Regional zones of innovative economy growth on the example of reproduction capital concept modeling

Las zonas regionales de crecimiento de la economía innovadora a modo de ejemplo del modelado del concepto de capital de reproducción

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Content
1. Introduction
2. Methodological Framework
3. Results
4. Discussions
5. Conclusion
Bibliographic references

ABSTRACT:
The paper purpose is to justify an innovative method for assessing the regional growth zones of the innovation economy from the viewpoint of the reproductive approach, adapted to the conditions of the Russian economic reality. The paper theoretically presents and empirically verifies the structural model of the innovation economy's regional growth zones, on the example of human capital concept modeling, which ensures the effective development of reproduction innovative type. Practical value of the presented article is determined by the possibility of using the results obtained in the development of innovative-oriented economic development's federal and regional programs and justifying investment social and economic policies.

Keywords: innovation, concept, management, model, mezzo level, neo-economy, reproduction

RESUMEN:
El objetivo del artículo es justificar el método innovador para estimar las zonas de crecimiento regional de la economía de la innovación desde el punto de vista del enfoque reproductivo adaptado a las condiciones de la realidad económica rusa. El artículo presenta de manera teórica y verifica de manera empírica el modelo estructural de las zonas de crecimiento regional de la economía de la innovación, recurriendo al ejemplo de modelar el concepto de capital humano que asegura el desarrollo efectivo del tipo innovador de reproducción. El valor práctico de los materiales del artículo se determina por la posibilidad de utilizar los resultados obtenidos para elaborar los programas federales y regionales de desarrollo económico orientado a la innovación, además de justificar la política socioeconómica de inversión.

Palabras clave: innovación, concepto, gestión, modelo, nivel meso, no-economía, reproducción
1. Introduction

The relevance of the research topic is conditioned by the fact that the Russian economy faces the strategic task of transition to an innovative development path. Innovative economy is a knowledge economy therefore intangible assets come to the fore. The central role in the innovation economy belongs to man, which determines the significance of human capital inherent in individual people, and the social capital that characterizes the relationship between people. Under Russian economic and social conditions, the transformation of the economy cannot be instantaneous and ubiquitous, and therefore begins with the cultivation of regional growth zones. With triple focus in the regional growth zone of economic, human and social capital it is possible to form sprouts of the innovation economy. The development of the methodology for such a selector study is very relevant for the solution of the socio-economic development’s central tasks of the regions and the country as a whole. In the 21st century, there is a transition from an "industrial society", with the domination of tangible (physical) capital to "postindustrial", with the dominant role of intangible resources (information, knowledge), intellectual property. The production of intangible goods, which has a direct bearing on the formation of public consciousness, becomes a powerful tangible force - a factor of entering a new qualitative basis of society productive forces. The desire of Russia to ensure the transition to an innovative type of socio-economic development, ensuring an adequate level of competitiveness and allowing improving the welfare of the country population large part, makes relevant the study of socio-economic development’s factors which are characteristic of the post-industrial era (Jacobs, 1961).

A lot of works have been devoted to theories and practices of forming an innovative economy. However, the emergence and development of innovation economy regional forms as a management task within the regional economic system, solved on the basis of tangible and intangible capital synthesis, despite its obvious scientific and practical relevance and significance, has not yet been the subject of a separate study. Thus, the need to develop a systematic approach and a methodology for the formation of a regional innovation economy predetermined and determined the purpose and objectives of this study.


The problem of creating and operating regional economic growth zones, both in Russia and abroad, is widely considered in the economic and legal sciences. One can note the works of such authors as: V.A. Zhuravlev (2000), I.V. Zhukovskaya (2016), A.I. Shinkevich (2016), V.A. Zubkov (2004), V. Ivanter (2007), F.F. Galimulina et al. (2016).


