.9%.

The average salary (without material assistance and social payments) accrued to those working at enterprises and organizations of the republic (in full circle) for January-March 2018 increased by 14.5% compared with the corresponding period of the last year.

Real wages in January-March 2018, calculated taking into account the consumer price index, compared with the corresponding period of the last year increased by 12.5%.

Pensions. As of April 1, 2018, the average size of pensions amounted to 11899.7 rubles, compared with the corresponding date in 2017, it increased by 3.2%. The real size of the assigned pensions, calculated taking into account the consumer price index, was 101.3%.

Labor market. The average number of employees of enterprises and organizations of the republic (in full circle) for January-March 2018 was 121.2 thousand people and increased by 1.3% compared to the corresponding period of the last year.

According to the RNO-A Committee on Employment, by the end of March 2018, the total number of job seekers who are registered and not engaged in employment has been 9.2 thousand people, 8.9 thousand people had the official status of unemployed, which is 0.3% less than a year ago (Dzobelova, 2019).

At the end of March 2018, the number of unemployed receiving benefits increased by 2.2% compared to last year and amounted to 7.5 thousand people.

The demand for workers by enterprises and organizations at the end of March 2018 was 1.586 people, against 1.094 people at the corresponding date of last year.

Social issues. Last year, fewer children were born in Russia than in 2017, Rosstat data claims. These numbers did not become a "surprise". The government expected a decline in indicators and began to develop measures that would make a difference.

So, in the whole country, 10.9 babies per thousand population were born (in the previous year – 11.5). Tyva (20.4 births per thousand population), Chechnya (20.2), Ingushetia (15.8), Dagestan (15.5) traditionally became the record holders in birth rates. The least number of all babies were born in the Tambov, Tula, Smolensk Oblast – 8-8.3 children per thousand population.

Last year mortality rates in Russia did not change, namely 12.4 people per thousand population. Least of all people die in our country in the Caucasus and in the North. Three people per thousand died in Ingushetia, 4.2 in Chechnya, 4.8 in Dagestan, 7.8 in Kabardino-Balkaria and Yakutia, and 7.9 in Tyumen Oblast.

Last year's migration increase amounted to 123.9 thousand people. In 2017, it was 211.9 thousand. Thus, the natural decline in the population in 2018 was 1.5%, in 2017–0.9%.

The decline in fertility is due to a decrease in the number of women of childbearing age. And now a significant increase in their number will occur only in 2033–2035, Maxim Topilin, head of the Ministry of Labor, said earlier to "RG". Until 2035, the number of women of reproductive age will decrease by a quarter. "Therefore, we set ourselves the task of continuing to increase the total fertility rate", the minister explained. He also outlined that the current 1.6 rate is a very good indicator. In many other countries it is much lower.

The president has set a task for the government to increase the birth rate to 1.7 per woman. Since the beginning of 2018, measures such as monthly payments for the first and second children, preferential mortgages at 6% have been launched for its implementation. Now a new package of measures is being prepared.

The authorities are aimed at reducing mortality. The national project "Healthcare" will be focused on this. In addition to medical methods of dealing with the most common diseases (oncology, cardiovascular), it also includes measures aimed at creating a fashion for a healthy lifestyle, responsibility for one's health, and combating alcohol and tobacco addiction.

Demographic situation in the RNO-Alania. The population of the republic decreased by 731 people in three months of this year. In the first quarter of 2018, 2255 births were registered, which is 1.3% more than in the first quarter of 2017. The number of deaths fell by 2.5% and amounted to 1979 people. As a result, the natural population growth was 276 people (in the first quarter of 2017–197 people). 8 people (or 0.4%) were below the age of one year of the total number of deaths. The infant mortality rate in the first quarter of 2018 decreased by 26.5% compared to the first quarter of 2017 and equaled 3.6 deaths under the age of one year per 1,000 births.

662 and 436 marriages were concluded and dissolved in the republic in the first three months of 2018. The number of marriages decreased by 3.4% compared to the first quarter of 2017, the number of divorces increased by 3.1%.

Migration decline of the population of the republic in the first quarter of 2018 was 1007 people against 798 people in 2017. The migration decline in the population is due to the outflow of the population to other regions of the Russian Federation.

