SOI: 1.1/TAS
DOI: 10.15863/TAS
Scopus ASJC: 1000

ISSN 2308-4944 (print)
ISSN 2409-0085 (online)

№ 10 (126) 2023

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

Philadelphia, USA

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

10 (126)

2023

International Scientific Journal
Theoretical & Applied Science

Founder: **International Academy of Theoretical & Applied Sciences**

Published since 2013 year. Issued Monthly.

International scientific journal «Theoretical & Applied Science», registered in France, and indexed more than 45 international scientific bases.

Editorial office: **http://T-Science.org** Phone: **+777727-606-81**

E-mail: **T-Science@mail.ru**

International Scientific Journal
Theoretical & Applied Science

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International Scientific Journal
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ISJ Theoretical & Applied Science, 10 (126), 424.
Philadelphia, USA

Impact Factor ICV = 6.630

Impact Factor ISI = 0.829
based on International Citation Report (ICR)

The percentage of rejected articles:

ISSN 2308-4944

Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 06.10.2023 **http://T-Science.org**

Issue Article

Maria Lvovna Vilisova
Institute of Service Sector and Entrepreneurship (branch) DSTU
Ph.D. assistant professor

Olga Ivanovna Okhrimenko
Institute of Service Sector and Entrepreneurship (branch) DSTU
Ph.D. assistant professor

Artur Aleksandrovich Blagorodov
Institute of Service Sector and Entrepreneurship (branch) DSTU
master

Vladimir Timofeevich Prokhorov
Institute of Service Sector and Entrepreneurship (branch) DSTU
Doctor of Technical Sciences, Professor,
Shakhty, Russia

Galina Yurievna Volkova
LLC TsPOSN «Ortomoda»
Doctor of Economics, Professor,
Moscow, Russia

CLUSTERS – SPECIAL ECONOMIC ZONES (SEZ) – TERRITORIES OF PRIORITY SOCIO-ECONOMIC DEVELOPMENT (PSED) – SUPPORT ZONES OF DEVELOPMENT (SDA) – COMPREHENSIVE PROJECTS FOR THE SOCIO-ECONOMIC DEVELOPMENT OF THE ARCTIC ZONES OF THE RUSSIAN FEDERATION. MESSAGE 2

Abstract: *The article substantiates the hypothesis that the project for creating priority development areas is based on the concept of "catch-up" development. The statistical analysis of the socio-economic indicators of the territories that received the status of PSEDA revealed negative trends in key parameters and casts doubt on the existence of the potential for accelerated development of these territories. To develop the concept of advanced development, the need for a targeted orientation of the project to obtain synergistic effects and the formation of a system of indicators that project the desired image of the future of each PSEDA is substantiated. The absence of such a system does not allow, in the process of project management, to quickly identify, analyze and evaluate key gaps in strategic development, which significantly worsens the quality of proactive management decisions and the effective achievement of set goals. The author's vision of the rapid development of the territory is presented, which is understood as a process of quantitative and qualitative (structural, phase) transformations with the manifestation of nonlinear (synergetic) effects, the complication of socio-economic, technological, organizational and management subsystems with an increase in the knowledge intensity of technological processes, products, and increased production efficiency systems as a whole with a target orientation towards creating a favorable environment for professional implementation and residence of innovators.*

Key words: *potential, advance, advanced development of the territory, synergetic effect, image of the future, territory of advanced development, taxes, preferences, budget, special zone of economic development, regional development.*

Language: *English*

Citation: Vilisova, M. L., Okhrimenko, O. I., Blagorodov, A. A., Prokhorov, V. T., & Volkova, G. Yu. (2023). Clusters – special economic zones (SEZ) – territories of priority socio-economic development (PSED) – support zones of development (SDA) – comprehensive projects for the socio-economic development of the Arctic Zones of the Russian Federation. Message 2. *ISJ Theoretical & Applied Science, 10 (126),* 201-230.

Soi: http://s-o-i.org/1.1/TAS-10-126-15 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2023.10.126.15

Scopus ASCC*: 2000.*

Introduction

UDC 339.72:332.14

Main part

The concept of a “single-industry town” is a real fact of our economy, still little studied. The meaning of the term “monotown” in the practice of our country is most often used as a “factory city”. It denotes the closest connection between the existence of a settlement and a fairly large enterprise. In this case, a plant or factory is called city-forming. Today it is impossible to find in the legislative framework what “monotown” means. This word is only implied in regulations that mention city-forming enterprises.

In accordance with the methodology, the concept of a single-industry town is defined as follows:

- A locality in which more than twenty-five percent of the residents are employees of one enterprise. Moreover, 50% of the products produced by this plant or factory are related to only one specific industry.
- This is a complex structure in which there is an inextricable connection between the enterprise and the locality. Moreover, the largest plant or factory conducts not only economic activity. Such an enterprise also has a social burden, which makes it possible to provide all living conditions in a given locality. However, this situation leads to the fact that the products produced have a high cost. It includes the costs of maintaining the social sphere. As a result, the final product, due to its high cost, is not able to withstand competition in the market.

Mono-profile cities have the following features:

There are one or more similar enterprises operating in the same industry. At the same time, all other economic entities of such a city produce products only for the needs of its population.

- There is a chain of enterprises that have technological connections among themselves and work for one specific final market (except for those that produce products for the needs of the city).
- Local budget income largely depends on the work of one or more enterprises.
- The population has a homogeneous professional composition.
- A populated area is located at a considerable distance from other cities, or does not have developed connections with the outside world in the form of roads, telephone networks, etc.

The federal classification, carried out by type of settlements, takes into account all single-industry towns in Russia in its list. The list of them currently includes 460 settlements. Moreover, they are classified into several types. Thus, single-industry towns in Russia can: have one city-forming enterprise; to be satellites of large cities; have several city-forming enterprises.

Each of these types of single-profile settlements has its own characteristics of the socio-economic environment and, as a result, special needs in the area of maintaining the social sector.

The emergence of single-industry towns in Russia has deep historical and economic roots. The first Russian mono-towns developed during the reign of Peter the Great. New industries began to be created in the country, primarily satisfying the needs of the army, such as cloth factories and iron factories, and weapons factories.

The development zones at that time were the Moscow region and the Urals (the cities of Irbit, Asha, etc.).

In the nineteenth century, a new stage in the development of single-industry towns began. Their formation was facilitated by the development of coal and light industry. The development of manufactories was shaped by new settlements: Pavlov Posad, Orekhovo-Zuevo, Shuya and Drezna. Mining single-industry towns arose on the territory of the Rostov and Kemerovo regions.

The beginning of the thirties of the last century, cities began to develop within the framework of new territorial production complexes: Novokuznetsk, Magnitka and Apatity, Norilsk, Vorkuta.

A significant number of single-industry towns appeared during the Great Patriotic War on the basis of evacuated enterprises: Bezymyanka, later the settlement became part of Kuibyshev, and Tankograd merged with Chelyabinsk.

In the second half of the twentieth century, production facilities began to be located in already existing small and medium-sized cities. This happened, as a rule, in the eastern lands of Russia. First of all, these are the cities of power engineers, which were located next to nuclear, thermal and hydroelectric power plants: Kirovsk, Volgorechensk.

A similar approach distinguished the cities created next to enterprises engaged in the extraction of gas and oil, non-ferrous metals and ore.

The food industry development policy gave rise to settlements adjacent to meat processing plants, sugar and cheese factories: Zolotukha (Kursk region), Starodub (Bryansk region), Shumikha and Petukhovo (Kurgan region).

To realize the scientific and technical potential in the nuclear and defense policy of Russia, closed

single-industry towns were created in the country: Kurchatov, Polyarny, Snezhinsk, Baikonur, Akademgorodok. Later, cities such as Troitsk, Obninsk, Chernogolovka and Dubna, Zelenograd and others arose.

Settlements built in close proximity to large enterprises have inextricable ties with them. Moreover, this is observed not only in the economic, but also in the social sphere. The city-forming enterprise itself ensures the livelihoods of the population.

During the Soviet era, workers in single-industry towns received departmental housing. Boiler houses and kindergartens, educational institutions and clinics were on the balance sheet of factories. The production complex bore all the costs of providing social facilities, including costs in the cost of its own products. With the advent of market economy, this led to the uncompetitiveness of such enterprises.

Settlements that support the work of large enterprises, accordingly, contributed to the economic development of the state.

A large number of single-industry towns have been built in the eastern and northern territories of Russia, specializing in the processing of raw materials. These are Nizhnevartovsk and Surgut, Usinsk and Novy Urengoy. Traditionally, the territory of the country's industrial belt, which is located in the Urals and southern Siberia, was used to locate single-industry towns. Krasnoturinsk, Beloretsk, Sayanogorsk and others were built here. Single-industry towns in this belt, whose enterprises relate to metallurgy and mechanical engineering, are the least successful in the development of the social sphere. This situation arose due to their considerable distance from large administrative centers.

With the advent of the nineties of the last century, the majority of single-industry towns found themselves in a difficult situation. This was facilitated by:

- decline in production levels;
- breaking the ties of the planned economy;
- failure of key products to compete in the marketplace;
- a large number of social facilities on the balance sheet of enterprises.

All these factors significantly influenced the deterioration in the quality of life of the population of single-industry towns. The problem with such factory villages is that the enterprises located on their territory have lost a significant part of the sales market.

The situation was especially difficult in those settlements whose economies were dominated by the nearby industrial complex.

Closed single-industry towns found themselves in a particularly difficult situation. Due to the loss of demand for their products, they were on the verge of extinction. Lack of government funding led to the cessation of scientific research and increased unemployment. Today, the program for closed single-industry towns should be based on the enormous anti-crisis potential they have. In addition, the state, which cares about its defense capability and security, intends to continue to finance the activities of these high-tech enterprises.

The most acceptable ways to solve the problems of single-industry towns are through large-scale government support or the evolution of city functions. In the first case, the site of non-operating enterprises can be used to develop a new business. Then the state must legislate a number of benefits for those who will produce products here. In the second case, the city will lose its original functions. The enterprise will be closed, and the settlement will become the center of the agricultural region.

Thus, a mono-city is an urban-type settlement with a population of more than 3,000 people, of which at least 20% work at the enterprises of one company. As a rule, it provides 50% or more of the gross output of the municipality.

As of January 1, 2022, the list included 313 monocities, where one tenth of the country's population lives. They are divided into three categories:

- with a difficult and critical situation - 75;
- the situation tends to worsen - 149;
- with a relatively stable situation - 89.

Mostly, these are cities that were created at one time near large deposits, where mining, processing and metallurgical enterprises predominated. During periods of economic stagnation, they suffer more than others. Plants and factories have passed into private hands, and as profits fall, the owners simply close them, not wanting to invest in modernization.

Unemployment in single-industry towns reaches 30%, while the national average is 7–8%. Young people are leaving depressed regions. But everyone can't leave, primarily because of the low cost of housing. Many people have been living there for generations and do not want to leave their homes.

The government was forced to pay attention to the problem after mass protests in Pikalevo (2009, Leningrad region). Such places are a source of constant social threat. In addition to the fact that the situation itself pushes people to indignation, the population in them is distinguished by a high level of organization and cohesion.

In 2021, the Single-Industry Towns Development Fund was created, the task of which is to create conditions for investment, business development, and the creation of new jobs. In 2022, 32 agreements were concluded with regional authorities on the financing of projects in Naberezhnye Chelny, Cherepovets, Tolyatti, and the Kemerovo region.

Until 2022, the Ministry of Economic Development will allocate almost 30 billion rubles for

these purposes. It is planned that they will be spent on co-financing:

- new infrastructure projects of regional and municipal authorities;
- subsidizing and lending to investment diversification projects;
- education, training of specialists, management teams for single-industry towns.

In accordance with the ongoing state policy, to solve the problems of the development of single-industry towns, the tool of forming territories of advanced socio-economic development began to be used. We will demonstrate activities to implement the policy.

Territories of rapid socio-economic development (TOR) are part of the territory of a constituent entity of the Russian Federation, where a special legal regime for conducting business and other types of activities is established. In particular, preferential tax conditions, simplified administrative procedures, etc. are provided.

They are formed not only for the purpose of developing economic sectors and attracting investments (such as special economic zones, SEZs), but also to create comfortable living conditions for the population.

Unlike existing SEZs and territorial development zones (ZTR), priority development areas are created for specific large investors who have entered into preliminary agreements with the authorized federal body that determine the type of planned economic activity, the volume of investment and the number of jobs created.

The priority development territory is created for 70 years, its period of existence can be extended, which is not provided for in relation to special economic zones (they are created for 49 years) and territorial development zones (validity period - 12 years). An application for the creation of a priority development area can be submitted by the leadership of any constituent entity of the Russian Federation, in contrast to territorial development zones. The list of regions in which ZTRs can be formed is compiled by the Government of the Russian Federation.

In priority areas it is allowed to develop mineral deposits and produce excisable goods. Such activities are prohibited in the SEZ (with the exception of the production of cars and motorcycles) and partially in territorial development zones (prohibition on the production of excisable goods, with the exception of cars and motorcycles, production of crude oil, natural gas, precious metals, precious and semi-precious stones).

The creation of such territories on Russian territory was first announced by Russian President Vladimir Putin in his annual message to the Federal Assembly on December 12, 2022.

The head of state proposed “to create a network of special territories and zones of advanced economic development in the Far East and Siberia with special conditions for the creation of non-raw materials industries, including export-oriented ones.”

In October 2020, the Russian government submitted to the State Duma a package of three bills aimed at forming territories of rapid socio-economic development. The package included:

- draft law on priority development territories;
- amendments to the Tax Code of the Russian Federation and changes to a number of other regulations;
- changes affected the Civil and Land Codes.

The Federal Law “On Territories of Advanced Social and Economic Development in the Russian Federation” was signed by the head of state on December 29, 2020, the document came into force on March 30, 2021.

According to the law, the boundaries of priority development territories cannot coincide with special economic zones or territorial development zones in the constituent entities of the Russian Federation. For each territory, the government establishes a list of types of economic activities that are subject to a special legal regime for doing business, a minimum amount of capital investments by residents, and provisions on the application (or non-application) of the free customs zone procedure. Within the boundaries of such territories it is allowed to create industrial (industrial) parks.

In the first three years, priority development areas can be created only in the Far Eastern Federal District and in the territories of single-industry towns (a populated area with one city-forming enterprise) with the most difficult socio-economic situation (the corresponding list is approved by the Russian government). Then they will be formed in other regions of the country.

Individual entrepreneurs and legal entities who have entered into an agreement with the management company to carry out activities in this territory can become residents of priority development territories.

Each territory has a management company that will create the necessary infrastructure and provide customs, legal and other services to residents. The company is determined by the government of the Russian Federation; this status can be obtained by a joint-stock company (or its subsidiary), 100% of the shares of which are owned by the state.

The management company of priority development areas in the Far Eastern Federal District is currently OJSC Far East Development Corporation.

To select territories and consider investment projects, a special subcommittee has been formed under the government commission on socio-economic development of the Far East and the Baikal region.

Applications from regions for the creation of priority development areas in single-industry towns are considered by the commission of the Ministry of Economic Development of the Russian Federation on

the creation and functioning of territories of advanced socio-economic development in the territories of single-industry municipalities of the Russian Federation.

TOR "Gukovo" will help attract investment to the single-industry town of Gukovo, as well as the creation of new jobs not related to the activities of the city-forming enterprises. Within the framework of Gukovo, 22 investment projects have been previously announced, the implementation of which will allow by 2035 to reduce the city's dependence on city-forming enterprises, increase its investment attractiveness and create up to 5 thousand permanent jobs.

"Naberezhnye Chelny" on the territory of the city of the same name in Tatarstan will allow creating up to 10 thousand new jobs not related to the activities of the city-forming enterprise PJSC KamAZ.

ASEZ "Usolye-Sibirskoe"(the city of the same name in the Irkutsk region) will provide up to 5.8 thousand new jobs (not related to the city-forming enterprises Usolyekhimprom LLC and Usolye Siberian Silicon LLC). The implementation of investment projects will increase the number of small enterprises and increase additional tax revenues to the municipal budget.

The solution to the problems of stable economic development and increasing the well-being of the population in Russia is largely determined by the development of rural areas. In our country, for many decades, the main way of development of rural areas has been a narrow sectoral agricultural approach, including in areas with limited agricultural potential. This has led to one-sided agrarian development of rural areas, often irrational placement of productive forces in them, underdeveloped social infrastructure and other serious problems. Combined with a sharp decline in state support for agricultural production, which has decreased over the past two decades from a 24% share of the budget to 1%, this has led to a deep systemic crisis in the countryside.

Currently, there is a tendency to strengthen state support for the innovative development of agricultural production. However, any sectoral policy, including agricultural, may completely coincide with the goals of development of rural areas, may partially overlap with them, or may contradict them. Thus, highly intensive agricultural production leads to a reduction in employment. Therefore, for the effective and balanced life of rural areas, this approach requires significant updating and diversification.

In modern conditions, measures to develop agricultural production must be complemented by projects for the integrated and sustainable development of rural areas.

The projects are designed to cover not only agricultural production, but also forestry, water management, local industry, tourism, social infrastructure and other types of activities, without the development of which it is impossible to increase the efficiency of the rural economy and improve living conditions in rural areas. Thus, the transition to sustainable development of rural areas makes it possible to provide a comprehensive and integrated solution to the main problems of rural areas within the framework of a single concept, at the center of which is the rural resident.

In Russia, until now, rural areas have not been the object of serious scientific study. As a rule, the process of development of rural areas was identified with the development of agriculture. However, the concepts of "agriculture" and "rural areas" are by no means synonymous, and even more so, they are not identical. Failure to pay due attention to this causes significant damage to both the theory and practice of state building in the Russian Federation. Therefore, a comprehensive consideration of the phenomenon of rural areas seems very relevant, especially from the standpoint of regional economics and environmental economics, which can help solve many economic, social, environmental and natural resource problems that arise on the way to revitalize both rural areas and the country as a whole.

The most important components of society and the state in terms of their socio-territorial structure are the city (urbanized areas) and the village (rural areas). Their interrelations and relationships constitute an important aspect of the political, economic and social life of society and are one of the most significant criteria for the level of socio-economic development of the state. A clear understanding of their role and place in the socio-economic development of Russia is necessary. Their study contributes to the formation of a new scientific direction in regional economics.

But if in the Russian Federation a wealth of literature is devoted to the study of the role of cities and a special branch of knowledge has been formed - urban economics, then rural areas have been deprived of the attention of scientists, politicians, and managers and an adequate branch of knowledge - the economy of rural areas is currently only in its infancy. This means that the role of rural areas and their place in the life of society and the state has not yet been assessed, which can lead to major miscalculations in social and economic policy not only in rural regions, but also in society as a whole and, as a consequence, - major socio-economic losses.

In the last decade, Russian society has become increasingly aware of the need for targeted and sustainable development of rural areas. Many of their problems and strategies for solving them are identified. Based on the use of special tools for the development of rural areas, the human and economic potential of self-development of rural areas is mobilized, which ultimately helps to overcome rural poverty and improve the well-being of the population, which are an indispensable condition for the transition to sustainable development based on the use of own resources and public-private partnerships.