Recognizing the high importance of the listed scientists research, it should be noted that the formation and development of regional forms of innovation economy as a management task within the regional economic system, solved on the basis of tangible and intangible capital synthesis, despite its obvious scientific and practical relevance and significance, as the object of a separate study has not yet been performed. Thus, the need for a methodology for the formation of a regional innovation economy predetermined and determined the purpose and objectives of this study.
2. Methodological Framework

2.1. Theoretical basis of the research
The theoretical basis of the research is the system integration approach and the conceptual provisions based on it, presented and substantiated in the scientific works on the theory of innovative economy and innovative economic policy, welfare economics, the theory of institutional changes and cluster strategies of neo-economics development, state regulation of innovation-oriented dynamics. As a subject of research, management relations are presented arising in the process of forming regional innovation growth zones.

The objectives of the study are the formation of a methodological framework and the development of regional innovation growth zones’ theoretical and conceptual model, exemplifying the concept of human capital, ensuring the effective development of reproduction innovative type in the interests of developing an innovative economic system.

2.2. Methodical basis of the study
In the process of research, a dialectical approach, methods of system analysis, expert assessments, statistical groupings, forecasting and economic and mathematical modeling were applied. The application of these methods, as well as an analysis of extensive factual and statistical material, ensured the objectivity of the conclusions.

2.3. Stages of the study
In the process of research:
1. The conceptual preconditions are revealed and the methodological platform of the human capital research in innovative economy is defined.
2. Systemic formation of the innovation economy on the basis of regional growth zones.
3. A structural model of regional innovation growth zones was developed, using the example of modeling the concept of reproductive (human) capital.

2.4. Theoretical and practical significance of the research results
Theoretical and practical significance of the research is determined by the relevance of the goals set and the level of the problems elaboration achieved the generalization and comprehension of the domestic and foreign fundamental and applied aspects of regional economic growth zones study as an integrated resource of innovatively-oriented economic development and theoretical and methodological approaches to its study. Theoretical conclusions, developed models, proposed methods and tools for the analysis and evaluation of regional economic growth zones based on the development of human capital in the system of the economy managing innovative development can be used in the development of federal and regional programs of innovation-oriented economic development, justification of investment socio-economic policy. The practical significance lies in the fact that individual research results can be used in forecasting regional development, in studying current and projected spatial heterogeneity, in the process of improving regional forms of the innovation economy. The proposed recommendations can be used in the work of investment departments and targeted programs of regional administrations, regional funds with the aim of increasing the efficiency of the state innovation policy pursued in the country (Bourdieu, 1993).
3. Results

3.1. Theoretical and methodological basis of research of human capital in innovative economy

Russia's desire to ensure a transition to an innovative type of socio-economic development, ensuring an appropriate level of competitiveness and allowing improving the welfare of a large part of the country population, makes an urgent study of socio-economic development factors which are characteristic of the post-industrial era. The economy, the main driving force of which is man and his abilities, acquires a social direction. In post-industrial economies, the maintenance of living high standard is not only and not so much due to the possession of natural resources and productive capital, as due to the high level of human capital. A more educated and skilled labor force, as a result of effective investments in human capital, is able to: adapt more successfully to changes in the economic and social environment; more actively learn new skills and knowledge; more quickly respond to the achievements of scientific and technological progress; more earlier introducing them into their daily practice.

Human capital as an economic category has become one of the general economic core concepts that allow describing and explaining many economic processes through the prism of human interests and actions. Now the person in economic theory is not only the owner of the goods "manpower", but also the most important factor of economic growth, since it has human capital (Becker G., 1964). In our study it is expedient to adhere to the following definition of human capital. Human capital is a certain amount of health, knowledge, skills, abilities, motivations that are generated as a result of investments and accumulations by man, which are appropriately used in a particular sphere of social reproduction, contribute to the growth of labor productivity and production's efficiency, and thereby influence the growth of earnings of the person. The main structural elements of human capital are education and professional skills, health, motivation for work and learning, mobility, natural abilities, general culture (Figure 1).