According to the Department of Migration Affairs for the RNO-A, 5.897 refugees and internally displaced persons were registered in the republic as of April 1, 2018. By the end of the first quarter of 2017, the number grew to 6.409 people. The largest number of refugees and internally displaced persons arrived from Georgia – 5.502 people (93.3%) and Tajikistan – 184 people (3.1%).

## Conclusion

The main reasons for the significant discrepancy between inflation in certain regions and national average rates are the level of income of the population (the lower it is, the lower the inflation rate which is limited by effective demand) and the cost of delivering goods to remote regions. Last year, inflation began to accelerate after a record low for the modern history of Russia in 2017, when the average consumer price level increased by only 2.5%. In 2016, prices rose by 5.4% (this was the previous minimum), in 2015 – by 12.9%.

The acceleration of inflation in 2018 was due to a combination of factors – the weakening of the ruble against the background of sanctions and turbulence in the markets, the announcement of a VAT increase from 2019, rising prices for gasoline, after which the prices of other goods usually immediately come up, and the return of food market to its standard dynamics on the background of a low base of 2017.

However, the Bank of Russia noted that, in general, there was no going beyond the target for inflation, formulated as "near four percent".

This year, the Central Bank expects inflation of 5–5.5%, it will return to 4% in the first half of 2020. Now, inflation as a whole remains within the framework of the Central Bank's lower expectations, and by the end of February, it amounted to 5.2% in annual terms. Prices do not grow at a high rate primarily because of the suppressed domestic demand of the population. According to experts, the full effect of the VAT increase will manifest itself in March-April and may lead to higher prices.

Inflation may be affected by the ruble exchange rate (through imports) and the seasonality factor (an increase in the share of imported fruits and vegetables in the basket). If the ruble remains stable or strengthens a little, then in the second quarter it will be possible to see stabilization and even some reduction in the level of annual inflation, the analyst expects.

Now the North Caucasus is quite attractive for the development of tourism. But for this we need public investment in the construction of roads, airports, power lines and much more. Local business has no money for infrastructure, Alexander Safonov says. Tourism in Altai, Siberia can be developed, but for this infrastructure is needed. In addition the rest there, as in the Caucasus, should be affordable. Now it is sometimes cheaper to go on holiday abroad.

Another reserve is to give a new impetus to the development of agriculture, cattle breeding, sheep breeding and the processing industry.

The Republic of North Ossetia – Alania is actively involved in the implementation of national projects. In addition, all executive authorities interact with the Ministry of the Russian Federation for the North Caucasus and relevant federal agencies.

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# 24 The Formation of Public-Private Partnership as a Prerequisite for an Effective Industrial and Cluster Policy (Case Study: Omsk Region)

## Introduction

In modern market conditions, the process of forming a cluster and industrial policy of the region is directly affected by the problems of competitiveness of the territory. The formation and retention of competitive advantages of the region determine the market realities of the regional development and the socio-economic viability of the territory. Public-private partnerships system (PPS) in modern conditions is gradually becoming an instrument for the realization of a cluster and industrial policy. This determines the synergistic effect defining the competitive environment and allowing to develop joint efforts of all subjects to guiding development strategies of the regional economy. The valuation of such mergers is elaborated in this article using the example of the Omsk area.

## Methodology

The applied research methodology is due to considering the relationship between industrial policy, cluster policy, and the Public-private partnerships system that shapes investment platforms to galvanize the effective socio-economic development of the territory. For this purpose, we use statistical analysis and selected results of the experts' survey carried out as a part of a research grant RFBR in 2018.

The regional industrial policy creates conditions for business enterprises and investment activity for competitive and innovative development of the territory. The industrial policy of Omsk area is aimed at innovative and secure development of industrial subsectors in the region, at the achievement and maintenance of the high competitiveness of the cluster economy, at the import substitution of the majority sectors products and on that basis the solutions to regional social problems. This includes the necessary boost of industrial sectors of the regional economy through the provision of various forms of support: financial and information support, the support of human resource development, the support in science, technology and innovation, the support to the implementation of foreign economic activity

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and activities for the implementation of resource-efficient and environmentally sound technologies by the economic subjects in the region in the form of State (municipal) preferences.