Figure 1. The process of transition to sustainable development of rural areas

The basic principles for the formation of state policy for the development of rural areas in the Russian Federation are formulated and theoretically substantiated. In our opinion, instead of the principles of preferential development of agricultural production, top-down planning, as well as equalizing the conditions for the development of rural areas in modern conditions, one should be based on the following principles:

- The principle of complexity. Consists of developing balanced, harmonious relationships between man, society and nature in the process of development.
- The principle of participation. It consists of involving the population and other interested parties in the processes of managing rural areas.
- The principle of subsidiarity. It involves the decentralization of power and the maximum transfer of administrative-territorial management functions to lower levels, with the subsequent integration of plans for their development into territorial development programs at higher levels.
- The principle of complementarity (mutually complementarity). When preparing plans at a higher level, the interests of lower ones are respected, and when planning at the local level, regional and federal policies are taken into account. The resulting complementarity and synergy make it possible to make the most effective use of all internal and external factors in the development of rural areas.
- The principle of differentiation. Implementation of state policy for the development of rural areas depending on their type.
- The principle of focused development of core rural areas. It assumes a special focus of financial, administrative, managerial, human and other resources in rural areas, which are the “poles”, “locomotives” of development, as well as the subsequent dissemination of their experience and innovative activity to less developed rural areas;
- The principle of partial compensation for residents of rural areas lagging behind in the socio-economic development of the consequences of the policy of polarized development.

- The principle of "preferences for reforms", i.e., selective (grant) budget support for local and regional initiatives for the development of rural areas, based on the maximum use of their own potentials and best practices.
- The principle of balanced development of all sectors represented in rural areas: agriculture, forestry and water management, local industry, tourism, crafts and other sectors.

The choice of the main directions for the development of rural areas is carried out on the basis of identifying and systematizing their current problems. During the research process, carried out on the basis of a systematic approach, four groups of problems of rural development were identified:

- Production and economic development related to the level of development of agricultural and other types of production, as well as the service sector.
- Socio-economic development related to the population, its culture and method of settlement, level of employment and income, social security, existing infrastructure, etc.
- Preservation of natural, cultural, spiritual heritage related to environmental protection, rational use of natural resources, protection and enhancement of spiritual and cultural heritage.
- Policies and institutional transformations related to relations of ownership, management and use of land, forests, water resources, production facilities, infrastructure, as well as the organization of power and management locally, in the region and the country as a whole, with the education system, etc.

In rural areas, district and municipal administrations often do not have the ability to resolve all important issues of socio-economic development. This is due to their heavy workload with current issues, an inflexible management structure and, often, insufficient professional training of personnel. Research has shown that in this case it is advisable to create new institutional structures to ensure the sustainable development of territories - their development centers, which represent a new algorithm for solving issues of integrated development of rural areas.

Global regional experience is of unconditional interest for research.

In Finland, Sweden, Belgium, Luxembourg, and Great Britain, an element of regional economic policy, such as the creation of infrastructure, is not officially considered regional policy and refers to national policy.

The existence of a regional economic policy in a country can only be judged if this policy is formalized by regulatory legal acts.

Features of managing the regional development of territories depend on the type of government structure. In federations, regional authorities are more actively involved in the implementation of regional tasks by co-financing expenses, holding events, and making joint management decisions. Joint decisions of federal and regional authorities clearly define the tools used to solve problems.

In Europe, in countries with a unitary structure (Greece, Ireland, Portugal, Luxembourg), the degree of centralization in regional economic policy is high. At the same time, in countries with elements of regional autonomy or in federations, the level of decentralization is much higher (in Spain, Great Britain, the Netherlands, Belgium, Austria, Germany).

In recent decades, there has been a convergence of federal and unitary states in the role that regional authorities play in the implementation of regional economic policy. In countries with an initially relatively high role of central authorities, attempts were made to increase the role of regions (in Italy, Greece), and, conversely, with an initially relatively high role of regional authorities - to strengthen centralization (in Germany).

With a high degree of decentralization, it is sometimes impossible to coordinate the efforts of central and regional authorities to solve key problems. When low, it is more difficult to take into account the characteristics of individual territories. Decentralization of regional economic policy, basing it on the concept of "development from below" is not possible under all conditions. So in Greece the goal of "development from below" was set. But regional authorities failed to support the programs being implemented, because did not have the necessary qualified personnel, scientific, technical and infrastructure base.

In Eastern European countries, preference is given not to free subsidies, but to tax breaks. This is due to the following reasons, namely:

- firstly, lack of financial resources;
- secondly, the lack of a reliable control apparatus;
- thirdly, the difficulties of entrepreneurs' transition to market relations when providing free subsidies.

Western European countries do not have such problems. There is experience in implementing regional policies to improve market relations. It is generally accepted that subsidies should be allocated to specific projects.

The practice of attracting large enterprises to problem regions has not found a positive continuation. Since such enterprises are tied to their related companies in developed regions, and are poorly integrated with the local economy.

Scientists and researchers from France, Italy, and Great Britain have demonstrated a pattern according to which targeted investments cannot solve the problems of unemployment and unfavorable industrial structure in the long term. At the same time, attracting small companies seems to be more effective, because they use less public funds and tend

to be more dependent on local markets than large firms.

The development of small business requires capital investment, access to information, qualified labor, and potential customers in the form of large private firms. Therefore, the development of small businesses requires comprehensive government assistance. Ultimately, the task of the state is the harmonious development of business structures of small, medium and large businesses in problem regions.

Of course, attracting foreign capital to problem regions has a positive impact on the development of territories. But there are also a number of problems: the head offices of such companies remain in large centers, and staff reductions under the influence of market fluctuations mainly affect branches. The branches themselves have a weak connection with the territory's internal markets.

The general trend of recent decades is associated with stimulating the development of high-tech industries, which is carried out through the creation of technology innovation zones and other measures.

Technology innovation zones or technology parks first emerged in the early 1950s in the United States. In the 70s, their positive experience began to be implemented in Europe.

An increase in the number of technology innovation zones arose in the 80s, which was associated with the increasing role of high technologies. Technology development zones began to be organized not only in developed countries, but in Brazil, India, Malaysia, Eastern Europe, the CIS and China.

In Great Britain, with the help of regulating territorial development, it was possible to level out the industrial structure of depressed areas.

In Germany, significant amounts of financial assistance were sent to the eastern states. But East Germany has not become the most attractive region even for West German investors. Despite a number of benefits, investors preferred to locate their enterprises not in new lands, but in countries with cheaper labor.

In Italy, it was possible to reduce the gap in the level of economic development of the North and South. But it was not possible to create conditions in the South under which catch-up development of this part of the country based on internal resources would be possible. Moreover, the convergence of the North and South in terms of labor productivity and infrastructure development has also exacerbated regional differences within the South. Some problems in the South have simply transformed. So, if before there was increased unemployment among the rural population, now it is among young people.

In Greece, regional differences in industrial production and employment tend to decrease. However, this is not only due to the development of dynamic industries in peripheral areas, but also to the emergence of structural problems in large urban centers, including the metropolitan area.

One of the main reasons for the relatively low effectiveness of regional economic policy is the limited financial resources that can be allocated for its implementation.

Therefore, in many countries they started talking about the need to coordinate the regulation of regional economic development with other areas of state economic policy and their harmonization.

The effectiveness of regional economic policy can be increased by concentrating the limited resources allocated to this policy. Therefore, in different countries, in certain periods, the implementation of regional economic policy is based on the identification of growth poles, which are provided with financial support and which in the future should become a source of diffusion of innovations for the surrounding territories.

There are different approaches to identifying growth poles, determined to a large extent by the level of economic development of countries.

In developing countries, growth poles are visible throughout the country. And in industrialized countries - only in problem regions.

In the first case, the main task of the growth poles is to boost the economy of the country as a whole, in the second case - the economy of problem areas.

A special role among the growth points was assigned to the largest agglomerations.

An interesting example of regional development that has brought contradictory results is China's experience in creating free economic zones. On the one hand, the creation of SEZs led to an acceleration in the rate of economic growth in the country as a whole; on the other hand, disproportions in the level of economic development of the regions increased.

One of the results of the development of the "open territories" system in China was the aggravation of regional protectionism in the late 80s and early 90s. A ban on the import of products produced in "open territories" and competing with local producers has become quite common. Moreover, the facts of protectionism were characteristic not only of the internal, but even of the relatively less developed coastal provinces, where they had their own "open territories". Some provinces have banned the export of cheap raw materials to more developed provinces. In addition to official bans, additional taxes and fines were introduced on "imported" (from other provinces) products.

The Chinese authorities, naturally, were forced to begin to combat such phenomena. In the 90s, the number of "open territories" was increased, which was supposed to accelerate economic transformation in the interior regions.

Currently, an integral part of China's economic reforms is the "opening up policy," which is aimed at

attracting foreign capital into the Chinese economy in the form of loans, direct investments, organizing joint ventures with foreign partners and attracting capital through special economic zones (SEZs).

The main goals of creating the SEZ were:

- attracting foreign capital, advanced equipment and technology, acquiring management experience, training national personnel;
- increase in export foreign exchange earnings;
- stimulation of reform, preliminary "testing" of its measures;
- efficient use of natural resources;
- stimulating the development of the country's economy as a whole, transferring advanced foreign technology and management experience to the interior of the country;
- the creation of "buffers" in connection with the return of Hong Kong (1997) and Macau (1999);
- mobilization of financial opportunities of Chinese emigration;
- ensuring accelerated development of those regions of the country where special zones of all types are located.

The FEZ management system is characterized by the following features:

- special tax incentives for foreign investment;
- greater independence in international cooperation.

Economic characteristics are presented in the form of the so-called "four principles":

- the design is primarily designed to attract and use foreign capital;
- the main economic forms are Sino-foreign joint ventures and partnerships, as well as wholly foreign enterprises;
- production of primarily export-oriented products;
- economic activity is primarily determined by the market.

There is a system of incentives used in SEZs to attract foreign investment:

- reduction in customs duty rates or lack thereof;
- absence of import quotas;
- liberalization or lack of exchange controls;
- unlimited repatriation of profits;
- reducing restrictions on foreign ownership;
- reduction of bureaucratic barriers;
- developed infrastructure;
- simplification of administrative rules with relative independence of local planning authorities;
- direct access to provincial and central planning structures;
- tax holidays.

It is important to note that the system of incentives for foreign investors operates not only within the specified SEZs. It should also be borne in mind that in large and medium-sized cities of China, since the mid-80s, 54 state-level technical and economic development zones, 15 free trade zones and 14 state-level cross-border economic cooperation zones have been created, in which local legislation provides for appropriate tax and administrative preferences for foreign investors.

The practice of operating Chinese SEZs and other areas with a preferential investment climate has demonstrated undoubted success. Among the achievements of SEZs in China, both Chinese and foreign experts include high, sustainable rates of economic growth, large volumes of foreign investment attracted to the zones, a significant increase in labor productivity and, finally, a significant increase in the standard of living of the population.

SEZs in the PRC (in addition to the common goals of special zones with other countries) are generally an experiment in the use of market relations in conditions of predominance of state ownership. The transition "all at once" to a market economy is recognized in China as unacceptable, fraught with serious shocks for the people and the economy as a whole.

The specificity of the Chinese experience in regulating SEZs is that SEZs for modern China are something more than special areas to stimulate foreign and domestic entrepreneurship, attract investment, accelerate the development of certain industries, etc.

In the SEZ of China, the formation and testing of, as Chinese economists point out, an economic model according to which in the 21st century. Almost all of China will live, which leads to positive results.

Currently, China is one of the leading countries in the world economy, having achieved incredible results in just 30 years of economic reforms. China's experience in creating special economic zones is invaluable for the global economy. The topic of special economic zones is the subject of study by economists from all over the world.

There is no specific definition of the concept of special (special) economic zones, if only because the creation of each special economic zone pursues a unique goal. The main factors characteristic of most SEZs can be identified:

- separate territory;
- providing economic preferences to certain categories of companies in order to develop the national economy.

One of the key factors for the success of the functioning of special economic zones is the stability of the political system in the country, which acts as a guarantor of the security of investments. In this aspect, China has the advantage of being a country with a stable, tightly regulated political system, capable of ensuring the safety of direct investment, having the political will to do so and the necessary mechanisms of influence, such as an effective judicial system. An equally important factor for the success of a particular economic zone is the presence of a long-term

development strategy for the region - a well-thought-out cluster system for the development of territories is necessary, taking into account their geographical location and territorial features.

The goals of creating special economic zones in China include:

- capital inflow;
- reduction in unemployment, growth in exports;
- stimulating economic growth and growth in consumer incomes;
- cluster development of territories;
- attraction and development of modern technologies, both production and management;
- use of the latest foreign and domestic technologies; accelerating the implementation of R&D results;
- concentration of scientific and technical personnel, including foreign ones, in priority areas;
- attracting experience and research achievements of scientific and technical centers and venture companies.

China used the SEZ as an experimental platform for developing new methods of economic regulation and management methods. The creation of SEZs and the policy of opening up are only part of the economic reforms begun in 1978.

The leadership of the PRC pursued a policy of openness, which involved attracting foreign capital and providing foreign investors with more favorable conditions than national ones.

But, at the present stage, special economic zones are losing their original purpose - attracting foreign capital. For foreign investors, economic preferences are reduced, and the difference between tax policies for foreign and national companies is leveled out. The Chinese leadership is constantly adjusting the list of priority industries, as well as industries in which the creation of new enterprises with foreign capital is prohibited.

China's priority policy areas include:

- improving the quality of life of the population,
- reducing the income gap, increasing the level of education,
- formation of the middle class.

In addition, an economy developing along an intensive path cannot be based only on foreign scientific achievements, so the PRC has set a course for domestic innovation and the development of the national R&D sector.

There will also be a transition from uneven development of cities and villages to urbanization and development of lagging provinces. For this guide

China is reducing the investment attractiveness of regions with developed economies by offering more incentives to backward provinces.

In order to maintain competitive advantages, companies are moving their production to other regions, new SEZs, thus contributing to the development of territories and improving the standard of living of the population.

More and more companies are focusing not on exporting their products abroad, but on selling them on the domestic market. On the agenda is the issue of supporting national producers and reducing preferences for companies with foreign capital in those industries in which Chinese enterprises can compete on equal terms.

For China, qualitative indicators of attracted investments come first rather than quantitative ones.

First of all, China welcomes attracting investments for the purpose of further borrowing advanced technologies, as well as acquiring experience and improving the skills of personnel.

There is also a shift in priorities regarding sectors of the economy; areas related to the primary and secondary sectors of the economy, such as the service sector, energy saving, biotechnology, pharmaceuticals, telecommunications, and many others, are coming to the fore.

In India, the issue of special economic zones (SEZs) has been the subject of constant criticism:

- it was argued that, unlike large Chinese zones, small Indian zones would be ineffective;
- it was stated that zones specialized in economic sectors would not provide an economic effect of scale;
- policies that allowed 50 to 70% of the SEZ to be used for purposes other than production and technical support received negative ratings;
- proposals, along with industrial infrastructure, to create social infrastructure to reduce the burden on overcrowded cities were regarded as “real estate fraud”;
- the activities of developers to purchase land plots were called “land grabs”;
- the opinion was imposed that SEZs would require too much budgetary expenditure, while the profits that increased economic activity would bring were not taken into account at all.

Finally, it was allowed to create SEZs if there are no complaints from peasants whose lands are alienated for special economic zones; In addition, the size of each SEZ was limited to 5 thousand hectares, which completed a complete revision of the policy regarding special economic zones.

A recently created special ministerial commission dealing with land compensation for displaced persons has recommended that in areas where at least 70% of land has been voluntarily acquired by non-state companies, the rest of the land should be acquired by the state.

India was inspired to create special economic zones by the successful experience of other countries, especially neighboring China. When they were created, the same tasks were set as their neighbors: developing infrastructure and accelerating economic

development by attracting investment, especially from abroad. And one of the "side effects" was the creation of additional jobs for Indian youth, the largest in the world.

However, the Indian SEZ model has one significant difference from the Chinese model.

China's government structure allowed it to develop vast zones in coastal areas using public funds, while in India SEZ financing was carried out jointly by the state and private investors in varying proportions.

The development of India as a center of world industrial production has demographic reasons. The country has over 550 million people under 25 years of age, and by 2010 the influx of labor into the labor market will be 71 million people. Two thirds of them are residents of rural areas, where they mainly earn their living by peasant labor.

This group represents the so-called "hidden unemployed" who tend to move to large cities in search of employment. EHOs, by providing economically favorable conditions, can, on the one hand, attract global investors for the development of industrial production, and on the other hand, provide India with additional jobs that could enable the country to benefit from its demographic characteristics.

Opponents of SEZs complain that companies located outside the zones are placed at an unequal playing field. However, as tariff restrictions are removed and India signs trade liberalization agreements with other countries, it is important that the country improves its competitiveness by developing a modern industrial infrastructure complemented by social infrastructure. Special zones are quite capable of solving this problem.

One of the keys to the success of special economic zones, which the government must now focus its attention on, is the so-called "communications infrastructure", which should ensure the movement of goods and access to markets.

The main goal of their creation of special economic zones in Poland is to intensify economic life in depressed regions with high unemployment. Some European models served as a model.

However, by the time the Polish law on special economic zones was adopted (October 20, 1994), it was already largely outdated due to the change in the European Union's course in this area, since the European Commission waged a large-scale fight against individual and regional benefits that impede normal development competition.

As a result of negotiations with the EU, the Polish parliament was forced to reduce tax benefits for business entities operating in special economic zones. A law was adopted (November 16, 2000) amending the law on special economic zones, which came into force on January 1, 2001.

A special economic zone is a specially designated area with created auxiliary infrastructure, in which economic activities are carried out on preferential terms (exemption from income tax for legal entities).

To become a resident of a special economic zone, an investor must obtain a special permit issued by the governing bodies of the special economic zone. In a permit to conduct business activity within a special economic zone, the investor must provide a general overview of the investment, the expected level of occupancy, the date of commencement of business activity and the boundary terms for fulfilling all of its obligations listed in the permit, which is usually valid until the end of the life of the special economic zone. economic zone.

There are currently 14 special economic zones in Poland, most of which have further subzones.

The total area of all zones today is about 12 thousand hectares, while the territory occupied by all special zones in the country cannot exceed 20 thousand hectares.

If the entrepreneur is interested in a different localization of his investment project, outside the territory of the special economic zone, under certain conditions, it is possible to include this place in its composition.

Conditions for doing business within the special economic zone:

- the volume of investment must exceed 100,000 euros, while the share of the entrepreneur's own capital cannot be less than 25%;
- capital investments must be absorbed over a period of at least five years, counting from the date of completion of the project (three years for small and medium-sized enterprises);
- jobs at newly created facilities must be maintained and maintained for at least five years from the date of hiring (three years for small and medium-sized enterprises).

The guaranteed tax benefit in the form of corporate income tax (CIT) exemption must be fully utilized by the investor until the end of the economic zone's existence (currently until 2020), but it cannot exceed the limit set by the local government.

Exemption from CIT is only available in respect of profits derived from activities carried out within the zone.

It will take three to four months to complete all the requirements necessary to obtain a permit to conduct business activities in a special economic zone and begin the activity itself.

The creation of maquiladoras in Mexico dates back to the 60s of the 20th century, when the Bracero Program, which allowed Mexicans to legally work in the United States as agricultural workers, was closed. This led to a strong increase in unemployment in border areas. To solve this problem, the Mexican government introduced the "Maquiladora Program",

the terms of which were attractive to foreign businesses.

Maquiladoras are export-production zones where investors are given preferential business treatment. The word "maquiladoras" comes from the Spanish "maquila", which meant the fee a miller charged for grinding grain. Maquiladoras include industrial enterprises engaged in the production of goods and services for export by processing materials from abroad.

The development of these enterprises has been very active since the very beginning of the program.

In 1985, maquiladoras began to generate more foreign currency for Mexico than the tourism business, and the creation of NAFTA only contributed to their further development. By the end of the 20th century, maquiladoras accounted for 25% of the state's GDP and 17% of the country's employed population.

With increasing globalization, the opening of Chinese markets and the creation of SEZs in other countries, the number of maquiladoras began to decline from the early 2000s, investment declined, but the industry still played a significant role in the Mexican economy.