![Figure 1](image)

Figure 1
Structural elements of human capital (Zhukovskaya, 2016).
There are different approaches to the classification of human capital. It seems to us expedient to base on classification on the allocation in the structure of species that can be alienated from the human personality. The author's approach to distinguishing the types of human capital is based on the delineation of abilities groups necessary for active human activity: (1) non-alienated species (illiquid capital): health capital (biophysical); cultural and moral capital; labor capital; organizational and entrepreneurial capital; (2) alienated species (liquid capital): social capital, client capital (brand-capital); structural capital, organizational capital.

The authors studied the components of inalienable human capital for Russia, namely: the capital of health, labor capital (the importance of increasing the financing of education as investments in labor capital is indicated), organizational and entrepreneurial capital (investments in its development are the most productive), cultural and moral capital (high culture and morality of man today are necessary in production as qualification and intellect).

Among the alienated types of human capital, social capital is most important, which can be defined as a certain set of social relations that minimizes the operational costs of information within the entire economy. Elements of a social organization include social norms, trust, so-called social networks - a set of public informal associations, interpersonal links (personal, family, business). Their task is to create conditions for the coordination and cooperation of labor for the sake of mutual benefit. The accumulated social capital of Russia is made up of forms of cooperation and collectivism.

An alienated kind of human capital can be considered client or brand-capital. The activity of a company with client capital becomes a social and economic activity, and the firm itself can be called a "meta-enterprise" involving the user in "joint creation and improvement of consumer values, because the buyer acts as the judge of last echelon of all products and services created by the company". Striving for the growth of client capital turns imperfect competition of individual producers into an innovative and competitive commonwealth of producers and consumers that affects the whole complex of social relations. The existence of the client capital category is especially evident for insurance companies and other financial enterprises, where the basis of activity is the portfolio of contracts with customers, which determines the scale, structure and dynamics of the activities (Akoff, 1985).

Structural capital is the ability of a firm to manage its organizational structure, adapting itself to the changing market conditions and simultaneously changing it in a direction beneficial to the firm. The effective structural capital of a firm can arise only where "ideas are valued higher than position on the hierarchical ladder". An example of a company with large structural capital is the world leader in the production of microprocessors Intel.

Another form of alienated human capital can be considered organizational capital. At its core, this is a systematized and formalized competence of the company plus systems that enhance its creative effectiveness, as well as organizational capabilities aimed at creating a product and value. Organizational capital includes: the capital of innovation, which includes protected commercial rights, intangible assets and values; the capital of processes, which can be represented, for example, by production, sales, after-sales service, etc., in the course of which the value of the product is formed. Organizational capital can be described as embedded knowledge or institutionalized knowledge that can be stored using information technology in accessible and easily expandable databases. Organizational capital can include certain information that is recorded in databases, instructions and standards for the implementation of procedures, or unwritten knowledge that can be mastered, exchanged or, as far as possible, codified. The study of human capital, the conditions for its transformation into a real factor of innovative and competitive growth, is not only relevant, but also necessary. This analysis is of particular importance for understanding the essence of the restrictions that impede the successful implementation of Russian citizens’ human capital as a necessary factor for sustainable social and economic development. The development of human capital theory is the result of changes in the technological mode of production and the functions of workers, the result of several innovative waves. Each new innovation wave, aimed primarily at changing
technology, machinery and equipment, has also changed the employee of their servicer, presenting ever new requirements for his qualification.