The cluster policy is determined by the management practice of the regional territories development by the authorities that are interested in an appropriate mix of enterprises and organizations as cluster participants and that are encouraging activities of potential and existing residents to actions which will allow consolidating a selected cluster structure.

The central function of clusters is an embedding of the activities which are located in the region to the system of the territorial division of labor. Therefore, structures that are linked with relations of geographical proximity (within a given region or based on their location near the regional boundaries) and functional relationship in the sphere of production and marketing of goods and services are related to the subjects of regional clusters:

- companies and equipment suppliers of component parts, specialized, manufacturing and business services
- research, educational, financial, insurance organizations (Kiseleva, 2017)

The link between industrial and cluster policy is seen in the need for the formation and development of industrial parks and industrial clusters, specialized organizations of industrial clusters to provide the incentive measures with regard to the field of industry. To meet the challenges of the regional cluster and industrial policy and ensuring processes of regional clusters' formation, the potential of the mechanism of territorial marketing and special-program method of regional and municipal management are coming into play.

These processes are simultaneously accompanied by the formation of a system of a Public-private partnership of government bodies and business taking into account the interests of the territories and the local communities. The system of partnership between government and business community is based on a positive experience of each subject, on a clear understanding of resource allocation processes and on implementation risks. It also based on striking a balance between the interests and needs both the partners and the territory and the society in general. Accordingly, the perspective of the research must justify the feasibility of building parity economic relations on the basis of PPS in the system of implementation of the industrial and cluster policy.

## Results

The basic element to ensure the development of industrial policy and cluster system of Omsk region is an investment component. An investment attractiveness of Omsk

region allows assessing likelihood of success in the accumulation of cluster initiatives in the practice of industrial policy and public-private partnerships, is presented in Tables 24.1 and 24.2.

Based on these data, by the end of 2017 Omsk region was allocated to regions of large group 3B1 by rating of investment climate, which meant "low potential – moderate risk" (The distribution of Russian regions according to the rating of investment climate in 2017, https://raexpert.ru/rankingtable/region_climat/2017/tab1).

The investment industrial potential of Omsk region can be assessed through the following rankings of Russian regions based on data for 9 months of 2017 (RIA analytical bulletin, http://vid1.rian.ru/ig/ratings/regpol_10_2017.pdf):

- for the Index of Industrial Production Omsk region is in 46 (from 85) place with the rate 103,4%
- for the Index of Industrial Production in the area of "The exploitation of mineral resources" – in 80 place (from 83) with the rate 82,1%
- for the Index of Industrial Production in the area of "Manufacturing facilities" – in 42 (from 85) place (103,9%)
- for the Index of Industrial Production in the area of "Electric power, gas, steam and air conditioning" – in 49 (from 85) place (100,9%)
- for the Index of Industrial Production in the area of "The water supply; sewerage, the waste management, Pollution Remediation" – in 17 (from 85) place (110,4%)
- for the Index of the quantity of work completed in building – in 58 (from 85) place: the Index of the quantity of work completed in building – 92,4%; the quantity of work completed – 38,3 bln. Rbl

The industrial complex is one of the leading sectors of the economy of the Omsk region that includes 26% of regional capital stocks and about 21% of the working population of the region. The basis of the priority competitive industrial areas of the Omsk region, due to the regional clusters that are currently relevant in the region, are the petrochemical market, the market for agricultural products, machinery and equipment market, and the forest market.

The market of petrochemical products is represented in the Omsk region by enterprises of two types of economic activity: "Chemical production", "Production of rubber and plastic products" (Program of development of the Petrochemical industrial cluster of the Omsk region until 2020, 2016). Petrochemistry is the basic market direction of the Omsk region, because it has an impact on other industries, on the problems of technological development, economic growth, and national security, both within the region and in Russia as a whole. This effect is due to the fact that the technology of the petrochemical industry and its types of products are the basis for the production of most modern materials that are used in all sectors of the regional economy.