Currently, due to the fact that wages of workers employed at enterprises are at low levels, Mexico has again become attractive to large transnational companies in the USA, Europe, and Japan producing electronics, clothing, furniture and cars.

A Mexican's salary is 25% of that of an American with the same qualifications, and the Mexican's work week lasts 48 hours. Additionally, the border location of most maquiladoras makes transportation costs minimal.

This cannot but attract investors to Mexican territories.

The experience of maquiladoras is currently being successfully used not only in Mexico, but also in other countries of the Latin American region.

The existence of single-industry towns is not an exclusively Russian phenomenon. Single-industry towns were created in all economically developed countries: England, America, Germany.

The most illustrative example is the city of Detroit (USA) - the former automobile capital, where the head offices of Ford, Chrysler and General Motors are still located.

After the main production was transferred to countries with cheaper labor and companies went out of business, the city lost almost all taxes.

As a result, household infrastructure was almost destroyed, buildings and homes were destroyed, fueled by race riots.

The population, which was almost 2 million people in the 50s, has decreased by two thirds. In 2013, the municipality declared itself bankrupt, with a debt of more than $18 billion and almost 100 thousand creditors.

A similar example is the city of Ruhr (Germany).

This coal and steel region in the north of the country began to decline after the 1975 crisis.

Almost 500 thousand jobs were lost.

The German authorities, together with a consulting firm and the municipality, have developed an economic diversification project.

Now this is the Ruhr Metropolitan, a conglomerate of 50 cities where mechanical engineering, electronics, banking are developing, and tourists are taken to closed mines.

Serious investments have been made in it for almost 40 years. Another success factor is the high population density, almost 1,200 people/sq. km. For comparison: in Kuzbass - 28 people/sq. km.

Let us consider a modern integrated approach to the formation of a special territorial regime that stimulates the development of entrepreneurial activity using the example of the Kaluga region.

President of the Russian Federation V.V. Putin made the following assessment: “The example of the Kaluga region convincingly shows how it is possible to create new industrial centers practically from scratch and actively attract advanced technologies.”

The region occupies a favorable geographical position, located in the very center of European Russia and borders on Moscow. This is very convenient from a business point of view.

The region is located next to the largest market for products, both light industry and high-tech equipment, for example, medical equipment and equipment. Moscow is growing, and today New Moscow already borders on the Kaluga region. More than 20 million people live here and 180 kilometers from Kaluga, which provides a capacious sales market. It is from the Kaluga region that you can most quickly deliver your product to the consumer.

The region, which covers an area of almost 30,000 square kilometers, has important highways and railways connecting our country with Europe.

More than 1 million people live in the region, and you can get to the capital in less than 3 hours. This gives access to one of the largest sales markets in Europe and the largest in Russia.

The region has numerous deposits of brown coal, chalk, gypsum, sand, and fresh groundwater. The region is home to one of the largest deposits of refractory and ceramic clays in Russia. About half of the region's territory is covered with forest.

Reserves of non-metallic minerals allow us to regard the Kaluga region as a large raw material base for enterprises in the construction industry.

Although the Kaluga region is not considered rich in resources, wood processing is very profitable in the region. Forests occupy almost 45% of the area. At the same time, finished products do not need to be transported far - Moscow and neighboring regions provide high demand for wood panels and cellulose products. Kaluga reserves of mature forest make it

easy to provide even large-scale production with material.

The Kaluga region is an example of building an economic model that is based on actively attracting investment.

The investment policy of the Kaluga region arose as an alternative to the development of raw materials regions. The riches of the region are people and land. Moreover, the land is strategically very well located in close proximity to Moscow. Having studied the best international experience and assessed the region from the investor's point of view, the region's leadership formulated a number of competitive advantages, which subsequently formed the basis of the investment strategy:

- cluster vector of development;
- a business product in the form of industrial parks with ready-made infrastructure has been developed and offered to investors;
- administrative barriers have been eliminated, a comprehensive system of regional development institutions has been created;
- a system of tax benefits and preferences has been created.

The key approach to the development of the regional economy is production clusters.

Investment development has the following directions:

- automobile cluster;
- cluster of pharmaceuticals, biotechnology and biomedicine;
- transport and logistics cluster;
- agro-industrial cluster;
- tourist and recreational cluster;
- information technology cluster.

The supporting group consists of: a high-quality living environment with a developed social infrastructure and existing enterprises modernized on the basis of innovative technologies. Further stable development is directly related to the "rise" of local production.

Today, production in various areas, from cars to medicines, is successfully developing in the region.

The cluster approach allows you to build the most complete technological chains, which means reducing the cost of the production process, reducing costs and increasing company profits.

The region has already created: a cluster for the production of automobiles and automotive components, pharmaceutical, transport and logistics; Currently, the agricultural industry cluster, the high-tech sector, as well as the tourist and recreational cluster are actively developing.

One of the largest centers of the Russian automotive industry was created in the region from scratch. Today we can already say that the automobile cluster has taken place.

Other enterprises in the cluster include Benteler Automotive (parts and suspension modules), HP Peltser Rus (sound insulation), Scherdel (seat frames), etc.

It should be noted that within the cluster, the region is building production chains. For example, the MPK plant supplies components to the production of Reydel, FAURECIA and Lear. In turn, these companies, being tier 1 suppliers, send finished products to car factories, including Volkswagen.

The cluster is based on innovative production.

Foreign partners are attracted by the ambitious plans of the Kaluga pharmaceutical cluster to occupy at least 10% of the Russian drug market by 2020. In addition, the policy taken towards import substitution makes the localization of production in the region particularly advantageous.

Today, more than 60 investment projects are already operating in the pharmaceutical cluster; the production core of the cluster consists of pharmaceutical plants of the largest global companies AstraZeneca, NovoNordisk, STADA CIS, BerlinChemie/Menarini, and large and medium-sized Russian pharmaceutical companies NEARMEDIC PLUS ", "Mir-Pharm", "PharmVILAR", "BION", "Obninsk Chemical and Pharmaceutical Company". Within the cluster there are enterprises for the disposal of medical waste and the production of packaging for pharmaceuticals. Within the cluster, not only the production of finished drugs is being developed, but, very importantly, the development and production of substrates for drugs is underway. Foreign companies actively cooperate with research centers operating in the science city of Obninsk.

The developments of the research association "Park of Active Molecules" formed the basis for the production of substances for foreign pharmaceutical enterprises. There is also a technology park with a business incubator in Obninsk, offering good conditions for starting new pharmaceutical production. There is also an engineering center equipped with modern laboratory equipment and specialists who help conduct initial research.

In 2022, the volume of work and projects in the field of scientific research and development carried out by organizations participating in the cluster reached 2.5 billion rubles, of which the number of joint works and projects in the field of R&D carried out by two or more participants amounted to 640 million rubles.

In 2022, the Russian Ministry of Economic Development recognized the Kaluga pharmaceutical cluster as a leader in global investment attractiveness.

Currently, new drugs are being developed and registered that are aimed at treating diseases in gastroenterology, gynecology, urology, resuscitation, neurology, and oncology.

Small and medium-sized enterprises in the cluster are currently implementing 31 innovative projects to develop and bring new pharmaceuticals to the market. Currently, the cluster enterprises are

conducting active scientific work on the development of innovative pharmaceutical substances. More than 70% of the products produced by the cluster enterprises are innovative products. Through the creation of a pharmaceutical cluster on the territory of the region, the regional leadership is solving the strategic task for the state of import substitution in the production of medicines.

Another important area of development for the region is logistics, which is developing according to two principles. The first is as a tool to ensure the activities of existing enterprises. The second is as an independent industry aimed at servicing traffic flows.

This industry is one of the most important in the development of the region, taking into account the expansion of Moscow and Russia's accession to the WTO. For the development of a logistics cluster, the region has both geographical advantages and reliable partners. The region has created all the necessary infrastructure for a continuous process: from the delivery of raw materials to the receipt of the final product by the consumer. Without this, the success of investment projects implemented in the Kaluga region is simply impossible. New roads, railways, customs and warehouse complexes were also built next to industrial parks.

Important highways and railways pass through the region, which covers an area of almost 30,000 square kilometers, connecting our country with other European countries.

Also in 2021, a new logistics project was launched - the Eurasian Silk Road, which has become one of the fastest land routes between China and Eastern Europe. On January 27, 2016, the launch ceremony of the first container train Dalian (PRC) - Vorsino (Kaluga region) took place in the Chinese city of Dalian. /that event marked the start of a new infrastructure project. Now the transport route connects the regions of Northeast Asia with consumers and partners in Europe through the territory of Russia. Thus, the Kaluga logistics complex Freight Village Vorsino became part of the New Silk Road.

On February 5, 2022, the first container train from Dalian arrived at the Vorsino industrial park. The train covered 7,721 km in less than 10 days. Thus, the implementation of the New Silk Road project makes it possible to reduce the delivery time of goods and goods from China and, accordingly, to China and Asian countries by almost three times. In addition, the new international logistics corridor is cheaper than most possible alternative logistics solutions. Customs procedures here take on average no more than an hour. The first arriving train was equipped with parts for the Kaluga plant of Samsung Electronics (for comparison: the delivery time for parts for the Kaluga plant from Asia by sea was more than 50 days).

In September 2022, the first container train from Mumbai arrived at Vorsino station. The new multi-modal route has completely changed the traditional logistics of cargo transportation from India to Russia. Thanks to new routes, the costs of our enterprises for transporting goods are reduced. Opportunities arise to enter new markets. It is further planned that the route will be extended to Europe. Plans for 2017 include increasing Russian routes to at least 10. The geography of international flights will also expand, and this year the international terminal will be operational on a permanent basis. This work increases population mobility.

In 2021, 6 new complexes were opened, including a large trout fish farm and a mushroom growing complex. The region has launched the "100 Robotic Farms" and "100 Meat Farms" programs, both programs are aimed at creating a reliable base of suppliers of quality products for processing. As part of the "100 Robotic Dairy Farms" program, more than 60 production facilities have already been opened. At the same time, up to 40% of the cost of robotic equipment is subsidized. In 2021 and 2022, the region ranked second in the country in terms of milk production growth rates, and was among the leaders in increasing the number and milk productivity of cows.

The largest vegetable growing complex in central Russia has been launched. I would like to note that in this sector there are no restrictions on the origin of investments, therefore, along with Russian companies, foreign firms also work. A product produced in the region can be easily sold throughout the country.

Promising areas for the region are mushroom growing, fish farming, and beef farming. The food embargo gave impetus to the rapid growth of the agro-food cluster in the region, and the business received a strategic chance for a profitable start.

Creation of industrial parks: infrastructure for investors.

These are industrial parks. Now there are 12 of them in the region. An investor can choose any of them. Their total area has already exceeded 7800 hectares. The sites have all the necessary engineering and transport infrastructure. Each of the industrial parks is a unique offer for business development; it is a profitable investment platform.

Most residents are located on sites specially prepared for production - industrial parks. This is one of the priority advantages of the region: for production, not just a plot of land is offered, but a ready-made infrastructure with all communications.

By offering new unique products for business, the region strives to develop ahead of investor needs. So, for an investor who is not profitable to invest in construction, or who does not yet have long-term contracts in Russia, the region offers to rent space that it will build for him or choose suitable premises in existing parks with all communications.

And the main point is the complete absence of infrastructure risks: an investor comes, and all the necessary infrastructure has already been created.

This is a connection to the road and, if necessary, to the railway, developed logistics, engineering networks and capacities.

It is possible to rent space built using the "Build-to-suit" technology, or to stay in "brownfields". Technology parks are being created for innovative production in the region.

All park residents receive tax benefits, support from the administration and special development institutions. And most importantly, they receive a plot of land with clear legal rights. All "paper" procedures are simplified as much as possible, and all legal rights are absolutely transparent.

Over 10 years, more than 90 large industrial enterprises were opened in the industrial parks of the region alone.

The SEZ specializes in various areas of production, including mechanical engineering, automotive manufacturing, wood processing, production of household appliances, and building materials.

The implementation of the project is aimed, first of all, at eliminating the imbalance in the development of the southern and northern regions of the region.

The peculiarity of this territory is that, in addition to the full accessibility of all engineering infrastructure, there are additional preferences for residents. Residents are exempt from income tax until 2021 and have significant benefits over the next ten years. Benefits have been developed for ten years on property tax, and for five years on land tax. A law was also passed that exempts participants from transport tax for 10 years.

At the same time, the SEZ has a special customs zone: the import of raw materials and components costs residents much less. It is in the special zone for woodworking that there are maximum benefits for all types of taxes. More precisely, the industry associated with wood processing is exempt from taxes for a long period.

By 2035, it is planned to create 5,800 jobs in areas of the special economic zone in Lyudinovsky and Borovsky districts.

The total volume of investments under agreements concluded in 2021 will amount to more than 30 billion rubles, the number of jobs expected to be created is 1,735.

Currently, the regional leadership is making every effort to eliminate infrastructural limitations so that existing and newly arriving industries can create all the conditions for efficient operation. Initially, the region developed the image of an industrial site for large-scale projects: giant factories Volkswagen or Continental. But in fact, the region is developing clusters by expanding the network of small and medium-sized businesses, localizing production, and inviting suppliers for existing enterprises. Every project is important for the region.

Creation of regional development institutions. Client-centricity and openness are the main principles of working with investors. The development of clusters is facilitated by a special business approach developed by the regional leadership.

Each investor is provided with transparent and predictable working conditions. These are the location of new production facilities in industrial parks, low investment risks, tax incentives and legislatively established administrative support from authorities and development institutions. The region has successfully built relationships with investors.

Experience of interaction with foreign investors has shown that among the most dangerous risks for investing in Russia they identify: bureaucracy and corruption. Effective overcoming of this barrier is possible through the "One Window" principle. Different regions implement different organizational models.

That is, any questions that an investor has at the stage of implementation of his project are resolved by these development institutions.

Of interest is the result of applying the historical and economic method to the study of the processes of development of entrepreneurship in the region, and previously in the province.

One of the first universal industrial districts in Russia, or the Maltsevsky industrial district, was located on the territory of the Kaluga province. The foundations of the industrial area were laid thanks to active entrepreneurial activity, carried out with full state support, since the time of Peter the Great, N.N. Demidov, who, starting in 1755, built Lyudinovsky, Sukremlsky, Bytovshesky, Yasenkovsky factories.

In 1820 I.A. Maltsev buys out the Demidov factories and continues to expand his business empire. A number of glass factories, distilleries, and a crystal production plant were put into operation. Continuing to expand the types of business, Maltsev organized brick, rope, oil, sugar, and flour milling industries. The holdings consist of 240 thousand hectares of land under forests and agricultural land, dozens of large factory enterprises and hundreds of auxiliary small-scale farms, where the entire range of goods necessary for the population of the territory was produced.

His son S.I. Maltsev, implementing the idea of "liberation from foreign dependence," is forming a new technological and socio-economic structure. To ensure the development of Russian railways, in 1814, the country's first rail rolling business was established, and in 1870 the first Russian freight locomotive was produced. In 1858, for the first time in Russia, three steamships were produced for navigation on the largest river basins.

By 1875, the Maltsevsky Industrial District included up to a hundred factories, mills, sawmills and small businesses. In addition to the production of

unique equipment, the extraction of raw materials and fuel and the production of consumer goods were carried out.

The district developed its own trading network, supplied with goods from its own enterprises, fully meeting the needs for flour, fabric, beer, vodka, and other food and non-food groups of goods. Outside the district, trading houses were established with employees in different cities of the Russian Empire. The list of cities in which Maltsev products were sold is quite extensive: St. Petersburg, Moscow, Kiev, Odessa, Rostov-Don, Nizhny Novgorod and others.

A credit system was formed that satisfied the needs of the population, both in consumer loans and in resources for housing construction. The latter was carried out for workers and employees of the company in installments, at preferential prices. Preference was given to small stone houses with an adjacent plot of land for gardening. Housing was provided with fuel free of charge.

It is significant that the first private telegraph in Russia with a telegraph line stretching over three hundred miles was opened by S.I. Maltsev in 1871.

The infrastructure of the universal industrial area was actively developing. The Maltsevs were engaged in the construction of roads, the construction of churches, bridges, dams, locks, and reservoirs. A network of well-equipped schools and public care homes has been constructed. A technical school was built. The established education system ensured universal literacy of the population of the district.

Personnel policy at enterprises was based on the balance of private wealth and public welfare. Workers and employees of the industrial area, at the instigation of the company owners, were confident that they, albeit in a small share, were the owners of the enterprises. This found real confirmation when workers who showed their energy and activity in the business were appointed plant managers, and artisans with their problems could turn directly to the owners.

The working day at the enterprises of the district was 10-12 hours; moreover, for complex work an 8-hour working day was established, while at other Russian enterprises it lasted up to 16 hours. Wage rates in the Maltsev industrial region were brought to the maximum possible and exceeded the average needs of families of workers and employees.

It is significant that within the framework of such an economic system as the “Maltsevsky district” an objective environment was formed that stimulated the emergence and mutually beneficial existence of diverse models of economic development of a separate region.

The supporting structures of a favorable environment for entrepreneurship and the everyday life of the population were a developed credit and financial system and systems for providing goods and services, solving infrastructure problems, ensuring the proper level of accessible and decent education, well-being and confidence in the future, and much more.

The diversification of business activity was clearly visible on the territory: from large, high-tech enterprises in the fields of metallurgy, mechanical engineering and shipbuilding, to dozens of model farms cultivating the land, and small-scale production of processing agricultural products. All this diversity was united by specific economic ties between economic entities.

Solving modern problems of socio-economic development of regions is of great national importance for Russia. State regional policy is based on the introduction of various types of innovative instruments for preferential stimulation of entrepreneurial initiatives.

At the same time, analysis of the real state of affairs in the field of territorial development allows us to formulate a number of important conclusions, namely:

Firstly, even with a fairly extensive list of tools that are designed to provide territorially focused, preferential stimulation of entrepreneurial activity, the process throughout the country as a whole occurs unsystematically and does not have clearly developed methodological, legal, informational, or organizational support.

The early closure of eight regional special economic zones in September 2020 is quite indicative. The Government of the Russian Federation has posted a resolution on its official website, the certificate to which states the fact of termination of the activities of eight inefficiently functioning special economic zones in a number of constituent entities of the Russian Federation. It should be recalled that such termination of the existence of a SEZ is permitted in territories where no agreement on the conduct of activities has been concluded within three years from the date of creation and where residents have not carried out relevant activities for three years in a row;

Secondly, the country continues to lack a unified system that allows for constructive, forward-looking interaction between branches of government at all levels, which leads to uncoordinated and uncoordinated activities. A regime of open and interested exchange of information, which can influence the effectiveness of the implementation of decisions made, has not been created;

thirdly, an order prevails, characterized by a high degree of formalism and bureaucracy, which impedes the introduction of innovations that are designed to ensure the technological, managerial and socio-economic progress of the nation.

At the same time, modern trends in regionalization indicate the need for new methods of management. As practice shows, a trend in management activity that is in demand is the transition from sectoral to regional management, the effectiveness of which is associated with increasing

the competitiveness of the territory and the quality of life of its population.

In modern Russian economic practice, a number of tools are used to stimulate entrepreneurial activity. The most widespread are the following: industrial districts; industrial industrial parks; technology parks; innovation clusters; special economic zones; priority development areas, etc.

Summarizing positive foreign and domestic experience, the mayor of Murmansk formulated the concept of the development of agglomerations as the main drivers of growth, ensuring the development of new technologies, economic progress, changing the environment with an emphasis on human capital and the necessary standard of living. The data he cited sounds convincing: in agglomerations, the return on investment is ten times higher, and labor is four times more productive.

At the same time, the implementation of various state instruments is aimed at overcoming imbalances in the socio-economic development of the regions.