To determine the basic directions of human capital growth, one must be able to evaluate it. One of the methods to assess human capital is the method proposed by United Nations experts - the use of the so-called special Human Development Index (HDI). It is calculated as the average weighted index of the measurement of human development (longevity is characterized by a single indicator, education - by two, material welfare by one) L. Gokhberg (2002):

$$\text{HDI} = \sum \alpha_j (X_j - m_j) / (M_j - m_j),$$

where the summation is over the values of \( j \) from 1 to 4; \( M_j \) - maximum and minimum values of human development indicators; \( m_j \) - maximum and minimum values of human development indicators; \( X_j \): \( X_1 \) - longevity expectancy at birth (minimum value - 25 years, maximum - 85 years); \( X_2 \) - literacy of the adult population (varies from 0% and 100%); \( X_3 \) - completeness of enrollment in primary, secondary and higher education (varies from 0% and 100%); \( X_4 \) - a special indicator of material welfare, which is based on real GDP per capita; \( \alpha_j \) are the weight coefficients of the indicators, chosen so that the three dimensions of human development have equal weight (\( \alpha_1 = 1/3, \alpha_2 = 2/9, \alpha_3 = 1/9, \alpha_4 = 1/3 \)).

The level of the human development index, ranging from 0.8 to 1, is considered as high, from 0.5 to 0.8 - as an average, less than 0.5 - as low. In the public system, as numerous studies have shown, there is a stable positive correlation between the level of education and other included characteristics, that is, education can be considered as a basic capital-forming factor for other positively evaluated qualities of workers.

The main sphere in which human capital is formed is the sphere of education therefore it is here that the efforts of society and the state should be focused. The sphere of education is the sphere of society strategic interests, and therefore its state and level of development are factors of social progress and economic growth. Therefore, at the present stage the most important are two points: (1) the restoration of education lost social functions, as a result of which social and human capital is formed; (2) the education system should become the basis for the formation of our society intellectual elite (Gius, 2004).

In the period of an innovative economy formation, investment in education is the most important resource for the development of high-quality human capital. Education forms the creative characteristics of an employee who is capable and ready to make rational and effective decisions that contribute to raising the level of enterprise competitiveness. The fundamental principle of "lifelong education" makes investment in education a basic element of the individual's socio-economic activities - the more important is the task of the constant modernization of education itself. Dynamic business development increases the need of Russian enterprises in highly educated personnel capable of generating an increase in the company's profits and increasing its competitiveness.

The investment of enterprises in education contributes to the establishment of partnerships between the enterprise and employees. The employee, as a true professional, strives constantly to improve his skills. The company provides for this maximum possible range of resources and opportunities, as well as a set of adaptation practices that contribute to the harmonization of the employee social environment (corporate culture). Education and production experience are the main sources of knowledge and skills. At the same time, education forms a common human capital that allows an individual quickly to learn new knowledge and skills during the acquisition of production experience, and also to adapt to changes in the economic and social environment, successfully introduce new technologies into everyday practice. Due to the production experience, labor skills are acquired and the qualification potential is formed.

The effectiveness and return of human capital use, not least depends on the mobility of labor resources. They, as carriers of the human capital, must quickly react to changes in the economy and be restructured into those areas of activity in which their productivity and effectiveness will
Mobility of the human capital is one of the most important objects of investment in the human capital, along with the spheres of education and health. Any investment in education will be meaningless if the person who has received an education does not have the opportunity to apply his knowledge in labor activity due to the lack of a certain workplace or conditions for starting an independent business in a certain region.

Economic growth for Russia is now largely provided with opportunistic factors, mainly high prices for oil and energy, thereby leading to a depletion of human capital. The current negative demographic situation in Russia calls for immediate intervention by all civil institutions of Russian society in those areas where citizens most reasonably expect a more active role and support of the state, achievable changes for the better: this is quality education, health care and affordable housing. It is these spheres that affect every person, determine the quality of life, lay the foundations and form a qualitative human capital - an educated and healthy nation.

Emphasizing the role and place of human capital in the development of the country's economic potential, we are convinced that the only true course of events should be an innovation development strategy based on one of the main competitive advantages - on the realization of human potential, on the most effective application of knowledge and skills of people for constant improvement of technology, economic results, the life of society as a whole.