**Table 24.1:** The components of the rating of the investment potential in Omsk area.

| Year | Capacity rank | Proportion to the total Russian potential, % | Ranks of components of the investment potential | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consumer | Labor | Industrial | Infrastructural | Financial | Innovative | Institutional | Natural resources | Touristic |
| 2013 | 31 | 1,002 | 21 | 24 | 19 | 56 | 24 | 29 | 24 | 42 | 65 |
| 2014 | 32 | 0,997 | 22 | 24 | 19 | 55 | 25 | 28 | 25 | 42 | 60 |
| 2015 | 30 | 1,009 | 21 | 26 | 17 | 60 | 24 | 27 | 21 | 43 | 64 |
| 2016 | 31 | 1,000 | 23 | 26 | 23 | 58 | 26 | 27 | 22 | 43 | 70 |
| 2017 | 36 | 0,914 | 25 | 28 | 25 | 58 | 30 | 26 | 25 | 44 | 74 |

Source: drafted by authors using: The investment ranking of Russian regions,(https://raexpert.ru/ratings/regions).

**Table 24.2:** The investment risk of Omsk region.

| Year | Risk rank | Weighted average index of risk | Ranks of components of the investment potential | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Social | Economic | Financial | Criminal | Ecological | Managerial |
| 2013 | 30 | 0.248 | 33 | 8 | 27 | 68 | 52 | 50 |
| 2014 | 25 | 0.234 | 35 | 10 | 30 | 64 | 52 | 56 |
| 2015 | 29 | 0.238 | 42 | 8 | 21 | 73 | 56 | 59 |
| 2016 | 28 | 0.231 | 39 | 8 | 27 | 67 | 55 | 63 |
| 2017 | 33 | 0.219 | 48 | 10 | 29 | 65 | 54 | 60 |

Source: drafted by authors using: The investment ranking of Russian regions, (https://raexpert.ru/ratings/regions).

The Omsk Region is one of the leading Russian regions in the agricultural sector, and in the Siberian Federal District, it ranks second place in the ranking after the Altai Territory in terms of the production of agro-industrial products. The role of the region as an agro-industrial subject of the Russian Federation is due to the presence in the region of 6,2 mln. hectares of agricultural land, it accounts for about 70% of all available land area. The share of the agricultural sector in the GRP of the Omsk Region is 9,5%, in Russia, on average, this indicator is 3,8% (Program of development of the Agrobiotechnological industrial cluster of the Omsk region until 2020; 2016).

The forest resources potential of the Omsk region is the starting point for developing and functioning of forest industry and wood-processing industry. The forest resources in the region are unevenly circulated and its area covers 5927,5 thousand ha (42,1% of total Land Fund area). The forest resources are included in the 19 forestry departments and are located within the territory of all 32 municipalities. The average forest cover is 32% (from 0,3% in steppe and from 55,7% to 72,5% in northern) (The General Directorate of Forestry, http://gulh.omskportal.ru/ru/RegionalPublicAuthorities/executivelist/GULH/Statistika.html). The competitive advantage of the Omsk region in the forest industry is considered to be the advantageous geographical position of the region in relation to forest deficient areas. The conditions for the successful development of the forest and woodworking industry in the Omsk Region are water and raw material resources (the Irtysh and Om' rivers), the availability of administrative and economic levers for regulating the development of the forest industry.

In order to stimulate the formation of industrial clusters in the Omsk Region have been adopted the necessary long-term planning documents which provide the legal basis for the implementation of the cluster approach. The development strategy of the chemical and petrochemical complex for the period until 2030 laid the foundations for the creation and development of petrochemical clusters in the

Russian Federation (Order of the Ministry of Industry and Trade and the Ministry of Energy of Russia "On Approval of the Strategy for the Development of the Chemical and Petrochemical Complex for the Period until 2030", 2014). The feasibility of the formation and development of all clusters of the Omsk region is reflected in the Strategy of Social and Economic Development of the Omsk Region until 2025 and the State Program of the Omsk Region "Development of Industry in the Omsk Region" as one of the key priorities of the region's development in the long term (Government Decision of the state program of the Omsk region "Development of industry in the Omsk region", 2013; the Decree of the Governor of the Omsk region dated "On the Strategy of socio-economic whom development of the Omsk region until 2025", 2013). Actualization of the industrial direction of the region's economic development is dedicated to the Law of the Omsk Region "On the Main Directions of Industrial Policy in the Omsk Region" and the Decree of the Regional Government "On Approval of the State Program of the Omsk Region "Development of Industry in the Omsk Region"" (the Law of the Omsk Region "On the Main Directions of Industrial Policy in the Omsk Region", 2016; Decree of the Omsk Region Government "On Approval of the Omsk Region State Program "Development of Industry in Omsk Region", 2013. The system and principles of public-private partnership are regulated at the regional level by the Omsk Region Law "On Public-Private Partnership in the Omsk Region" (Omsk Region Law "On Public-Private Partnership in the Omsk Region", 2014).