Providing the SEZ with investment resources is carried out on the principles of multi-channel. The federal budget allocated 2,600 million rubles and the regional budget 600 million rubles. More than twenty residents of the economic zone have allocated investment resources in the amount of about seven billion rubles for development.

Let's give a few more positive examples.

To solve the problems of sustainable integrated development of the construction industry and meet the needs of the rapidly developing Arctic. The company has been producing and selling paints and decorative coatings for professional construction for more than half a century. It is one of the leaders in the global building materials market and has developed a modern line of materials and painting cycles, based on new technologies in the field of professional construction.

Similar goals are being implemented by the Alkhimet company, located in the economic zone, which is implementing a project for the production of galvanized steel wire with an anti-corrosion coating of increased durability. It is expected that the unique technologies that will be used at the plant will reduce the energy intensity of products by 3-4 times and will be absolutely environmentally friendly.

The Vodostop company is constructing a plant for the production of waterproof, noise-insulating floor coverings. The production of extruded parquet is innovative for the domestic materials market. The offered products have serious advantages over laminated and natural parquet: moisture resistance, sound absorption, absence of carcinogenic formaldehydes, the possibility of use in a “warm floor” system, increased fire resistance, the possibility of wet cleaning, low cost.

Assessing the unlimited possibilities of the capital as a consumer of the food market, the Agro-Invest company in the SEZ has launched the construction of greenhouse complexes for year-round cultivation of vegetables using the most modern and efficient technologies. In total, on a site of 237.8 hectares there are 80 hectares of greenhouses, as well as auxiliary buildings. The volume of investment resources is over twelve billion rubles.

In the subject of the federation, to ensure the effectiveness of the regional management process, structures (expert and supervisory boards) have now been formed, which involve representatives of business and society, scientists, and environmentalists.

The special economic zones, liquidated by the decision of the government of the country, did not have the necessary potential, in particular, a favorable geographical and territorial location, developed infrastructure, quantity and quality of labor resources, like the Kaluga region.

But the presence of potential does not guarantee the effective use of tools to stimulate entrepreneurial initiatives.

An active, verified regional policy of government structures is required, ensuring a trusting nature of relationships with all participants in the innovation process.

Increasing the development trajectory and expanding the boundaries of interaction is achieved by the presence of a perfect regulatory framework that meets modern requirements, and the effective activities of regional development institutions.

At the same time, regional government structures and the development institutions they have built are not able to solve all the problems of improving the external environment of business activity, especially in terms of the growth of companies, the formation of medium and small businesses, and the formation of new sectors of the economy.

Consistent, coordinated implementation of a set of government policy measures at the national and interregional levels is required. Reforms are needed to ensure qualitative changes in the content of all socio-economic processes and the system of industrial relations.

The global process of forming local government systems and ensuring transparency of budget data is regularly analyzed by experts from the international Organization for Economic Cooperation and Development (OECD), who note the intensification of the positions of local governments on the practical implementation of the principles of the European Charter of Local Self-Government.

Local government is, of course, the level of public authority closest to the population. The effectiveness of solving issues of local importance, and ultimately solving problems of sustainable, integrated development of territories, depends on his active position, independence, and responsibility.

Unfortunately, today only 40% of Russians can be classified as middle class, which is a merit of technology, since economic development is determined not only by the size and distribution of income, but also by technological development.

There is an influx of low-skilled personnel into the country, while more than a million highly qualified Russian specialists work outside the country. The process of falling real incomes of the population continues.

And for economic growth, increasing labor productivity, and creating a favorable investment environment, strengthening innovative potential and a high level of competencies characteristic of representatives of the middle class are required.

Authoritative researchers pay special attention to the Polish experience, arguing that modern Poland would not exist without the development of local self-government. The profound Polish transformations that took place in the last decade of the twentieth century were made possible thanks to the greatest civic activity of society.

It was civic activity that acted as the force that brought about political transformations, made it possible to lay the foundations of local self-government, abolishing the monopolies of parties, eliminating hierarchical dependence on power and separating the municipal service from the civil service. In turn, this gave independent status to municipal property and finance.

The formation of full-fledged local self-government freed up the social energy of every citizen and ensured the participation of local communities in resolving public issues.

As a result, currently every second Pole is confident that he personally influences decisions made in his municipality, and 58% of respondents expressed confidence in local government bodies. At the same time, the level of trust in central government bodies (executive and representative) and political parties is much lower. The volume of municipal budget expenditures in Poland is the highest among the countries of Central and Eastern Europe.

The Russian way of development of local self-government, which maintains the complete dependence of municipalities on financial assistance from regional budgets, does not contribute to stimulating the socio-economic development of municipal territories and increasing the efficiency of budget expenditures. It is significant that the total volume of debt obligations of the constituent entities of the Federation and municipalities is 2.5 trillion. rub.

The legislation of Poland enshrines the provision that the basis of the state, its democratic principles and the freedoms of individual citizens is the transparency of the budget process implemented in the country. Compliance with the transparency of budget data is ensured by the open publication of indicators, reports, results, and changes in activities in the field of public finance.

Only openness of data ensures the security of the treasury and prevents irresponsible and criminal handling of funds entrusted to the state.

Every citizen has the right of free access to information that accurately and completely reflects any activity related to budget funds.

The provision of information about the budget process must be carried out in strict accordance with the following requirements: complete detail of the data; accessibility and understandability of the data presented; timeliness and updating of information provision.

An activity that requires a citizen, in order to master the information presented, to have additional knowledge in the areas of financial, economic and regulatory affairs is not considered transparent. To ensure a complete and clear perception by the citizen of data on the budget process, they are provided in a system defined by law, which provides for budget continuity, classification, and detailing. The legislation establishes the following requirements for openness of the budget process.

For all levels of the budget system, public debates are provided, at which deputies of representative bodies discuss the draft budget. Transparency of debates is observed during the adoption of the budget, and subsequently, when approving reports on budget execution.

All information about the budget parameters of state and municipal authorities is mandatory. A similar procedure is followed with respect to information contained in monthly reports on budget execution.

Openness of data is strictly observed when discussing draft long-term financial plans of all local government structures.

All government contracts, with data on the volume of financial resources, indicating specific work performed by business structures, are subject to publication.

In the healthcare sector, in order to ensure transparency of activities, the following data are subject to publication: on sources of income and expenses incurred, information on pricing policy.

All data relating to the allocation of subsidies or other funds for the implementation of powers are published, indicating the specific budget recipient.

Government bodies annually report to citizens on the results of their financial activities.

In turn, every citizen is provided with access to budget accounting and reporting data.

The official Bulletin of Public Information presents a report on the execution of the budget for the previous financial year and data on the draft budget for the next financial year.

At the same time, Polish regulatory documents contain provisions that specifically stipulate the legal

limits of transparency of budget data. They are associated with the implementation of activities to ensure the security of the state, citizens and other structures.

It is advisable to take Poland's positive achievements in successfully implementing local government reforms into account when solving Russian problems. Taking into account the national characteristics of Russia, it is necessary to rethink the proven effective Polish approaches to ensuring the development of local self-government and transparency in the fiscal sphere at all levels.

In modern conditions, to ensure economic growth, a worker with a certain level of income and, accordingly, effective demand is required. For modern Russia, the most important sources of economic growth are, along with exports, the effective demand of the population, which provides consumers with access to the fruits of globalization.

The process of forming the Russian middle class should be intensified. World historical experience shows that at turning points, in conditions of crises and challenges, small and medium-sized businesses, which form the basis of the middle class, have always proven their high efficiency and effectiveness in solving problems.

The current situation requires maximum use of the potential of local government, its focus on the human aspects of consciousness, to realize the creative potential of the population and the community of entrepreneurs. Giving the status of a territory for priority social and economic development (PSED) to part of the municipalities of the Russian Federation is a new instrument of regional policy.

In accordance with the decision of the Government of the Russian Federation, a special legal regime has been established for the implementation of entrepreneurial and other activities in order to create favorable conditions for attracting investments, ensuring accelerated socio-economic development and creating comfortable conditions for ensuring the livelihoods of the population.

A TASED resident is an individual entrepreneur or commercial organizations that, in accordance with Federal Law No. 473-FZ dated December 29, 2020, entered into an agreement to carry out activities in a TASED and are included in the register of TASED residents.

- a resident of a PSEDA must simultaneously meet the following requirements: registration of a legal entity is carried out on a PSEDA;
- the activities of a legal entity are carried out exclusively in PSEDA;
- a legal entity is implementing an investment project on the territory of a TASED that meets the requirements established by the Government of the Russian Federation;
- the legal entity is not a city-forming organization of a single-industry town or its subsidiary;
- the legal entity is not a participant in regional investment projects; the legal entity does not include separate divisions located outside the PSEDA.

There are criteria for making a decision on assigning the status of a TASED resident, who must sign an agreement on the implementation of an investment project, namely:

the cost of the investment project is at least 5 million rubles during the first year after the inclusion of a legal entity in the register of residents of TASED; creation of new jobs - at least 20 units during the first year after inclusion of a legal entity in the register of TASED residents;

for legal entities that have existing production facilities on the territory of a single-industry town, the number of new jobs created must simultaneously be no less than the average number of employees for three years;

there is no provision for the execution of contracts concluded with the city-forming organization of the single-industry town or its subsidiaries.

And, of course, this status will not be granted to those residents who would like to work in an industry for which there is already a single-profile area of this single-industry town.

It is important that the following benefits are provided for organizations that have received TASED resident status, namely:

- on income tax;
- on corporate property tax;
- on land tax.
- on insurance premiums.

A single-industry town can receive TASED status for 10 years with the possibility of extension for another five years.

In accordance with Article 284.4 of the Tax Code of the Russian Federation, standard tax benefits for income tax are established: the federal part is completely zeroed out, the regional part is no higher than 5% during the first five years, and no lower than 10% in the next five years.

There is a reduction in the tariff for insurance premiums by more than four times, that is, if the base value is 30%, then for residents of TASED it is 7.6%.

For those PSEDAs that will be created in single-industry towns working with extractive industries, a decreasing correction factor has been established when applying the mineral extraction tax.

A significant plus is regional taxes, the possibility of exemption from property tax and other taxes and fees, the right for which is granted to the subjects of the Federation.

According to Federal Laws No. 380-FZ, No. 519-FZ and No. 473FZ, PSEDAs have a special legal

regime for carrying out business activities, which is as follows:

- preferential income tax rate;
- priority connection to infrastructure facilities, the construction of which is carried out at the expense of the federal budget;
- benefits for corporate property tax and land tax;
- the amount of insurance contributions is set at 7.6%, including 6% to the Pension Fund of the Russian Federation, 1.5% to the Social Insurance Fund of the Russian Federation, 0.1% to the Compulsory Medical Insurance Fund.

Comparison table:

TAX	RATE FOR PASED RESIDENTS	STANDARD RATE
Income tax	0% for 5 years from the date of first profit, 10% for the next 5 years	20%
Property tax	0.5% for the first 5 years, 1.1 for the next 5 years	2.2%
Land tax	0% for the first 5 years	up to 1.5% (determined by the municipal authority)
Social payments	7.6%	thirty%
Mineral extraction tax	Reduction factor: 0% -first2 years; 0.2 - on3-4 years; 0.4 - on5-6 years; 0.6 - on7-8 years; 0.8 - for 9-10 years.	Chapter 26 of the Tax Code of the Russian Federation

It should be noted that the application for the creation of a PSEDA provides for a list of types of economic activities, the implementation of which is allowed as a result of the implementation of investment projects of PSEDA residents, information on the projected volumes of shortfalls and lost revenues of the budget of a constituent entity of the Russian Federation, as well as the local budget.

The first meeting of the Commission on the creation and functioning of territories of advanced socio-economic development was held on September 9, 2020 in Moscow. 16 applications from constituent entities of the Russian Federation for the creation of PSEDAs on the territory of single-industry towns were considered. Following the meeting, 4 applications were supported.

Currently, the first twelve territories of advanced socio-economic development have been created in the Far East.

On June 25, 2015, a resolution was signed on the creation of the Khabarovsk and Komsomolsk priority development areas in the Khabarovsk Territory.

August 21, 2015 – “Belogorsk” and “Priamurskaya” in the Amur region. The same resolution determined the creation of the following zones: “Mikhailovskaya” in the Primorsky Territory, “Beringovsky” in the Chukotka Autonomous Okrug and “Industrial Park “Kangalassy” in Yakutia.

On August 28, 2015, a document was adopted on the creation of the priority development territory "Kamchatka" in the Kamchatka Territory.

On January 28, 2016, a decree was signed on the creation of the Big Stone priority development area in the Primorsky Territory, and on March 16 of the same year - the Yuzhnaya and Mountain Air territories in the Sakhalin region. A free customs zone regime will operate in all territories. As of March 2016, 110 residents were registered in 12 priority development territories in the Far East, and the total amount of declared investments is 442 billion rubles.

According to the relevant federal structures, in 2016, the TOP management company received 110 official applications from investors for the implementation of investment projects with a total investment amount of 442.3 billion rubles. Over 10 years, the total volume of contributions from project implementation to budgets of all levels is expected to be 242.4 billion rubles.

Three priority development territories have been created in mono-cities. On January 28, 2016, resolutions were signed on the creation of the "Gukovo" and "Naberezhnye Chelny" priority development areas on the territory of the cities of the same name in the Rostov region and the Republic of Tatarstan, and on February 26 of the same year - "Usolye-Sibirskoye" in the Irkutsk region.

"Khabarovsk" with an area of 587 hectares is being created in the territories of Khabarovsk and the Khabarovsk region, as well as the Rakitnensky rural settlement.

The main direction is transport and logistics, metallurgy. The expected volume of private investment is about 30 billion rubles. During the

implementation of projects, 3 thousand jobs will be created in these territories.

The territory "Komsomolsk" will appear in the cities. Komsomolsk-on-Amur and Amursk, Khabarovsk Territory. Its area will be 210 hectares. The main areas will be aircraft manufacturing, production of components for aircraft manufacturing. The expected volume of private investment will be about 15 billion rubles, and about 3 thousand jobs will be created.

The Nadezhdinskaya priority development territory is being created on the territory of the district of the same name in Primorsky Krai, on land plots with an area of 806 hectares and will specialize in the development of transport and logistics services, processing industry, etc. The total volume of private investment is 6.7 billion rubles, during implementation projects will create 1.6 thousand jobs here.

In the territories of Khabarovsk, Komsomolsk and Nadezhdinskaya, a special regime for doing business applies to 53 types of economic activity.

The minimum amount of capital investments by residents in the three territories is 500 thousand rubles.

In 2018-2021 These priority development areas will be created at the expense of the federal budget (within the framework of the state program “Socio-economic development of the Far East and the Baikal region”).

For these purposes, 1.258 billion rubles are provided for Khabarovsk, 902.6 million for Komsomolsk and 1.986 billion rubles for Nadezhdinskaya.

The construction of engineering and transport infrastructure will be carried out using funds from regional and municipal budgets and extra-budgetary sources: 1.103 billion rubles for Khabarovsk, 329.64 million for Komsomolsk and 1.986 billion rubles for Nadezhdinskaya.

"Priamurskaya" (industrial and logistics specialization) will occupy an area of 857 hectares in the Blagoveshchensky and Ivanovo districts of the Amur region.

A cement clinker processing plant with a capacity of 142 thousand tons per year, an oil refinery, and a large logistics center will be built here. The volume of initial private investment will be about 130 billion rubles; the implementation of projects will create about 1.5 thousand jobs. No budget investments are planned. The infrastructure will be created through extra-budgetary sources.

The priority development territory "Belogorsk" will be created in the city of Belogorsk, Amur Region. Its area will be 702 hectares. The main direction is agriculture.

It is planned to build a soybean processing plant, a feed mill and a bakery plant. The volume of private investment is 1.45 billion rubles. During the implementation of the projects, about 700 thousand jobs will be created. The construction of engineering and transport infrastructure will be carried out using funds from the budgets of the Amur Region, the Belogorsk urban district and extra-budgetary sources. “The Kangalassy Industrial Park is being created on the territory of the capital of the Republic of Sakha (Yakutia), on land plots with an area of almost 17 hectares and will have an industrial specialization.

Residents of the ASEZ will be enterprises producing construction, energy and industrial materials from local raw materials. It is expected that by 2020 there will be 13 factories operating here: for the production of ceramic blocks, paint and varnish products, plastic pipes, dry building mixtures, etc. The total volume of private investment is 1.11 billion rubles, 350 jobs will appear.

In 2018-2021 113.2 million rubles were allocated from the federal budget for the creation of the territory. 87 million rubles are provided for the construction of engineering and transport infrastructure; this money will be allocated from the budgets of Yakutia and the city of Yakutsk, as well as from extra-budgetary sources.

The Beringovsky ASEZ will be created on the territory of a group of coal deposits in the Anadyr region and the city of Anadyr, Chukotka Autonomous Okrug.

Its area will be almost 6 million hectares. The initial volume of private investment is 8 billion rubles, 450 jobs will be created. No budgetary investments are required; the construction of transport infrastructure will be financed from extra-budgetary sources.

It is expected that in the future, enterprises producing and processing natural gas will become residents of the ASEZ. Processing of up to 50 million cubic meters is expected. m of gas into diesel fuel and gasoline, which will meet the energy needs of the Chukotka Autonomous Okrug and abandon the Northern supply of petroleum products.

"Mikhailovskaya" will occupy 3.15 thousand hectares in the Primorsky Territory (Mikhailovsky, Spassky and Chernigovsky districts) and will specialize in agriculture.

It is planned to build pig-breeding complexes, feed mills and auxiliary production facilities. The volume of private investment will amount to 39 billion rubles, and 2.4 thousand jobs will appear. In 2018-2021 2.219 billion rubles were allocated from the federal budget for the creation of the territory. A total of 2.219 billion rubles will be allocated from the regional and municipal budgets of the Primorsky Territory and extra-budgetary sources for the construction of engineering and transport infrastructure. The priority development territory "Kamchatka" will be created in the territories of the Elizovsky district and the city of Petropavlovsk-Kamchatsky, Kamchatka Territory. Its area will be 2.2 thousand hectares.

A number of companies have already expressed their readiness to implement projects in this territory with a total investment volume of 28.1 billion rubles, which will result in the creation of about 3 thousand jobs.

In 2018-2021 5.728 billion rubles were allocated from the federal budget for the creation of the territory. 2.737 billion rubles are provided for the construction of engineering and transport infrastructure; this money will be allocated from the regional budget and municipal budgets, as well as extra-budgetary sources.

"Bolshoi Kamen" will appear in the Primorsky Territory (urban district of Bolshoi Kamen). The ASEZ will make it possible to more effectively develop shipbuilding in the region, including on the basis of the Zvezda complex. 3.152 billion rubles will be allocated for its creation. budget funds. The volume of private investment will amount to about 140 billion rubles, and it is planned to create 5.5 thousand jobs.

The "South" ASEZ for agricultural purposes is being created on the territory of the city of Yuzhno-Sakhalinsk and the Aniva and Tomarinsky urban districts of the Sakhalin region.

Large livestock complexes and broiler production facilities will appear here, and 450 jobs will be created. Four residents of the territory (Green Agro-Sakhalin, Mercy Invest Group, State Farm Zarechnoye and State Farm Teplichny) will invest 6.3 billion rubles in the creation of the ASEZ. In 2016-2018 1.460 billion rubles will be allocated from the regional budget and extra-budgetary sources for the construction of engineering and transport infrastructure. There are no plans to use federal budget funds.

“Mountain Air” will appear on the territory of the ski resort of the same name in Yuzhno-Sakhalinsk and will have a tourist and recreational specialization.

The TOP will also include the Sinegorsk Mineral Waters sanatorium, the coastal zone of Nevelsk and the island. Moneron.