3.2. Innovation economy system formation based on regional growth zones

The formation of an innovative economy from the point of the state view should be based on: (1) the solution of its main obligatory internal tasks (citizens’ life support and security); (2) the realization their main competitive advantages on the global market (extensive natural resources, geopolitical position, high level of education and science, areas where there is world leadership). Proceeding from this, it is possible to single out the main directions of innovative growth: (1) life support (heat, autonomous sources of electricity, new technologies for the production of medicines, food, construction of cheap housing and roads); (2) areas of Russia world leadership (nuclear industry); (3) advanced weapons; (4) import substitution; (5) innovations implemented by small businesses. For the formation of an innovative economy in Russia, it is advisable to turn to world experience (Table 1).

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<td>Characteristic features of innovative economy's models</td>
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<tr>
<td>The Japanese model</td>
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<td>North European model</td>
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<td>American model</td>
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In Russia, due to the historically established role of administrative-political elites, one should mainly focus on the North European model (high-status coordination councils for innovation),
integrating into it certain elements of the American model (support zones, innovative clusters with a specific institutional structure) and the Japanese model (vertically and horizontally integrated target groups) P. Akoff (1985).

### Table 2
Factors of capital growth for innovative economy

| Physical capital growth | Development of instruments for innovations financing, commercialization and capitalization  
|                        | Development of the system of professional and business promotion of developments "from idea to innovation" Genesis of the National Innovation System |
| Human capital growth    | Development of an education and coaching system adequate to the needs of an innovative economy  
|                        | Formation of innovative market conditions ("cult of innovation", value, relevance, attractiveness of innovation)  
|                        | Formation of the innovative economy personnel reserve (formation of innovative management national school)  
|                        | Enhancement of the business community innovative culture. The domestic innovative brands introduction on the market, the national strategy formation for the creation and promotion of innovative brands. |
| Social capital growth   | Development and optimization of innovative economy legislation and other institutions Growth of organization network forms  
|                        | Creation of a system to support innovation economy by the political and administrative elites of the Russian Federation, a network of consolidated administrative and political support for innovation activities  
|                        | Formation of information channels and communication space  
|                        | Social and political projects aimed at supporting innovations |

The backbone of an innovative economy formation in Russia should include two major components (Zhukovskaya, 2016):

- general triune development of physical (industrial, financial), human and social capital (table 2);
- Creation of a network of RGZ of IE (regional innovation economy growth zones) (innovative clusters).
- The general idea is to form the sprouts of the innovation economy by triple focusing of economic capital, human capital and social capital.

For the formation of an innovative economy, an increase in the entire arsenal of financing instruments, financial engineering of production and innovation circulation is required, including: institutes and tools for optimizing the innovation activity conjuncture; Institutions and tools for the capitalization of innovative developments and enterprises; program funds and budgets; instruments of public-private partnership; tax preferences; government order; institutes and instruments of venture financing; business incubator tools; stock tools of innovations market. Capitalization is necessary at all stages of the innovation project promotion.

Financing of an innovative economy formation process is possible on the conditions of a combination of financing's federal sources, funds of the federation and regions entities and
funds of private investors. Federal sources can partially be various programs aimed at supporting business, science, education, and also for the purposes of regional development.

**Figure 2**
The symbol of the triple unity of capital development in the innovative economy (Zhukovskaya, 2016)

For human capital growth the formation of an innovative economy's personnel reserve and the innovative management's system formation are needed, which requires: coaching centers, educational programs, intellectual asset management centers, consulting firms.

**Coaching.** To form an innovative economy, it is necessary to create a network of regional coaching centers. Their main tasks are: monitoring of the innovation economy conditions and parameters; formation of innovative economic thinking; the development of regional programs and projects aimed at the formation of an innovative economy; communication of business, administrative and political elites on issues of IE; formation and consolidation of elites' layer oriented to innovative development.