The main reason of development of public-private partnership the Omsk region, posed by the need to sustain a competitive advantage of the region, have economic and socio-political nature. It is worthwhile to highlight:

1. the socio-economic situation of a region, but given obvious territorial strengths:
   - an exceptionally good geographical location of the region at a crossroads "Europe – China" and "North-East – Central Asia"
   - availability of established processing industry
   - availability of scientific, human and nature potential
   - availability of a million-person city, which concentrated the bulk of the population of the Omsk region
   - availability of a developed scientific-educational complex and other
2. the lack of budget funds in the Omsk Region for the implementation of important projects and the provision of services to the population, therefore, there is a need to attract additional investments from business entities
3. The situation is due to the fact that one of the factors for improving the competitiveness of the region – the developed infrastructure – in the Omsk Region is not at a high enough level, which serves as an obstacle to the growth of the investment attractiveness of the territory.

According to the rating of Russian regions by level of development of public-private partnerships, the Omsk region is situated on 61 place from 85 subjects of Russian Federation with a final integral result as 27.9% (see Table 24.3).

While the process of implementation of the industrial cluster initiatives in the practice of public-private partnerships, the development needs of a particular region should be taken into account. An industrial cluster project created on the basis of a

**Table 24.3:** The level of development of a public-private partnership in the Omsk region in 2017 in comparison with 2016.

| **The final integral result of subject's rating in Russian Federation in 2017** | **27.9%** |
|---|---|
| The region's sum of the points on visibility "The experiences of projects implementation" | 3.2 |
| The region's sum of the points on visibility "The institutional environment" | 3.5 |
| The region's sum of the points on visibility "The legal framework" | 1.5 |
| The established value of indicator by level of development PPS in Russian subject in 2017 | 53.1% |
| The difference between the final rating result and an established value in 2017<br>The final integral result of subject's rating in Russian Federation in 2016 | 25.2%<br>29.1% |
| The score difference | –1.2% |
| Position in the rating in 2017 | 61 |
| Position in the rating in 2016 | 49 |

Source: The draft national report, https://pppcenter.ru/upload/iblock/90a/90acd5070ef93cfcf89e2377aa34328e.pdf.

public-private partnership has good adaptation characteristics with respect to an unstable market environment, it is distinguished by a high decision-making speed, flexibility of the organizational structure and pricing policy. One of the main advantages gained by the industrial cluster created in this way is the ability to attract additional (in addition to budgetary) financial resources from the open capital market. As a result, capital will have a heterogeneous nature, different aspects of risk manifestation, and work to reduce the payback period of cluster projects in the public-private partnership system.

Lately, public-private partnerships are perceived by the authorities as an effective strategy for managing the territory, due to the need to improve the quality of service provision and the implementation of large infrastructure projects in the territory. Thanks to intensive cooperation between public and private actors, it is possible to achieve better and more innovative results in industrial policy at lower costs.

In 2018, within the framework of the RFBR grant on the development of public-private partnership as an instrument of regional cluster policy, an expert survey was conducted of representatives of public-private partnership: experts representing the interests of a public authority and experts representing the interests of a private partner.

From the proposed list, experts unanimously identified two key areas in which the region has the greatest potential for the implementation of public-private partnership projects by cluster members: “Production projects of enterprises participating in clusters” directly (the total weighted average is 3, out of 5 maximum possible points) and “Development of physical infrastructure” (2.5). Third places in the rankings were equally scored 1,6 points, but were evaluated differently: experts from the public partner singled out “Development of the educational and scientific infrastructure”; representatives of a private partner – “Development of telecommunication infrastructure”.