Private investments will amount to 6.1 billion rubles. For the creation of infrastructure from the regional budget and extra-budgetary sources in 2018-2021. 10.031 billion rubles were spent. The implementation of the projects made it possible to create 725 jobs.

List of created territories of advanced socio-economic development

1 "Komsomolsk" in the territories of the municipalities "City of Komsomolsk-on-Amur" and "City of Amursk" of the Khabarovsk Territory Resolution of the Government of the Russian Federation dated June 25, 2015 No. 628

2 "Nadezhdinskaya" on the territory of the municipal formation "Nadezhdinsky Municipal District" of Primorsky Territory Resolution of the Government of the Russian Federation dated June 25, 2015 No. 629

3 "Khabarovsk" in the territories of the municipalities "Khabarovsk City", "Khabarovsk Municipal District" and "Rakitnenskoye Rural Settlement" of the Khabarovsk Territory Resolution of the Government of the Russian Federation dated June 25, 2015 No. 630

4 "Belogorsk" on the territory of the municipal formation "City District of Belogorsk" of the Amur Region Resolution of the Government of the Russian Federation dated August 21, 2015 No. 875

5 "Beringovsky" in the territories of the municipalities of the Anadyr municipal district and the Anadyr urban district of the Chukotka Autonomous Okrug Resolution of the Government of the Russian Federation of August 21, 2015 No. 876

6 “Industrial park “Kangalassy” on the territory of the municipal district “Yakutsk City” of the Republic of Sakha (Yakutia) Decree of the Government of the Russian Federation dated August 21, 2015 No. 877

7 “Mikhailovsky” in the territories of the municipal formations Mikhailovsky municipal district, Spassky municipal district and Chernigovsky municipal district of Primorsky Krai Resolution of the Government of the Russian Federation dated August 21, 2015 No. 878

8 “Priamurskaya” in the territories of the municipalities of Blagoveshchensky district and Ivanovo district of the Amur region Resolution of the Government of the Russian Federation dated August 21, 2015 No. 879

9 “Kamchatka” in the territories of the municipalities of Elizovskoye urban settlement, Paratunskoye rural settlement, Razdolnenskoye rural settlement, Nikolaevskoye rural settlement, Novoavachinskoye rural settlement, which are part of the Elizovsky municipal district, and Petropavlovsk-Kamchatsky urban district of the Kamchatka Territory Resolution of the Government of the Russian Federation of August 28, 2015 No. 899

10 “Bolshoy Kamen” on the territory of the urban district of Bolshoi Kamen, Primorsky Territory Resolution of the Government of the Russian Federation dated January 28, 2016 No. 43

11 "Naberezhnye Chelny" on the territory of the municipal formation "City of Naberezhnye Chelny" of the Republic of Tatarstan Decree of the Government of the Russian Federation dated January 28, 2016 No. 44

12 “Gukovo” on the territory of the urban district of the city of Gukovo, Rostov region Decree of the Government of the Russian Federation dated January 28, 2016 No. 45

13 “Usolye-Sibirskoye” on the territory of the municipal formation of the city of Usolye-Sibirskoye, Irkutsk region Resolution of the Government of the Russian Federation dated February 26, 2016 No. 135

14 “Mountain air” on the territory of the municipal district “City of Yuzhno-Sakhalinsk” of the

Sakhalin region Resolution of the Government of the Russian Federation dated March 17, 2016 No. 200

15 “Yuzhnaya” in the territories of the municipalities of the urban district “Yuzhno-Sakhalinsk City”, “Aniva City District” and “Tomarinsky City District” of the Sakhalin Region Resolution of the Government of the Russian Federation dated March 17, 2016 No. 201

16 “Yurga” on the territory of the municipal formation Yurga urban district of the Kemerovo region Resolution of the Government of the Russian Federation dated July 7, 2016 No. 641

17 "Krasnokamensk" on the territory of the municipal formation of the urban settlement "City of Krasnokamensk" of the Trans-Baikal Territory Resolution of the Government of the Russian Federation dated July 16, 2016 No. 675.

18 "Amur-Khinganskaya" in the territories of the municipalities "City of Birobidzhan", "Leninsky Municipal District" and "Oktyabrsky Municipal District" of the Jewish Autonomous Region

Decree of the Government of the Russian Federation of August 27, 2016 No. 847

19 “Nadvoitsy” on the territory of the municipal formation “Nadvoitsky urban settlement” of the Republic of Karelia Resolution of the Government of the Russian Federation dated September 19, 2016 No. 940

20 "Anzhero-Sudzhensk" on the territory of the municipal formation "Anzhero-Sudzhensky urban district" of the Kemerovo region Resolution of the Government of the Russian Federation of September 19, 2016 No. 941

21 "Krasnoturinsk" on the territory of the municipal formation of the Krasnoturinsk urban district of the Sverdlovsk region Resolution of the Government of the Russian Federation dated September 19, 2016 No. 942

22 "Tolyatti" on the territory of the Tolyatti urban district of the Samara region Resolution of the Government of the Russian Federation dated September 28, 2016 No. 974

23 “South Yakutia” on the territory of the municipal formation “Neryungri district” of the Republic of Sakha (Yakutia) Resolution

Government of the Russian Federation dated December 28, 2016 No. 1524

24 “Belebey” on the territory of the urban settlement of the city of Belebey of the Republic of Bashkortostan Decree of the Government of the Russian Federation of December 29, 2016 No. 1536

25 “Kumertau” on the territory of the urban district of the city of Kumertau of the Republic of Bashkortostan Decree of the Government of the Russian Federation of December 29, 2016 No. 1550.

Let us present a number of modern theoretical arguments and practical examples concerning territorial development, from the standpoint of the following aphorisms: “Knowledge of the disease is already half the cure” (M. Mudrov) and “The bitterest pills can produce the best effect” (D. Kelly)

A new vector is demonstrated, associated with the formation of a new, network structure, and the reformatting on this basis of the organization of modern economy and society (N.V. Smorodinskaya).

The emerging new institutional space is based on developed network interaction. There are two trends in the center: the phenomenon of collaboration at all levels of the economy (including the so-called “triple helix” - collaboration between the state, science and business); organizational and managerial design of collaboration – cluster networks.

Collaboration(collaboration) – joint activity (process) in any area (two or more persons, organizations). In the process, knowledge is exchanged, learning is achieved, and agreement is reached. Participants can get more opportunities to achieve success (higher than in competition).

Network structure, network interaction at all levels of society and the economy reflect the general complexity of social and production systems at the post-industrial, information stage of development, which is characterized by constant, continuous updating, regardless of temporary geographical boundaries. This way of life has absorbed and quickly and pragmatically mastered the main modern trends.

An opportunity has arisen to radically change the system of market coordination. Forms of market coordination are shaken by the possibilities of interactive communications. The possibilities for concerted actions that can be opposed to traditional competition are expanding. Complex modern products and technologies are created and maintained in the market through cooperation and collaboration.

A network is an extended group of people with similar interests who interact with each other and maintain informal contact for the purpose of mutual support and assistance. A simplified definition of a network as “a set of stable contacts between individuals or groups” is common among sociologists.

We will consider the network from the point of view of economic theory. The network is one of the forms that allows for economies of scale in production, an intermediate form between the market and hierarchy. Intercompany cooperation helps reduce transaction costs associated with obtaining information and exercising control.

David Stark defines a network as an organization built on a horizontal structure of many connections.

Marketing classic Philip Kotler speaks of a network organization as a coalition of interdependent specialized economic units with their own goals (independent firms or autonomous organizations), which operate without hierarchical control, but are involved in a system with common goals through numerous horizontal connections, mutual dependence and exchange.

One of the most radical approaches to the interpretation of networks is demonstrated by F. Webster. Based on the strategic approach, he equates networks with closed corporate structures: "Network organizations are corporate structures that are the result of multiple relationships, contacts with partners and strategic alliances."

American researchers tend to be more organized in their interpretation of networks. Thus, Jones, Hesterly and Borgatti proposed the following definition in their work: "A network is a stable and structured collection of semi-independent firms (and/or non-profit organizations) involved in mutual relationships and united by a common goal. Relationships in the network are designed to streamline exchange relations between participants and facilitate their adaptation to the conditions of a changing environment. The basis for organizing a network is both formal and informal contracts."

French economist Robert Paturel considers "networking" to be a strategic management method that consists of forming a network with its nodes and connections to achieve goals in accordance with the needs and expectations of partners and business conditions.

Russian economists also have not come to a common point of view regarding the definition and functioning of network structures.

Thus, a network organization, according to M.M Chuchkevich, is an association of independent individuals, social groups and/or organizations acting in a coordinated manner on a long-term basis to achieve agreed goals and having a common corporate image and corporate infrastructure.

The network can be considered as a temporary cooperation of enterprises (organizations, individual teams and people) with key competencies for the best execution of market orders, based on a unified information system.

Sometimes the concept of network structure is introduced to describe changes in typical organizational structures over time. The network structure is represented as a set of a priori equal agents, in which temporary hierarchical and other structures can arise, determined by the tasks solved by the system.

Nesterenko Yu.N. speaks of the concept of an entrepreneurial network, reflecting a system of long-term cooperative interactions of formally independent enterprises based on the sharing of resources, a special system of values, and having a specific set of organizational and managerial interactions. It is important to mention long-term cooperative interactions.

Gaponenko A.L. and Pankrukhin A.P. A network organization is understood as a type of organization whose structure is a loosely connected, flexible, horizontally organized network of fundamentally equal, independent partners with different roles and functions.

A broad understanding of networks is given by S.I. Parinov, in whose works the concept of coordination of network forms appears. A network organization "occurs when a group of individuals, united by a certain organizational framework, carries out their interactions based on Internet technologies. Such a technical basis allows a group of people conducting joint activities to create a more flexible and effective organizational structure compared to traditional forms of organizations." Network form of management (coordination) - "can be used both in network organizations and in the network economy to coordinate joint activities. The main difference between this form and the market and command form is the direct and equal participation of all members in the process of coordinating their activities."

Most professional services organizations do not have a hierarchical infrastructure with a simple chain of command. As a rule, they are a federation of firms providing services under a single brand, but not many manage to unite their branches and benefit from joint work.

We can formulate the factors that determine the network's ability to develop by attracting new participants and, accordingly, increasing its business:

- Having an online presence is beneficial if it helps the local firm do its job better, i.e. if the customer benefits from their service provider's network membership.

The entry of a local company into the network implies an increase in its "local" value, due to an increase in its status and the expected increase in professionalism and quality of services provided. Behind this statement is serious work at the network level to provide local benefits from network participation that are valuable to customers.

- The best opportunity for network development is to provide a system of support and interaction that will help all local members become more useful to their own clients.
- Network participation can be valuable in serving geographically dispersed clients.
- Unfortunately, here we are again faced with the issue of the inequality of national, regional and local markets.
- To receive international or national orders, the chain must establish a strong local presence.
- It is in the network's best interest to ensure that it is running successfully before it is tasked with serving international or national clients.
- International projects require cooperation based on mutual trust and respect.
- The likelihood of success increases if a local member of a consulting network has a history of benefiting from collaboration within the network by interacting with other firms to do so.

Researchers note the following main modern features of development:

- A model of industrial policy is being formed, which will play an important role in the innovative post-industrial economy.
- Government intervention is forced to become soft and targeted, aimed at creating an institutional environment of partnership interactions both within cluster networks and between them.
- The state has a special role (not yet a function) - assisting science and business in finding new network partners and joint project ideas (cluster initiatives).
- Resource flows are directed towards the most competitive cluster groups, and within the clusters themselves - to the most efficient and productive companies.

Productivity is determined by the quality of business interactions. A cluster, network environment allows us to bring together the concepts of "productivity growth" and "innovation". That is, the ability to continuously generate and commercialize new technologies, products and services.

- The new environment, as the organizational basis of modern industrial policy, connects sustainable economic growth with the constant development of collaboration, involving authorities, real sector companies, scientific and educational organizations in unified communication networks.

Practical example.

The largest technology companies are working together to create artificial intelligence. Corporations Amazon, DeepVind, Facebook, IBM, Microsoft (former competitors in global markets) announced the creation of the non-profit organization "Partnership on Artificial Intelligence for the Benefit of People and Society."

Each company has serious developments in the field of artificial intelligence. However, they recognize the need for partnerships to better understand the technologies used and their implications for the development of society.

Modern ideas fit poorly into Russian reality. There is a lag between Russia and the global trajectory, or a significant divergence from it. Reasons for the lag (discrepancy):

- Russia is increasingly confronting the ability for self-development and self-organization through continuous information exchange and collaborative generation of innovations with a tendency towards hierarchical subordination, growing mutual distrust, informational secrecy, compression of the competitive space and strengthening monopolism.
- Reduced opportunity to develop horizontal connections and interaction, which are not necessary in the context of strengthening the power and management vertical.
- Reduced opportunity to develop horizontal connections like a triple helix, reduction in the space for collaboration, loss of the environment and tools for self-regulation and self-development.
- At the regional level, the discrepancy with global trends is even more noticeable: instead of expanding managerial independence and encouraging cluster projects, the region, on the one hand, is increasingly subordinate to the center, and on the other, is increasingly disunited.

Improving the institutional environment usually means improving the functioning of existing and creating new economic and social institutions. The formation of a triple helix is not considered at all.

- High differentiation of production sectors in terms of the level of innovation and technological development, as well as social differentiation, as a result of discrimination against certain groups in terms of access to the development and implementation of innovation policy.
- Innovation policy remains the prerogative of departments of several departments and government agencies, with the participation of individual corporations not free of charge.
- Organizational contours are blurred, feedback is primitive, and there is no specific responsibility for the development and implementation of decisions.
- The country has failed to use its unique competitive advantages: the presence of rich natural resources, a capacious domestic market, a generally educated population, and high innovative potential.
- The latest concepts of advanced infrastructure and forms of organization of production are subject to politicization and are used only as a fashion brand.
- The business environment is dominated by monopolized structures, vertical hierarchical relationships and imperfect legal procedures for property protection, which are associated with high risks.
- The long-term negative trend in the Russian economy, with a deterioration in all indicators, can hardly be called a "new normal", and can only partially be attributed to the effect of Western sanctions and Russian counter-sanctions.
- The reversal of the negative trend depends on systemic transformation based on structural reforms.
- The country is included only in global value chains through the export of raw materials and the import of investment equipment.
- The country ranks only 96th in the WEF Global Competitiveness Index, which is worse than most developing countries.

Corresponding Member of the RAS G.B. Kleiner, based on the results of the new theory of socio-economic systems, determines the place of economic management activities and the project sector in the hierarchy of key systems that determine the stability of the national economy.

The author formulates the qualities that an economy must have in order to meet the requirements placed on it by other macro-level subsystems.

Among the qualities he considers is the diversification of the economy in relation to the jobs provided to society and the opportunities provided to businesses to implement investment projects.

Kleiner believes that today in Russia it is especially important to rethink the role and functions of the economy in society, since the country has crossed a certain threshold, beyond which new prospects unfold and new problems of social dynamics arise. Depending on the characteristics of the system for making the most important decisions on managing society, the researcher identifies three main options ("styles") of management:

- manual, when for each individual problem a separate decision is made by a separate entity (option - by one person);
- strategic, when a decision on each individual problem is made on the basis of principles clearly formulated within the framework of a previously formulated and accepted long-term strategy by society;
- institutional, when a decision on each problem is made on the basis of both explicit and implicit norms and rules (institutions) shared by the participants in the process.

According to Kleiner, today the country is in a transitional stage. The period of manual management is ending, but the period of strategic management has not yet begun. The country has no experience of such management; the ideology and methodology have not been developed as a single whole.

As a negative example, the author cites the process of development and failed implementation of the "Strategy 2020", which he calls "mosaic", that is, not having an integral system. When developing this strategy, in his opinion, there was inattention to the fundamental principles of strategic planning and management.

Turning to the concept of institutional management, the researcher expresses the idea that it is possible only after the completion of the "strategic" stage, subject to the consolidation of society and the presence of clear concepts for the prospective and retrospective development of the country, as well as long-term goals shared by society and economic entities.

G.B. Kleiner, analyzing such characteristics of the Russian economy as "effective", "innovative", "market", "socially oriented", believes that the formulations do not have sufficient theoretical justification, do not always fit together and do not provide any complete and realistic characteristics of the desired image of the Russian economy.

Based on an interdisciplinary systemic concept of the place and role of economics in society, the scientist argues that the basis should be the platform of system economics - a new direction of economic theory, within which socio-economic systems are considered as key actors in economic space-time.

He proposed a scheme for the functioning of society as a chain of interaction "state - society - economy - business".

At the end of the study, a number of conclusions are presented.

From the point of view of coordination and regulatory interactions, the economy must demonstrate sensitivity to the demands of society and the needs of business.

It is possible, according to Kleiner, to summarize the obligations of the economy in relation to its direct systemic counterparties as follows. She must:

- provide society with jobs in accordance with its potential and economic needs;
- meet society's needs for economic benefits;
- ensure the possibility of moving labor resources and products, harmonize the living conditions of all individuals and social groups throughout the country;
- provide businesses with the conditions and resources to implement entrepreneurial initiatives;
- be receptive to innovations coming from business, select them for possible dissemination and consolidation in the form of routines;
- harmonize successful business initiatives within economic processes;
- coordinate interaction and harmonize the relationship between society and business;
- ensure movement towards general and local economic equilibrium.

The methodological approach outlined above to the analysis of the composition and structure of national macro subsystems makes it possible to substantiate the following qualities that the economy as a social subsystem that satisfies the requirements formulated above should have. Unfortunately, the author comes to the conclusion that the modern Russian economy lacks these qualities.

Deep, multi-dimensional and multi-dimensional diversification. We are talking primarily about three main components: job diversification; product diversification; diversification of "project niches".

Diversification of the "project niches" offered by the economy for business is an analogue of diversification of jobs in relation to capital. For the sustainable operation of the economy, the range of projects available for investment, both in terms of investment volumes and in terms of payback, profitability and risk indicators, must correspond to the diversity of opportunities, aspirations and inclinations of potential investors.

Transferring the economy to the path of diversification is a more important and more complex task than increasing its degree of innovation. Diversification of the economy is impossible without increasing the share of the innovative economy in the

total volume of production, consumption, exchange and distribution of goods. At the same time, an increase in this share is possible outside the framework of diversification, including in the form of innovations in the Russian raw materials complex.

Social loyalty. According to the proposed concept, we should not talk about the social orientation of the economy (this is usually understood as providing the population with consumer goods), but about its partnership with society.

The relationship between social consumption and economic accumulation is dynamic in nature and should support both current life activity and the long-term development of the entire "state - society - economy - business" configuration.

The requirement for social responsibility of business in this configuration is inadequate.

We can talk about the "civil responsibility" of business to the state and the economic responsibility of business to the national economy, but it is hardly appropriate to demand that business bear direct responsibility to society, since they do not directly interact with each other.

Tolerance towards business. The economy must demonstrate readiness for strategic partnerships with business.

Economy and business should not enter into strategic competition.

This concerns, first of all, the payment of dividends to investors and the operating conditions of the stock market.

The "fusion" of the state with business in any variant (with the dominance of business or with the primacy of the state) is in principle undesirable, however, it is acceptable if the state actually functions as a social one (shows loyalty to society).

Thus, an important mission of the economy is the coordination and synchronization of the interests of society and business.

Extensiveness of the economy. It is generally believed that the economy should increase the intensity of use of almost all types of resources, including space (territory). In relation to macroeconomics, this thesis has no convincing justification and leads to spatial fragmentation of the national economy.

A weak connection between the economies of individual regions slows down the spread of innovation, prevents optimization of resource allocation, aggravates the socio-economic differentiation of regions, reduces the potential of the economy as a whole and threatens the loss of the country's economic independence.