An important part of an innovative economy construction should be GR-system of relations between the innovation economy and state structures. The task of involving political and administrative elites in innovation management is solved through the creation of a network of consolidated administrative and political support for the innovative economy, including the Federal Coordinating Council (CIC), which will be an arbiter and "guarantor of compliance with the rules of the game" at the federal level, as well as Regional CIC as arbitrators at the regional level. Such Councils will be able to perform the following main tasks:

- formation of national and regional innovation policies;
- formation of an effective system of "government relations" for an innovative economy;
- provision of guarantees for the functioning of the innovation economy conventional institutional structures (rules, norms) in the regional growth zones;

The effectiveness of the regional CIC functioning is ensured by their missions "linking" to regional innovation growth zones and specific innovative projects, as well as programs aimed at creating an innovative market environment (Schultz, 1971).

To form an innovative economy is necessary to create in 20-25 regions the "reserve growth zones of innovation economy" with the optimal institutional structure that will attract business, science and investment, will allow on the terms of public-private partnerships to form
The work on creation of "reserve zones of innovative economy growth" includes: development of investments and financing instruments; development of innovative infrastructure, engineering of innovative projects promotion; support of specific innovative projects, coordination of implementation issues with regional administrations; formation of initiative groups in the regions, as well as groups of entrepreneurs for training in the program "analysis and management of innovation processes"; development of intelligence, innovative thinking; encouraging initiative and enterprise; development of innovative economy institutes; formation of communications, information space. In the future, the "reserve zones of the innovation economy growth" will become a kind of attractors ("centers of attraction") and "system integrators" of the innovative economy, will give rise to the formation of innovative clusters in the regions and will become centers for training personnel.

3.3. A structural model of regional innovation economy growth zones is developed on the example of the concept's modeling of reproductive (human) capital.

In the context of the "innovation economy" theory, the regional growth zones are the result of the national welfare's components productive use as a whole. At the same time, two main types of regional growth zones are distinguished: resource and product / process (Figure 3 (Zhukovskaya, 2016)).

![Figure 3](image_url)

Structural model of innovation economy growth zones
The resource growth zone is identified as an excess profit obtained by using innovative-intellectual factors of production convertible from reproducible elements of national welfare, including labor, human capital, entrepreneurial abilities, information, and natural resources. The product / process zone of growth (occurs among entrepreneurs who first mastered fundamentally new highly efficient technologies, implemented basic or improving innovations). Resource approach to the analysis of innovation economy growth zones, allowed to identify its place in the system of innovation-oriented reproduction (in the reproduction cycle) (Figure 4).

**Figure 4**
The place of innovative growth zones in the reproduction cycle (Zhukovskaya, 2016)
The study of the conditions and factors for the formation of a new model of subject-object relations in the system of the innovation economy reproduction and the conversion of growth zones elements into resource sources showed that the "network reality" makes the issue of working out a collective strategy for the development of the innovation economy institutional system, in which the moment of "cooperation" prevails over the moment of "competition", and the classical model of society, based on legal definitions of liberalism and market regulation of economy is replaced by a model of corporate community.

4. Discussions

The key concept in the framework of the study is the theory of human capital. The problem of human capital development has long-standing roots in the history of economic thought. The prerequisites for the origin and development of the theory were laid down in the writings of political economy classics: P. Bourdieu (1972), J. Brown (2001), T. Davenport & L. Prusak (1999), T. Franck (1996). I. Fisher - developed the concept of human capital in the late XIX - early XX century. No economic theory can do without the "working model of man." In the works published by J. Jacobs (1961), S. Lindenberg (1992), T. Schultz (1971), and many of their followers, an approach has been described that makes it possible to give estimates from the standpoint of obtaining both individual and socially significant economic results, to the educational level, professional skills, health and other properties of people engaged in economic activities.

5. Conclusion

As a result of the study, the research concept is based on the evolutionary-cyclical and innovation-institutional paradigm of economic development, as well as on the resource approach to the analysis of the economy functioning and consists of theoretical provisions set reflecting the scientific position of authors in accordance with which the regional zones of innovation economy growth, which are the productive result of repeated reproduction cycles, in postindustrial society is an integrated, basic resource of the economy’s innovation-oriented
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[Index]

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