The problem of the availability of financial resources for PPS projects and cluster projects, allocated by both groups of experts, is of a regional and federal nature. First of all, this problem is based on the existing legislative norms and the possibilities of resource provision resulting from them. Experts evaluated the existing federal and regional PPP in the field of PPP in terms of meeting their expectations as participants in partnerships. Representatives of the public partner see a little more optimistic about the state of affairs in this aspect: they rated the federal PPA at 1,9-point average against 1,7 points from representatives of the business community; regional regulatory legal acts – 1,7 points (public partner) and 1,4 points (private partner).

The lack of a public-private partnership strategy in the region has a certain negative impact on the resource support of PPS projects and cluster projects. Since there is no systematic economic and regulatory framework for an effective public-private partnership process, this situation generates a number of problems that have been identified by experts in terms of their priority to solve. Moreover, the opinions of the various expert groups on the problem areas are somewhat different, but the “Difficulty in drawing up partnership agreements” and the “Ineffectiveness of the organizational structures of support for PPP” are in the first three lines of both ratings, and therefore are perceived as the most relevant, requiring their primary solution problems.

The experts analyzed external and intra-regional institutional factors that have a decisive impact on the formation of public-private partnerships in the region and allow for PPP-projects in the framework of regional cluster policy. As key factors, experts unanimously identified the level of profitability to attract investors (block “Economic conditions for project implementation”), the professionalism of the project team and the effectiveness of the project organization structure (block “Characteristics of a private partner”). Representatives of the authorities exercising managerial functions in the socio-economic development of the Omsk Region also noted the investment attractiveness of the region as a whole (block “Investment Environment for Project Implementation”).

Experts representing the interests of a private partner pointed to the significant influence of the factors “Investment attractiveness of the region”, “Availability of state support instruments” and “Stability of the regional political system and legal

regulation", thus underlining the practical importance of the state of the organizational elements of the public-private partnership system.

Research interest was represented by the insignificant, in the opinion of all experts, influence of the "Competition in project implementation" factor for the implementation and implementation of public-private partnership projects in the practice of regional cluster policy. The unanimity of the experts seems to be due to the insufficiently developed regional market for projects of public-private partnership and cluster projects separately, and considering them in their interconnection in principle has not yet had its competitive beginnings. The identical expert opinion on the factor "The state of the regional financial market" correlates with this assessment. Market fundamentals in the region do not at present represent a good foundation for competition for the implementation of public-private partnership projects in the practice of regional cluster policy.

In the block "Economic conditions for project implementation", experts also equally note the factors "Long-term demand for goods / services offered by the project" and "Level of tariffs for resources (electricity, water and gas supply, etc.)" as having a significant impact on the possibility of embedding public-private partnerships in regional cluster policy. This indicates the relevance of these factors and a certain underestimation by their authorities when developing the foundations of cluster policy, since they are emphasized by representatives of both groups of experts.

The difficulty in drawing up partnership contracts and the ineffectiveness of the organizational structures of support for PPPs are also significant obstacles to the formation of partnerships on both sides. For a private partner, the complexity of supporting projects due to the diversity of PPP forms becomes a significant problem, since state authorities are not active in information and consulting support for PPP relations.

While implementing industrial cluster initiatives in the practice of public-private partnerships, situations of complexity and interaction uncertainty often arise. In this case, it is possible to provide for flexible contractual relations in the practice of finding a balance of business interests of all entities in order to ensure greater efficiency and long-term viability of the cluster project. Flexible contracts allow the contractual framework to be adapted to unforeseen circumstances, thereby creating incentives for such cooperative behavior (Athias L., Saussier S., 2010).

## Conclusion/Recommendations

To summarize we should speak of a need for a systemic vision on the possibilities provided by partner relations between authorities and business community in practice of the formation and implementation of industrial cluster initiatives. The constructing of the public-private partnership based on the competent industrial and cluster policy

would represent a path-breaking approach to the effective management of the regional economic and social development. The successful functioning of a public-private partnership in the Omsk region can be facilitated by the formation of an effective PPS management system in conjunction with relevant goals, objectives of industrial and cluster policy; ensuring the openness of public-private partnerships and the implementation of incentive measures for investors in PPS and cluster projects at the regional level; comprehensive integration of public-private partnership mechanisms into the system of strategic planning (determination of the order of interdepartmental interaction of the executive authorities of the constituent entity of the Russian Federation) and cluster policy.

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