The economy is a kind of connective tissue that ensures the spatial unity of the country. Although the main stakeholder in the process of developing territories is the state, it is the economy that plays the role of a key subsystem in solving this problem. The result of the scientific analysis carried out by the researchers (Zubov V.M., Inozemtsev V.L.) was the conclusion that currently the so-called surrogate investment system (SIS) has been built in Russia. It includes the relationship between the federal budget and production structures, as well as financial institutions, special agencies, and special economic zones. The authors reduce the fundamental diagram of the investment process to a simple formula. Property that is not put to effective use is leased to those who can use it profitably. The most common form is providing a loan from available funds.

In this case, decisions may be made that replace market instruments with administrative instruments, which inevitably leads to a decrease in efficiency. Decisions based on private initiative, when responsibility for spending one's own funds is personalized, are more effective than using public (state) funds in conditions of vague responsibility.

Deformation of the conditions of competition and a decrease in efficiency are observed with an increase in the number of implemented point projects.

The state tends to make not only decisions aimed at maintaining the institutional environment in a stable and favorable state for general use, but also private economic decisions. Decisions made to support ineffective companies at the expense of successful companies have a negative impact. This is due to the fact that managers strive to improve the economic trend with the help of public resources.

The researchers identified four erroneous actions, in their opinion, that predetermined the formation of the surrogate investment system:

- Proclamation of the goal of doubling Russian GDP in 10 years. Thus, the tasks of technological modernization of the economy and increasing the role of institutions that promote competition and stimulate technological and social innovation were relegated to the background.
- Concentration of assets in the hands of the state. The action is typical for mining countries. Led to the dominance of state regulation over entrepreneurial initiative.
- Directing efforts to mitigate the social consequences of the crisis (2008-2009). An action related to the refusal to change the owners of bankrupt enterprises. Dependency (at the expense of budget funds) of the largest enterprises has become the most important factor in economic policy.
- Lack of awareness of the fact that the country does not need measures to overcome a temporary decline in production, but a new development model, the main goal of which should be to increase the efficiency of the economic mechanism.

Two important points clearly indicate a decrease in the efficiency of the Russian economy:

- The economy does not generate fundamentally new technologies or products.

- Economic diversification has a negative sign, which is manifested in the total contribution of extractive industries to budget revenues.

The definition of "surrogate investment system" does not initially have a negative connotation. The system can play a positive role, but should not become the main direction for improving the innovation process.

The following elements of the SIS are distinguished:

- Direct subsidies to enterprises from the budget (hundreds of enterprises).
- A type is special economic zones. Subsidies are provided through preferential taxation (28 units).
- Budget guarantees.
- Subsidies from the budget through pseudo market institutions. Reserve fund. NWF. ASI. VEB. State corporations. State-owned companies and others (23 institutes).
- Providing loans from the Central Bank of the Russian Federation through the Ministry of Economic Development and leading state banks to selected enterprises ("project financing").
- Special projects. The goal is to stimulate the development of regional economies through a multiplier effect (APEC, Sochi - 14).

In the current situation, researchers propose to increase social efficiency by moving to a new technological curve. Why rely not on subsidies, but on new types of business. To do this, it is necessary to turn the cash flow from subsidizing unprofitable projects to supporting potentially profitable ones.

And SIS act as links in the mechanism of irrational use of resources of the national economy. They ensure that resources are transferred to inefficient activities from businesses that could produce new products and technologies.

It is necessary to improve the quality of investment projects and launch truly innovative impulses.

To designate the Russian economy, a number of researchers have proposed the term "non-stationary".

As an illustrative example of non-stationary behavior, the situation with the fall in oil prices in 2015 is given. The decline in oil prices caused a natural decline in motor fuel prices around the world. The only exception was Russia. According to experts, the country has to pay for the unique path it has chosen in terms of loss of efficiency.

The non-stationary nature of the Russian economy is manifested in the following:

- heterogeneous and often double-digit inflation;
- sharp changes in the exchange rate of the ruble against major currencies, which causes an increase in the cost of imports;
- a significant discrepancy between bank interest rates on loans and deposits;
- expensive money, and short at that;
- a significant difference in the price of money for Russian and foreign participants participating in the project;
- the absence of established markets and, as a consequence, significant differences between the market value of the property and the one at which it is shown in the company's balance sheet;
- almost annual "innovations" in the tax system;
- there is a real danger of losing business as a result of an attack by government officials.

In September 2016, the Government prematurely terminated the operation of eight Russian special economic zones (SEZs).

The corresponding resolution is posted on the official website of the Cabinet of Ministers. "The activities of eight ineffective functioning special economiczones in the Stavropol, Khabarovsk, Primorsky and Krasnodar territories, the Murmansk region, the republics of Altai, Adygea and North Ossetia-Alania," says the certificate to the document.

Early termination of the existence of a SEZ is permitted in territories where no agreement on the conduct of activities has been concluded within three years from the date of creation and where residents have not carried out relevant activities for three years in a row.

The analysis carried out by the Russian Ministry of Economic Development showed the following picture.

To date, not a single resident has been registered on the territory of the SEZ in the Stavropol, Khabarovsk, Primorsky and Krasnodar territories, the Murmansk region, the republics of Adygea and North Ossetia-Alania.

Residents of the SEZ in the Altai Republic have not yet carried out tourism and recreational activities. SEZs in the Khabarovsk Territory and the Murmansk Region were ports, the rest were tourist and recreational.

In addition, the Government closed the special economic zone on Russian Island. The resolution on the early termination of the SEZ was published on September 30 on the government website.

A special economic zone on Russky Island was created back in March 2010 (Resolution of the Government of the Russian Federation dated March 31, 2010 No. 201). With its help, the authorities hoped to attract investment in the development of the region's tourism potential and load the infrastructure facilities built for the APEC 2012 summit.

Among the priority ways for the development of Russky Island, medical and health, water and cruise tourism, SPA tourism and the development of environmental and sports areas were proposed. According to Russian legislation, enterprises located in the SEZ receive tax holidays on land, property and transport taxes, as well as income tax.

The total area allocated for the SEZ is 3,613 hectares. However, since the creation of the special economic zone, there have been unresolved issues related to the gratuitous transfer of land plots from the jurisdiction of the Russian Ministry of Defense and federal property to the Primorsky Territory.

Due to the lack of interest among investors in Russian Island, in 2014 the Ministry of Economic Development already proposed to close the project. At the same time, in 2015, a decision was made to further implement the project to develop a special regime on Russky Island at the expense of the budget of the Primorsky Territory.

The issue of terminating the SEZ on Russian Island was raised again in March 2016. At the same time, the Ministry of Eastern Development is working on a project to create a priority development territory "Russian Island".

It is planned that scientific-educational, scientific-implementation and tourist-recreational activities will be provided here. The main centers will be FEFU and the Primorsky Oceanarium. President Vladimir Putin instructed to complete the development of the development strategy for Russky Island by June 1, 2017.

At the Eastern Economic Forum (EEF), autumn 2016, representatives of the highest Russian authorities promised investors infrastructure development, access to inexpensive loans, and a reduction in administrative barriers and taxes.

Further development of the economy of the Far East, according to the Russian leadership, should be based on large projects, namely:

first, the development of a reliable energy infrastructure.

The initiative to create an energy super ring that will connect Russia, China, Japan and the Republic of Korea is supported. It was proposed to create an intergovernmental working commission. Russia is ready to provide its partners with a competitive price for electricity in the Asia-Pacific region and fix it for the long term:

secondly, the creation of modern transport infrastructure. Formation of new, competitive trans-Eurasian and regional routes;

thirdly, the formation of a common space for the digital economy. Creation of an integrated information system designed to ensure interaction in the field of transport, foreign trade, customs, veterinary, tax and other procedures.

It is significant that back in September 2013, a report on the results of the control event "Audit of the effectiveness of the use of public funds aimed at the creation and development of special economic zones" was published on the official website of the Accounts Chamber of the Russian Federation.

The information presented in the document indicates that over seven years (2006-2013) the state invested 112 billion rubles in the development of special economic zones. In fact, at the beginning of 2014, the companies had completed work worth 52 billion rubles. According to the report, this is only 26% of the expected cost by 2017. For every Russian ruble invested, there are 74 investment kopecks. For the successful development of SEZs, these are insignificant indicators.

After a large-scale on-site inspection carried out in November 2013 by the Interregional Inspectorate of the Federal Tax Service of Russia for the largest taxpayers No. 8 (St. Petersburg), the company's activities for 2010-2012, tax officials revealed that Volkswagen illegally took advantage of property tax benefits and wrote off their accounts are 618 million rubles.

This amount includes additional taxes on property and profits, VAT, as well as fines and penalties.

Experts express the opinion that the cause of the conflict is the instability of the legislative framework of the Kaluga region. Property tax legislation was changed in the region five times, three times in 2013 alone.

Representatives of Volkswagen believe that changing legislation so often is incorrect and are trying to defend their interests in court. The subject of the dispute between the company and the interregional tax authority of Russia was the application of the provisions of regional legislation on the use of property tax benefits. The company is confident that the version of the legislation in force at the time of the conclusion of the investment agreement on cooperation between Volkswagen and the administration of the Kaluga region, which provided for complete tax exemption for all investor property created and acquired as a result of the implementation of the investment project, is subject to application.

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Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.771	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2023 **Issue:** 10 **Volume:** 126
Published: 06.10.2023 **http://T-Science.org**

Issue Article

Maria Lvovna Vilisova
Institute of Service Sector and Entrepreneurship (branch) DSTU
Ph.D. assistant professor

Olga Ivanovna Okhrimenko
Institute of Service Sector and Entrepreneurship (branch) DSTU
Ph.D. assistant professor

Artur Aleksandrovich Blagorodov
Institute of Service Sector and Entrepreneurship (branch) DSTU
master

Vladimir Timofeevich Prokhorov
Institute of Service Sector and Entrepreneurship (branch) DSTU
Doctor of Technical Sciences, Professor,
Shakhty, Russia

Galina Yurievna Volkova
LLC TsPOSN «Ortomoda»
Doctor of Economics, Professor,
Moscow, Russia

CLUSTERS – SPECIAL ECONOMIC ZONES (SEZ) – TERRITORIES OF PRIORITY SOCIO-ECONOMIC DEVELOPMENT (PSED) – SUPPORT ZONES OF DEVELOPMENT (SDA) – COMPREHENSIVE PROJECTS FOR THE SOCIO-ECONOMIC DEVELOPMENT OF THE ARCTIC ZONES OF THE RUSSIAN FEDERATION. MESSAGE 3

Abstract: *The article traces the emergence of support zones for the development of the Arctic zone of the Russian Federation using state documents and carries out an examination of the definitions of their content. The main features of support zones are indicated: general and social functions, organizational form, economic model, spatial structure, type. For the first time, a comparative description and rating assessment of support zones was carried out using the Database of Indicators of Municipal Entities of Rosstat and with an emphasis on population dynamics, volume and structure of production, and the nature of local budget revenues. The assessment results made it possible to identify factors of strong differentiation of zones that adversely affect the socio-economic development of the Arctic regions. An overview is presented and an assessment is made of the regions' proposals for the design filling of support zones.*

Key words: *spatial development, support zone, Arctic, rating assessment, framework, natural resources, reindustrialization, territorial planning, clusters, management objects.*

Language: *English*

Citation: Vilisova, M. L., Okhrimenko, O. I., Blagorodov, A. A., Prokhorov, V. T., & Volkova, G. Yu. (2023). Clusters – special economic zones (SEZ) – territories of priority socio-economic development (PSED) – support zones of development (SDA) – comprehensive projects for the socio-economic development of the Arctic Zones of the Russian Federation. Message 3. *ISJ Theoretical & Applied Science, 10 (126)*, 231-249.

Soi: http://s-o-i.org/1.1/TAS-10-126-16 ***Doi***: https://dx.doi.org/10.15863/TAS.2023.10.126.16

Scopus ASCC: *2000.*

Introduction

UDC 339.72:332.14

Effective management of the territories of the Arctic zone of the Russian Federation (AZ RF) is an urgent scientific and practical task. Support zones of development are recognized as a key mechanism for achieving strategic interests and ensuring national security in the region. However, this tool does not yet have sufficient methodological, regulatory and organizational development. The evolution of the normative economic and spatial image of the support zones of the Russian Arctic allows us to track the evolution of special documents on the development of the Arctic Zone of the Russian Federation (Table 1). Their study helps to identify the most significant features for the methodology of development and implementation of concepts for the formation of support zones: general and social functions, organizational form, economic model, spatial structure and the main features of the potential type of zone.

Table 1. Evolution of the content of support zones for the development of the Russian Arctic

Document	Information related to Development Support Zones (SDZs)
Strategy for the development of the Russian Arctic and ensuring national security for the period until 2035. Section “Spatial development of the Arctic: zones of advanced development...”. Approved 2020	The possibilities for ensuring the global competitiveness of the Russian Arctic include the formation of priority development zones (shelf development of the Pechora-Barents Sea province, Polar-Ural pioneer development; Belkomur industrial; Kola innovative, etc.). Has no spatial aspect.
State program “Socio-economic development of the Arctic zone of the Russian Federation for the period until 2035” 2024	Key implementation mechanisms: frame-cluster approach; formation of support zones for development; selective state policy for the development of Arctic territories.
“On the development of the Arctic zone of the Russian Federation.” April 2021. Ch. 1, clause 5, art. 3 “Basic concepts used in this Federal Law.”	OZ is “a part of a subject of the Russian Federation, in which, in order to ensure the socio-economic development of this subject and the Arctic zone as a whole, as well as ensuring national security issues in the Arctic, it is planned to provide measures of state support for economic and other activities in order to create favorable conditions for the provision of investments, ensuring accelerated comprehensive development and creating comfortable conditions to ensure the livelihoods of the population.”
“On the development of the Arctic zone of the Russian Federation.” New Year 2021. Art. 3 “Basic concepts used in this Federal Law.”	OZ is “a comprehensive project for planning and ensuring the socio-economic development of the Arctic zone, aimed at achieving strategic interests and ensuring national security in the Arctic, providing for the synchronous interconnected application of existing instruments of territorial and sectoral development and mechanisms for the implementation of investment projects, including on the principles of state- private partnership".
State program “Socio-economic development of the Arctic zone of the Russian Federation”. Implementation until 2035 August 2024	OZs are “comprehensive projects for the socio-economic development of the Arctic zone, aimed at achieving... (äàëåå ïî òåêñòó ñâûøå)... on the principles of public-private and municipal-private partnership."
“On the development of the Arctic zone of the Russian Federation.” February 2021. Art. 3 “Basic concepts used in this Federal Law.”	OZ is “the territory of the Arctic zone, where interconnected projects are being implemented aimed at the comprehensive socio-economic development of the Arctic zone, achieving... (in the text of the article)... PPP, as well as special regimes for carrying out economic activities and territories with preferential conditions for conducting business activities."

Support zones realize and develop the communication and resource potential of the Russian Arctic. They will activate the transport capabilities of the Northern Sea Route (NSR), meridional river and road corridors, air and railway communications, information communication to involve fuel and energy, minerals, raw materials and biological resources of the Arctic into economic circulation, taking into account interregional interaction.

Social role. Support zones work for the development of their region and the Russian Arctic as a whole, ensuring an improvement in the quality of

life of the population living and working here. The regional vector of development of each specific support zone is determined by the level and nature of the problems of the municipality on the basis of which it is formed. Directions and projects for the formation of the zone should solve these problems.

In organizational form, support zones represent a "project of projects", consisting of a set of transport, industrial, social projects that must be linked to each other in time and space. The "struggle" of spatial and organizational forms manifested itself in changing definitions of the support zone. Sharing the point of view of one of the authors of the bill "On the development of the Arctic Zone of the Russian Federation," member of the Council for the Arctic and Antarctic under the Federation Council M. A. Zhukov, the authors consider the support zone to be the territory where projects are being implemented.

The economic model for the formation and functioning of support zones involves the use of public-private partnerships (PPP) and other state support mechanisms operating in an interconnected and synchronized manner in the implementation of investment projects on their territory.

The spatial structure of support zones is materialized by a transport-industrial framework, the planning and creation of which ensures their formation and development. The main elements of such a frame, namely:

1) highways providing access to the Northern Sea Route, communication with neighboring regions and their support zones and transport accessibility of new sources of raw materials;

2) transport (ports, stations), mineral resources (extraction and primary processing of raw materials) and multifunctional nodes and centers (resource processing, cargo transshipment, socio-cultural sphere, energy, construction, etc.).

The ideology of the transport-industrial framework grew out of the concept of the supporting framework - "the combination of the main focuses of the economic, social and cultural life of the territory and the socio-economic lines connecting them" - a classic analytical and constructive tool of economic geography. It also works in the formation of settlement and infrastructure frameworks (through the concentration of necessary resources) and the supporting framework for the reindustrialization of the Arctic.

Typical features of support zones determine: the level and nature of the development of natural resources, the associated maturity of industrial specialization, the relationship between the center and the periphery, as well as features determined by the specifics of the financial and economic mechanisms used for their formation and implementation. The beginnings of typification can be traced in the classification of priority development zones in the draft Development Strategy of the Russian Arctic for 2020 and in the type of Arctic territories (promising, active development, industrial development) identified in the State Program for the Development of the Russian Arctic until 2035.

An analysis of the Arctic strategies of foreign countries did not reveal direct analogues to Russian support zones. Territories of special attention in the Arctic policy of European countries and Canada are areas inhabited by indigenous peoples, which are allocated administratively in Denmark and Canada. Norway's Arctic strategy affects only the High North, which includes the provinces of Nurlan, Troms and Finnmark. A special approach within the framework of a special program (Northern Periphery and Arctic Program 2018–2035) is being implemented by the European Union, co-financing projects in various fields of activity in these territories through a regional development fund.

Main part

Large-scale development tasks in the Arctic regions of Russia have to be solved against the backdrop of problems that have accumulated over the past decades. At all levels, from federal and regional to corporate and small businesses, the search continues for the most effective forms of adaptation to complex realities using new methods of territorial integration and interaction between production, science and education while activating the social sphere. At the legislative level, approaches to the formation of new territorial formations of support zones are being developed on the basis of already existing attempts at cluster associations as powerful cores of the future socio-economic development of the Arctic. Despite all the expediency of forming support zones for development, the initial bureaucratization of the management process can be traced,Regarding the northern vector, Heartland faces the problem of reorganizing the Arctic zone. The space adjacent to the North Pole - the Arctic Ocean - is significantly increasing in importance with the development of aeronautics and especially rocket science, as well as due to the approaching shortage of natural resources at the global level. The shortest route between Eurasia and America passes through the Arctic, and the Arctic shelf is replete with poorly explored natural resources (according to preliminary estimates, up to 25% of all undiscovered oil and gas resources in the world lie there). In such a situation, every inch of Arctic land or maritime boundaries acquires a special geopolitical value.

Countries that today lay claim to control over the Arctic space are the USA, Canada, Norway, Denmark and Russia. The USA, Canada, Norway and Denmark are members of NATO, i.e. representatives of the Atlantic bloc. At the moment, the process of Greenland gaining independence is gaining momentum (at the moment it is autonomy within Denmark), but it is unlikely that a new country, under

the control of the Inuit Eskimos (of which there are less than 60 thousand in the vast expanse of Greenland), will be able to someday, in the foreseeable future, future, to become an independent force. In the meantime, there are American naval bases on the territory of Greenland (Kanak). Therefore, from a geopolitical point of view, the balance of power in the Arctic is determined by Russia (Heartland) and the United States (together with other NATO countries). Recognizing the importance of Arctic resources, many other countries that do not have direct access to the Arctic are developing the construction of an icebreaker fleet (as, for example, China), which shows the enormous importance of this area for those who think strategically about the future. In recent years, Russia has begun to pay increased attention to the Arctic, closely dealing with legal issues, carrying out symbolic Arctic expeditions and rapidly re-equipping military-technical facilities located in this zone. All this can be considered constructive steps to consolidate the multipolar structure of the world. If Heartland's territories are invulnerable to possible air attack from the North American continent, and also have a large and legitimate share of Arctic natural resources, this will qualitatively increase the likelihood of establishing a multipolar model.

Russia is creating a military base in the Arctic. Last October, Defense Minister Sergei Shoigu said about this: “We are not hiding this from anyone - we have actually completed the creation of a base on the New Siberian Islands, on Kotelny Island. This is such a large base that did not exist in Soviet times, it is a modern structure, with everything necessary to equip those borders.” The head of the defense department noted that a group of Russian troops in the Arctic has been deployed and is equipped with all the necessary weapons. At the same time, according to him, bases smaller than the one on Kotelny will be built on Wrangel Island, on Cape Schmidt, on the eastern coast of Chukotka, as well as on the Kuril Islands. Let us recall in this regard that at the end of 2018, Russian President Vladimir Putin announced the creation of a separate strategic direction “North”. New structure formed on the basis of the Northern Fleet of the Russian Navy, became operational on December 1, 2018. It included all sea, air and ground forces located in the Arctic. In fact, the very restoration of Russian military infrastructure in the Arctic began back in 2016. As part of this program, implemented by the military department, the construction and repair of facilities is carried out both on the Arctic islands and on the continent, in particular, in the Bering Strait and on Franz Josef Land. In addition, the Russian military will also fight the harmful effects of Arctic pollution. On June 15, 2019, the Russian Arctic National Park was created in the Arkhangelsk region. It included a territory with a total area of 1,426,000 hectares, of which land - 632,090 hectares, sea waters - 793,910 hectares. In fact, The park is both a huge nature reserve and a research center. In addition, large-scale studies of the Arctic part of the biosphere and geological formation are being conducted. What is drawing Russia to the Arctic? There are several reasons for moving in this direction. Russia cannot afford to lose in the struggle for survival that will unfold in the 21st century. In fact, she has already begun to enter the acute phase. The resources and spaces of the Arctic are precisely the zone around which battles will flare up in the first half of the 21st century. The Anglo-Saxons have already paid attention to the region and are trying in every possible way to facilitate the implementation of the Russian Arctic program. One of the geopolitical imperatives for the development of Russia - Eurasia is the North Arctic. The strategic direction “North” is upholding our country’s right to national security and national interests; in a sense, this is another milestone in the creation of a multipolar world. The future of humanity, according to the forecasts of competent analysts, is associated with a tough battle between states and transnational corporations for the possession of not only space, but also resources. Rich in minerals and other resources, the Arctic can and should become part of the Russian raw materials economy. At the same time, modern technologies make it possible to extract resources without disturbing the ecosystem. Resource famine threatens humanity with disaster. If an Anglo-Saxon globalist lays his paw on the resources of the Arctic, then humanity may forget about their fair distribution, as well as the distribution of income from them. For competent development of the Arctic space, appropriate technologies are required. This mobilization task will require the development of science and technology, which will inevitably entail a number of discoveries that can be applied, for example, to the space program or to defense. In the social sphere, this will be reflected in the creation of many jobs, which is extremely necessary for Russia in an era of increasingly unfolding crisis. Again, personnel shortages due to new jobs will require positive changes in the education system. Russia was the first in the Arctic space. The development of this region began with the Russian Pomors and other indigenous peoples of the North. Russian navigators continued to study it, then they were replaced by Soviet scientists and military personnel. Following imperial logic requires the peoples of Russia-Eurasia to continue the begun path to the North. From the point of view of Tradition, it is in the North that Hyperborea, the cradle of humanity, lies, hence the development of the Arctic, in a sense, is a return of Russia to its metaphysical origins. That is why the Arctic development program is a geopolitical, strategic, cultural and historical imperative for Russian development. The slander and provocations that Russia encounters on its northern path are the

essence of a geopolitical and information war against the Russian state, led by the Anglo-Saxon aggressors. This war itself, coupled with the statements of our liberals, only means that we are going the right way. The Arctic is a component of Russian destiny, through it our country will gain a new dimension, a new direction of development. This direction should not be missed under any circumstances. Russia has adopted an Arctic development strategy for the period from October 2020 to 2035. Reflecting the hopes and perceived threats associated with the progressive warming of the Arctic, it aims to accelerate the development of the region's rich resources, primarily oil and gas, and improve the living conditions of the population. In the longer term, the Kremlin hopes to make the Northern Sea Route a new global shipping artery. Moscow is also concerned that an increasingly ice-free Arctic could create new territorial vulnerabilities in its Far North, and is responding by restoring its military presence there. Finally, Moscow also wants to maintain environmental balance in the region. However, there are signs that the interests of the energy sector and the military will be respected, and funding to improve environmental protection and living conditions will remain insufficient. On October 26, 2023, Vladimir Putin officially adopted the new "Strategy for the development of the Russian Arctic zone and ensuring national security until 2035" It is based on "Basic principles Arctic policy", adopted in March, and replaces "Arctic Strategy 2020", adopted in 2018. The political importance of the Arctic in Russia has grown steadily since the late 2000s, as reflected in various policies, programs and presidential speeches, as well as the reactivation and modernization of military bases in the region. The Arctic region will also be in the spotlight in May 2021, when Russia is due to take over the Arctic Council for two years. Although the new strategy is largely built on continuity, shifts in Russian domestic and foreign policy since 2018 are also visible between the lines: the strategy does discuss opportunities for international cooperation, but devotes more space to threat scenarios. And where civil society organizations were named as implementing partners in the 2018 Strategy, they are now simply absent. In addition, the assessment of climate change has also changed. Improving living conditions in the Arctic is the most important priority of the new Strategy. It aims to end the population decline that has affected the entire Arctic region since the collapse of the Soviet Union by 2035.

Climate-related permafrost melt is already having devastating consequences and is expected to affect 70 percent of infrastructure in the coming years. At the same time, many projects proposed at the regional level for the construction of roads, railways and ports remain unrealized due to the lack of government funding. From Moscow's point of view, the Arctic is just one of many problematic and structurally weak regions of the Russian Federation. The state program for the socio-economic development of the Arctic was launched in 2014, but only 17.6 billion rubles (190 million euros) are allocated from the federal budget for 2021–2023. For comparison, the social and economic development program for Crimea provides for more than 300 billion rubles (3.2 billion euros). The lack of adequate government funding for the priority goals of past Arctic strategies leaves Russia's powerful energy sector as the driving force for development in the High North. The Arctic accounts for more than 90% of Russian natural gas production and 17% of oil. New major projects such as Novatek's Yamal and Gydan LNG terminals are driving the expansion of local infrastructure.

National goals President Putin by 2035 provides for a fourfold increase in the annual volume of cargo along the NSR to 80 million tons. Currently in Moscow there are disagreements regarding this goal, which is now considered unrealistic. The Russian state should take on one third of the investments required for the NSR, which Rosatom estimates at US$11.7 billion; the rest is Rosatom, Rosneft, Novatek, Gazprom Neft, Gazprom, Norilsk Nickel, banks and future users of the route. Moscow hopes that commercial projects to develop offshore oil and gas fields will also stimulate development. To date, Western sanctions have largely blocked such initiatives. China looks attractive as an alternative to the West, but its ability to supply technology (including for seismic exploration in the Barents Sea) and the necessary capital are limited.

It is also questionable whether future oil prices will justify the development of these remote reserves. In order for offshore fields in the Arctic to become profitable, a price of at least $80 per barrel is required; current price is approx. US$48 and the lifting of US sanctions. Progress on planned development of new coal deposits is also slow. The window of opportunity for extracting these distant fossil resources is likely to gradually close as international efforts to protect the climate reduce demand for such resources, but this is controversial. Historically, extreme climate conditions have acted as a natural barrier protecting Russia's long Arctic coastline. Therefore, the melting of "permafrost" is a cause for concern. The new strategy speaks of the growing conflict potential in the Arctic, requiring the constant expansion of Russia's military presence in the region.

In a sense, Russia is gaining new external borders that need to be protected from potential aggressors. The naval threat could theoretically come from the east through the Bering Strait or from the west through bases in Greenland and Norway. Thus, shrinking ice creates new vulnerabilities to invasion. From Russia's point of view, its oil and gas terminals are also high-priority facilities requiring protection. In response to the threat, many of the Soviet-era bases

that had been closed since 1990 have been restored and new ones built, including ten search and rescue bases, sixteen deep-sea ports, ten new air bases (out of fourteen), and ten air defense facilities. The military is often deployed there where civilian facilities are found to be insufficient or prohibitively expensive; search and rescue operations are one example. So a growing military presence does not necessarily indicate expansionism. However, there has been a significant increase in military activity, including simulated air attacks on radar installations in Vardø, Norway, jamming of GPS signals in Finland, and increased submarine patrols.

In October 2019, ten submarines passed through the Norwegian Sea on their way to the North Atlantic, the largest such maneuver since the Cold War. And in August 2020, a Russian military aircraft pursued an American bomber into Danish airspace during NATO exercise Allied Sky.

Following its naval doctrine, Russia seeks to strengthen its position as a maritime power, especially in the Arctic and Atlantic. The role of the Northern Sea Route is to guarantee Russia's access to the Atlantic and Pacific Oceans. Thus, the Northern Fleet on the Kola Peninsula has absolute priority; In the event of conflict, it is also expected to be protected by ballistic missile submarines, which make up two-thirds of Russia's naval nuclear deterrent. A revived Soviet-era "bastion concept" envisions the creation of a "reserve" from the Barents Sea to Iceland. In the event of a conflict, the Russian fleet will provide access to the Atlantic, preventing enemy forces from entering the Russian Arctic. Air patrols along the NSR to protect the bastion and its fleet resumed in 2007. In 2019, new air defense missiles were deployed and a hypersonic missile was tested near Novaya Zemlya in the Barents Sea as a show of Russian power. In addition, S 350 mobile SAM launchers integrated into the Area Denial Denial (A2/AD) strategy protect bases on Franz Josef Land, Severnaya Zemlya, New Siberian Islands, Novaya Zemlya and Wrangel Island. The area of the system as a whole covers all islands and archipelagos along the NSR. Russia takes a defensive position in the Arctic, but is ready to respond quickly if a conflict arises. This could include offensive operations to defend the bastion, including the occupation of parts of northern Scandinavia. Moscow sees not only new challenges on its external borders, but also new threats to its internal security. The consequences are felt negatively by members of Russian civil society working on environmental issues in the Arctic and defending the rights of indigenous people. Large economic development projects regularly provoke local protests. Some civil society organizations supported state, others are subject to repressive measures. Those who receive funding from abroad are labeled as "foreign agents" and subject to strict oversight and restrictions. The Kremlin's new Arctic strategy confirms its intention to protect the Arctic environment. This is definitely necessary. Collapsing heavy industries, climate change impacts such as thawing permafrost, and local government failures are creating a toxic mix for the Arctic's fragile ecosystems. This became evident in early June 2020, when more than 20,000 tons of diesel fuel leaked into the Ambarnaya River after thawing permafrost moved beneath a large reservoir. In 2019 (and again in 2020), wildfires grew out of control in the Russian Arctic. The Arctic Strategy now proposes to modernize fragile infrastructure to cope with climate change. It is also planned to create new nature reserves and direct government support to the waste management sector. In the new project, pollution in the Russian Arctic will be regularly monitored, including pollution for which North America, Europe and Asia may be responsible. While many states are stepping up their global efforts to protect the climate, the Kremlin has increasingly avoided linking global warming to carbon emissions. And while the 2013 Arctic Strategy still made reference to man-made climate change, the new document makes no mention of the causes of global warming. Thus, Moscow's climate policy remains ambiguous. She is taking up the issue at the UN to distinguish herself from the Trump administration and emerge as a responsible player. Despite, that legislation regulating CO_2 emissions is under discussion, Russia's emissions targets under the Paris Agreement are actually higher than current levels. There is no plan to phase out oil and gas production. On the contrary, Moscow intends to further expand production and exports. The same goes for coal, which is particularly bad for the climate; here annual production could increase to 668 million tons by 2035. The door to international cooperation is not completely closed, even if the new Arctic Strategy has expanded the space devoted to countering threats. Sometimes conflicting interests - for example, the defense of national sovereignty against the internationalization of the sea route - are reflected in an ambivalent position that contains elements of both confrontation and a desire for cooperation, emphasizing political competition or practical cooperation (depending on the situation). The new Arctic strategy has a separate section dedicated to international cooperation, in which foreign investment plays a central role. Here Moscow is mainly interested in technology and investment in the energy sector, which is subject to Western sanctions. Western firms can collaborate on infrastructure projects and environmental issues. German-Russian cooperation in the natural sciences has been less problematic for the Kremlin and remains successful. The New Arctic Strategy proposes to develop a comprehensive plan for joint international research on ecosystems and the impacts of climate change.The issue of development of the Arctic zone is global in nature, all its stages will be implemented. This was stated on September 11 during the session of the Eastern Economic Forum

(EEF) "Trade and logistics centers in the Arctic: a new opportunity for the development of northern and Arctic territories," said Maxim Dankin, director of the department for the development of the Arctic zone of the Russian Federation and the implementation of infrastructure projects of the Ministry for the Development of the Far East and the Arctic.He recalled that the key strategy and framework of state policy were approved by the president in 2023. "The strategy was signed until 2035. Three stages of the strategy: until 2025, stages are being implemented that trigger many mechanisms," he emphasized. Dankin continued that the mechanisms will be updated from 2026, they will begin to work in full, since a pilot implementation project has already begun for a number of instruments. "For example, it is associated with the development of key stronghold settlements. The President gave instructions only this year, and we are now forming this list and by next year we will be ready to formulate it," he explained. The speaker also clarified that the Arctic now creates one fifth of Russia's income and even more.

"What is important is that global economic projects are being implemented here. Take the Northern Sea Route infrastructure project alone – this is one of the largest strategically important projects in our country," he continued. The authorities will try to launch those mechanisms that improve the quality of life of northerners and the local population, Dankin concluded.Earlier at the EEF, the special representative of the President of the Russian Federation on environmental issues, ecology and transport, Sergei Ivanov, at the session "World Transport Northern Route" indicated that the role of the Northern Sea Route (NSR) for the population of the Russian Federation is huge, but there is still a lot of work to be done in this direction. He clarified that a climate change monitoring system is being created and climate testing sites are being constructed.

Earlier, on August 24, 2023, the President of Russia Vladimir Putin instructed the government to set a rate of 2% for young families purchasing housing in the Arctic zone. He announced the extension of preferential mortgage conditions to the Arctic zone back in July during a meeting on the development of closed administrative-territorial entities and Arctic cities.

The President indicated that The Arctic zone is strategically important for the Russian Federation from a defense and security point of view. The text of the updated State Program for the Development of the AZ of the Russian Federation (2023) outlines the goals and objectives of the support zones, the mineral and raw material nature of their projects and their close connection with the development of transport. The large section "Participation of government bodies of the constituent entities of the Russian Federation in the implementation of Program activities" presents material that requires updating on the formation and functioning of eight support zones of the Russian Arctic regions. With the inclusion of three municipal districts of Karelia into the Arctic zone of Russia in July 2017, the Karelian support zone was added to this eight. In the last two years, the formation of a statistical base for the macro-territory has been underway: section 2.5 has been introduced into the Federal Statistical Work Plan. "Indicators of socio-economic development of the Arctic zone of the Russian Federation and ensuring national security", The State Statistics Committee website presents the Publication Calendar of official statistics. However, for now the information is provided in general for the Arctic Zone of the Russian Federation or for regions that include Arctic territories. In this article, using available statistical materials, a socio-economic characterization of the support zones is carried out, they are compared using a rating assessment, and the factors influencing interzonal differentiation are revealed. We chose the municipality as the operational unit of comparative analysis, which is due to the different status composition of the support zones. The main information source was the passports of municipalities; additional data (for example, on the execution of municipal budgets) were collected on the websites of the respective districts. The general indicators of support zones were determined by summing up similar indicators of municipalities, which provides a unified methodological and information basis for assessment and representativeness of the characteristics of the Arctic zone itself, and not the totality of the subjects of the Federation, of which only four are included in it entirely, and five are separate municipalities. The calculation of zone ratings for each indicator and the summary average as its place in a series of nine reference zones was carried out according to the author's methodology. To assess the socio-economic situation of the support zones, data for 2021 was used, which allows us to get an idea of the starting situation of their development (Tables 2 and 3). The paucity of indicators is due to the focus on assessing production development and the lack of information on individual indicators and municipalities.

Table 2. Characteristics of support zones for the development of the Russian Arctic

Support zone for the development of the Russian Arctic	General characteristics of support zones				
	Area, km^2	Population as of 01/01/2017, people	Share of urban population,%	Social population density, people/km^2	Home-produced goods shipped, completed services in-house (TSPiUSS), thousand rubles.
Arkhangelskaya	185 617	650 755	92.8	771,533	351 868 546
Kola	139 523	634 282	92.8	838.516	401 431 288
Nenets	176 810	43,937	72.4	307,604	324 557 313
Taimyr-Turukhanskaya	1,095,095	227 220	90.4	31,164	1 036 785 268
Karelian	43 377	43 930	67.2	1.315	8 714 223
Yamalo-Nenets	769 667	536 049	83.7	272,914	2 524 084 683
Vorkutinskaya	24180	80 061	99.4	-	41 580 714
Chukotka	723 489	49,822	70.0	84,733	83 144 623
North Yakutskaya	593875	26 190	50.5	0.048	25 844 772

The analysis revealed contrasting differences in support zones in composition, area, size and social density of the population, the cost of goods produced and services provided, and the share of manufacturing industries in it. Common to the support zones is the predominance of the urban population (with the exception of North Yakutia), low and very low population density and the road network. The general trend of "northern outflow" of the population is intensified by the production decline (Vorkuta and Karelian zones), but the trend reverses in those zones where production is developing (Nenets and Yamalo-Nenets zones). The "earned" revenues of local budgets are directly dependent on the nature and power of the municipal economic basis.

The identified differences are largely explained by the accumulated transport and industrial potential of mineral resource development, which makes it possible to distinguish old and new industrial Arctic territories. The first include Arkhangelsk, Kola, Vorkuta, Taimyr-Turukhansk, Karelian, the second - Nenets, Yamalo-Nenets, Chukotka, North Yakutsk.

Table 3. Rating assessment of support zones for the development of the Russian Arctic

Support zone development of the Russian Arctic	Indicators used to calculate ratings						
	Population decline 2022 to 2014, %	Physical population density, people/km^2	Share of manufacturing industries in TSPi-USS,%	TSPiUSS shipped per resident, thousand rubles/person.	Share of tax and non-tax revenues in the own revenues of local budgets,%	Road density, km/100 km^2	Summary rating
Arkhangelskaya	-6.3	3,506	59.3	541	78.5	1.159	3.9
Kola	-15.0	4,546	28.8	649	73.0	0.566	4.8
Nenets	5.8	0.248	6.3	7387	78.4	0.067	4.8
Taimyr-Turukhanskaya	-20.1	0.207	46.0	4563	56.6	0.050	5.8
Karelian	-26.1	1.013	14.3	198	55.3	3,731	6.0
I have little-Nenets	5.7	0.696	13.9	4709	37.2	0.162	6.1
Vorkutinskaya	-40.3	3.311	1.5	519	46.9	0.496	7.3

Chukotka	-7.4	0.069	0.9	1669	32.0	0.043	7.7
North Yakutskaya	-21.0	0.044	0.2	987	35.4	0.031	8.2

The Arkhangelsk and Kola support zones are especially distinguished by the balance of the economy and the maturity of the industrial complex (diversification of the sectoral structure of industry, the ratio of production and processing, etc.). In them, as well as in the Karelian zone, the main elements of the transport and industrial framework of the AZ of the Russian Federation were formed - the Arctic port and the railway connecting it with the federal railway network (Arkhangelsk, Murmansk, Belomorsk). In other zones, even those with great resource potential, the industrial and transport components are poorly and disharmoniously developed; rare centers cannot overcome the influence of the vast periphery.

Spatial and economic imbalances are caused by single-profile specialization and, in fact, the dependence of the economy of a particular territory on the state and development plans of one company. Transport inaccessibility is the main limitation for the implementation of investment projects and the formation of new mineral resource centers in support zones.

Closely interconnected integrated resource and (especially) infrastructure areas are the main frontiers (frontiers) for the development of Arctic territories [Zamyatina, Pilyasov, 2018]. Their prospects depend primarily on the availability of access to the Northern Sea Route, the formation of the main transport axis, the level of network trunking, and the stage of frame formation. A preliminary assessment of the frames of support zones with an emphasis on the primary transport component, carried out using open sources, revealed the following, namely:

– the framework is developing in the Arkhangelsk, Kola, Karelian zones, which is manifested in the reconstruction of Arctic ports and the ongoing plans for the construction of the Belkomur railway (Arkhangelsk - Syktyvkar - Solikamsk);

– the framework is being formed: actively with powerful corporate participation in the Yamalo-Nenets zone (Sabetta port on the NSR, Northern Latitudinal Railway); moderately, but with real funding under the State Program for the Development of the Arctic Zone of the Russian Federation in North Yakutia (reconstruction of ports on the Lena River, the port of Tiksi, construction of a shipyard on the basis of the Zhatai shipyard);

– the frame is being designed: the Syktyvkar - Naryan-Mar highway is being built in the Nenets zone, a pre-design feasibility study for the port of Indiga has been completed, the construction of the Barentskomur railway line (Indiga - Sosnogorsk - Solikamsk) is proposed; in the Vorkuta zone, the Northern Railway is being modernized, possible railway exits to the NSR through Arkhangelsk "Belkomur", Indiga "Barentskomur", Ust-Kara (or Amderma) "Karskomur" are being considered;

– the framework requires reconstruction in the Taimyr-Turukhansk (port of Dikson, new coal ports "Chaika" and "Sever") and Chukotka zones (port of Pevek) and formation in the Chukotka zone (construction of the Kolyma – Omsukchan – Omolon – Anadyr highway).

Thus, for the Nenets and Vorkuta zones the main task is the railway access to the NSR port. For the Kola, Arkhangelsk, and Karelian regions, the development of the transport network through all types of transport (multi-highway transport) is essential; for the remaining zones, it is the strengthening of the main transport axis "river-sea" or "road-sea" with the reconstruction of ports on the NSR.

Regional initiatives to form support zones.

The formed or completed frames are the transport basis for anchor projects that create the production base of support zones and determine their industrial profile.

According to the implementation plan for the State Program for the Development of the AZ of the Russian Federation, in December 2018, a Decree of the Government of the Russian Federation on the procedure and criteria for selecting projects for inclusion in the list of priority ones within the framework of support zones should be adopted. This issue is considered in the scientific literature, as a rule, in the aspect of describing the largest investment projects. We were unable to find a comparative analysis of project initiatives for all support zones from the point of view of complementarity. Below, based on materials from various sources, proposals from the Arctic regions for potential anchor projects are summarized.

Kola support zone. The region is positioning itself as a successful investment site, combining traditional and new types of economic activity in the Arctic. The strategic function of the zone can be designated as an outpost of the Northern Sea Route.

The basis of the production potential is made up of enterprises in the mineral resources, mining, metallurgical and chemical sectors, which are part of the largest national financial and industrial groups. The necessary transport and energy infrastructure is being formed to meet their current needs and potential capabilities. An indisputable advantage is the presence of an ice-free Murmansk seaport and a base for the Russian icebreaker fleet. The traditional core, which includes the fishery complex, is complemented

by a new cluster for the construction of offshore hydrocarbon production and processing facilities, as well as the tourism sector.

As an economic model of the support zone, a combination of tax and administrative regimes provided under the terms of special investment contracts, targeted rehabilitation programs for single-industry towns (in seven municipalities) and the creation of a territory of priority socio-economic development (PSED) in Kirovsk was chosen.

Arkhangelsk support zone. The main emphasis in its development is on the creation of an Arctic transport system. The strategic function associated with supporting the NSR is close to the Murmansk region, but with some restrictions that may be of a fundamental nature.

On the territory of the Arkhangelsk region there are strategic enterprises with developed competencies in the field of shipbuilding and ship repair, united in the Severodvinsk cluster. Their specialization is mainly military in nature, while civil shipbuilding is considered as a promising direction. Work has begun on the creation of the Arkhangelsk production and logistics complex, which will work both in the interests of the Russian Ministry of Defense and for commercial orders.

The production potential of the region is represented by the woodworking and pulp and paper industries, which in the long term are unlikely to be able to provide sufficient cargo flow along the NSR, unlike the mining, metallurgical and chemical enterprises of the Murmansk region. Projects for the development of the region's mineral resources are so far limited to the Pavlovskoye silver-bearing lead-zinc deposit. However, its location on the Novaya Zemlya archipelago does not contribute to the loading of the Arkhangelsk port, which also freezes in winter and requires constant dredging. Commercial fishing is in an uncertain state and its impact on the support zone is still difficult to determine. Among the projects that have potential competitive advantages over other Arctic regions are:

The economic model of the Arkhangelsk zone is associated with the realization of the advantages of the priority development territory and the widespread use of the cluster approach.

Karelian support zone. The region declared its specialization to be the introduction and use of environmentally friendly technologies for environmental management and production in the Arctic.

The project content is expected to be achieved through the creation of a multimodal transport hub with a deep-water seaport in Belomorsk, which should become a key element of the transport corridor facilitating the development of the natural resource potential of the republic.

The existing industrial potential is represented by a mineral resource complex for the development of deposits of common and strategic minerals, and it is proposed to develop it through a biotechnological cluster, combining projects in the field of advanced processing of timber, biological resources of the White Sea, and wild plants.

The specialization of the Karelian zone in renewable and alternative energy turned out to be unique for the European sector of the Russian Arctic. In the future, the region can provide itself with the most environmentally friendly energy, becoming a leader in the pace of low-carbon development. The direction of economic diversification, as in other Arctic territories, is the promotion of ethnocultural, environmental, fishing and rural tourism.

There is no definite vision yet regarding the economic model for the functioning of the Karelian zone.

Nenets support zone. Since the Nenets Autonomous Okrug is the least populated and poorly diversified region of the Russian Arctic, the ideology of development of its support zone is determined by the development of transport infrastructure for more efficient development of hydrocarbon resources on the sea shelf and onshore part of the Timan-Pechora oil and gas province.

Most of the hydrocarbon production projects in the western sector of the Arctic, including the shelf zone (Varandey terminal and Prirazlomnaya platform), are already being implemented in the region. This allows the district, in planning its prospects, to rely on the experience of implementing commercially successful projects in the Arctic without special tax and administrative regimes.

With regard to the economic model, it is especially emphasized that the development of oil and gas fields already makes it possible to accumulate the necessary financial and technological resources for the formation of a modern system of settlements with high standards of quality of life. The development of transport infrastructure will make it possible to use the economic potential of the territory even more effectively, as well as strengthen ties with the central part of Russia and strengthen the country’s position in the Arctic basin.

Vorkuta support zone. The Komi Republic is the only Arctic region of Russia that does not have direct access to the Arctic Ocean and, accordingly, to the infrastructure of the Northern Sea Route.

The specialization of its support zone in the context of fulfilling strategic tasks at the national level is a production and logistics complex that provides transcontinental connections between the ports of the Kara, Barents and White Seas with the ports of the Pacific Ocean, which will allow mining and processing enterprises in the regions of the European North, the Urals and Siberia to reach promising global markets in the West and East. The second component of the specialization is national security. Its development is based on the infrastructure of the

Arctic group of troops and the Ministry of Emergency Situations. In order to ensure self-sufficiency of the support zone and fulfill the tasks of socio-economic development of the Komi Republic, it is assumed that Vorkuta will specialize in preserving the coal industry, developing telecommunications,

In the future, it is planned that the support zone will reach the sea by extending the branch of the Northern Railway "Karskomur" from Vorkuta to the potential seaport of Arcturus [Litovsky, 2016] on the shore of the Kara Sea in the village of Ust-Kara, or the village of Amderma, Nenets Autonomous Okrug. An important factor in the development of the transport and logistics hub is the construction of the Northern Latitudinal Railway. The connection of transport corridors, in the zone of influence of which new mineral resources and processing centers may arise, will ensure the filling of cargo flows of the NSR and optimization of the load of Arctic ports.

For the development of the Vorkuta zone, it is proposed to use mechanisms to support depressed territories by granting the single-industry GO "Vorkuta" the status of a PSEDA. To strengthen the financial base, it is proposed to change the standard for crediting the tax on mineral extraction in the form of hydrocarbon raw materials to the regional budget to 5%.

Yamalo-Nenets support zone. One of the most actively developing territories of the Russian Arctic. Positions itself as a transit corridor providing connections between the industrial centers of the Urals and the oil and gas centers of Yamal with the European part of Russia. Essentially, it consists of three elements - operating anchor projects for the extraction and production of liquefied natural gas (LNG) in Yamal, the new seaport of Sabetta and the Northern Latitudinal Railway, which is under construction, which has a chance of being faster than other options (Belkomura and Barentskomur) to materialize the transport link "Ural – Komi – North-West" that is strategically important for interregional development.

The transport and industrial framework is complemented by a strong humanitarian block in the form of numerous environmental, educational and scientific projects for the comprehensive study and natural rehabilitation of this sector of the Russian Arctic.

The zone uses a wide range of economic mechanisms in the implementation of projects: private investments are attracted (Yamal LNG), government funding (the port of Sabetta), a PPP mechanism is used along the Northern Latitudinal Railway in the form of a concession, supplemented by regional investments in the construction of the road part of the bridge across the river. Ob.

Taimyr - Turukhansk support zone. Its specialization is formed on the basis of mining. At the moment, there are two active cores - the Vankor oil and gas cluster and the Taimyr coal mining center. In the future, two more oil and gas fields may be added to them - Ust-Yenisei and Khatanga. At the same time, only the coal industry and metallurgy, which is being developed in the Norilsk industrial region, are focused on the transport capabilities of the Northern Sea Route (interestingly, the current port of Dikson, according to plans, will be focused only on receiving cargo, and two new ones - "Chaika" and "Sever" - on exporting coal to export). Existing oil and gas flows are tied to a system of trunk pipelines in a southwestern direction outside the zone of influence of the Northern Sea Route and other Arctic territories.

A feature of the economic model of the Taimyr-Turukhansk zone is the high degree of involvement of raw material corporations in the construction and operation of transport infrastructure for their own projects. This, on the one hand, increases their feasibility and independence from government investment (but only during favorable market conditions). On the other hand, it consolidates the export and raw materials specialization of the territory with all the accompanying socio-economic risks.

North Yakut support zone. The fundamental feature of the development of the territory can be considered the basin approach, due to the lack of alternatives to inland water transport, complete dependence on northern supplies and the connection of all Arctic and northern territories of Yakutia with the Northern Sea Route (via inland waterways). It is noteworthy that the authorities of the republic classify as territories of integrated development not only five uluses classified as AZ RF by Presidential Decree of May 2, 2014, but another eight that are rightfully proposed for expansion of AZ RF and the North Yakutsk support zone.

The river-sea transport infrastructure is the framework of both the support zone and the republic as a whole. At the same time, two vectors of Arctic specialization are clearly distinguished. External (latitudinal) is aimed at ensuring the activities of the Northern Sea Route along the entire coast of Yakutia, including servicing ships and vessels with nuclear power plants in the port of Tiksi. The internal (meridional) vector reflects the realization of the region's own interests in the Lena basin. The key project here is the construction of the high-tech Zhatai shipyard.

The design content of the industrial core of the support zone is supposed to be linked with potential mineral resource centers for the development of acutely scarce and strategically important resources. However, the degree of preparation of projects varies greatly, which casts doubt on their feasibility in the near future. The most relevant in this regard remain the anchor projects of the Anabar territory (diamond, rare earth and oil and gas), as well as the Zyryansky coal center of the Kolyma territory.

Among the government support measures that could intensify the formation of the North Yakut support zone are TASED and PPP. In addition, it is proposed to extend to this territory some procedures of a free customs zone and other measures to simplify business activities.

Chukotka support zone. The specialization of the easternmost support zone of the Arctic is fully formed and cannot be changed. Based on the use of the geographical advantages of direct access to the Pacific Ocean and the proximity of the markets of the Asia-Pacific region, two practically isolated territories will be developed here - the Chaun-Bilibino and Anadyr industrial zones. The first specializes in the extraction of polymetallic raw materials, the second - in the development of traditional fuel and energy resources. A special feature of the territory is that its infrastructure framework needs serious modernization of all three subsystems: energy, transport and telecommunications, and so far, unlike other Arctic regions, it is considered not as a competitive advantage, but as a deterrent.

The economic model of the support zone is based on the Beringovsky TASED in the south and the extension of the preferences of the Free Port of Vladivostok to the port of Pevek in the north of the region.

The development concept of the North Yakutsk support zone presents passports of anchor investment projects with an assessment of costs and efficiency, as well as information on mineral resource centers, which distinguishes it favorably in terms of the degree of development from other support zones of the Russian Arctic.

Let us note that the description of project initiatives touches on the proposed mechanisms for the creation and functioning of public health organizations.

Several publications by the authors of the article and other researchers are devoted to this issue, including on the basis of comparison with foreign experience.

The enormous importance of the Arctic region is no longer in doubt, as well as the realization that this region cannot be developed using the methods of the Soviet five-year plans, and as we move to high latitudes (to the Arctic shelf, to the coastal zone and coastal territories), the volumes increase required investments and financial risks.

The main difficulty in introducing new approaches and methods in the formation of space, cells of the territory's framework is that the inertia of already established structures and management methods is still great, and new proposals, developed and even enshrined as mandatory in government documents, have difficulty making their way . This situation can be explained by the difficulties of the transition from the usual strictly centralized management to the need to establish equal rights for different participants in the process of Arctic development. Even with the understanding that they all have a common goal - the modernization of outdated industries and the creation of new ones based on progressive technologies that correspond to the principles of sustainable development of territories and meeting the social needs of the population, uniform rules have not yet emerged. Arctic zone of Russia, consisting of the northern parts of eight subjects of the Federation, due to completely unique circumstances, has practically approached the position of a special and independent object of state regulation and management. These circumstances include: the huge and diverse resource potential of the territory; the determining role of extracted raw materials in the country's export earnings; the high vulnerability of the Arctic ecological system, on which the state of many regions of the world depends; urbanization of developed territories (80% of the population lives in cities and towns). Exorbitant costs in industrial production and maintenance of public utilities inevitably stimulate the search for methods and solutions to reduce costs, hence the objective need to build an innovative economy here. It depends only on the success of this direction, will the Arctic develop in the modern format of the 21st century, or will it get stuck in the 20th century with its worn-out funds and the continuing outflow of population to more prosperous regions. Only the state can be a guarantor and necessary participant in the movement of the Russian Arctic along the innovative path of development. Hopes for private capital and the market did not justify themselves. Private companies, which have taken possession of what was developed in Soviet times, are not engaged in the development of the territory, but in the exploitation of rich deposits, more in their own interests than in the Arctic or the country and its population. This is evidenced by the insufficient level of investment in R&D and low expenditures on corporate social responsibility, despite the fact that almost all owners of Russian mining companies appear on the Forbes list.

However, even under such unfavorable circumstances and despite all the contradictions of state policy, a new space is gradually being built in the Russian Arctic with modernized enterprises serving large government orders and the needs of large companies, thereby forming regional clusters, which will play a major role in the formation her new look.

New avant-garde areas of development, as a rule, are tied to the localization of the largest deposits of strategic types of raw materials, cities and towns serving these deposits or producing the necessary equipment and materials for them, as well as seaports and port points associated with sea and river transport routes with access to to the Arctic, Pacific and Atlantic oceans. In recent decades, the polar territories, regardless of their national protectorate, have increasingly become an area for the implementation of

pilot projects to introduce innovative development methods, the latest eco-friendly production technologies, information technologies and communications, monitoring of natural and social processes. Such approaches to the development of resources and space in the Arctic in the modern world order are dictated, on the one hand, plans to create a powerful raw material and production base of the polar countries in extreme natural and climatic conditions, and on the other hand, high investment risks and market requirements to meet international standards. Products created in the Arctic must not only be in demand in the domestic and world markets, but also competitive. At the same time, today the task is also not to destroy those unique resources of this region, which are still less involved in economic development or are classified as resources of deferred demand, but in the future may be of even higher importance than the reserves of energy and mineral raw materials that are so in demand today. There are still obstacles to the implementation of such large-scale plans in Russia, which, unfortunately, cannot be overcome tomorrow or in the near future. These include: insufficient, and more often meager, financing due to budget deficits and the choice of other priorities for government injections (expenditures on the military-industrial complex and military operations, on new Crimean facilities, etc.); an acute shortage of professional personnel in the absence of effective incentives to attract specialists to work in a difficult climate and in conditions of primitive infrastructure; lack of own technologies and the depressing state of science designed to develop these technologies (during the period of reduction in funding for "northern projects", many scientists and engineers working in this field went abroad); the lack of an effective system for managing complex resource-territorial objects and, finally, a corrupt corps of managers of all ranks, slowing down useful initiatives and transferring state support funds into inappropriate expenses. All these negative factors are well known, and there is no doubt that they were taken into account when developing numerous program documents on the Arctic: these are the "Concept of sustainable development of the Arctic zone of the Russian Federation" (2018), and "Fundamentals of state policy in the Arctic until 2020 and beyond" (2035), and "Strategy for the Development of the Arctic Zone" (2035), and the State Program for the Social and Economic Development of the Arctic Zone until 2035 (2023). However, if we take a realistic approach to the situation on the ground and take into account people's sentiments, it becomes obvious that social policy will play almost the leading role in achieving Russia's ambitious goals in the Arctic. Today it is quite difficult to achieve the voluntary resettlement of people to areas with unfavorable natural and climatic conditions, especially in the absence of modern production and social infrastructure. Besides, The older generation, who spent decades working in Arctic fields or at weather stations on the polar coast and lost their savings during the "shock therapy" of the 1990s, has already popularly explained to their children the dubious advantages of working in the North.

Let us present the results of surveys in the Arkhangelsk region, which are very typical for most northern regions. The main problems pushing young people out of rural areas, respondents consider the impossibility of decent employment (79%), lack of modern leisure facilities (52%), lack of comfortable housing (45%), uncertainty in the future of the settlement (32%), low incomes and inaccessibility of education (14% each). Residents of coastal settlements massively focus on the lack of access to medical and educational services, the inaccessibility of transport territories, the absence or degradation of agricultural and industrial production, the impossibility of using their abilities, education and qualifications. The next stage of lawmaking for the formation of new spatial structures in the Arctic was the draft of the new Federal Law "On the development of the Arctic zone of the Russian Federation" (2020). In it, this zone of the Russian Federation is considered as a single management object, with the formation of a federal executive body and a new integrated approach to territorial and socio-economic development - the creation of support zones. The support zone is defined as "a comprehensive project for planning and ensuring the socio-economic development of the Arctic zone, aimed at achieving strategic interests and ensuring national security in the Arctic, providing for the synchronous interconnected application of existing instruments of territorial and sectoral development, as well as mechanisms for investment projects, including on the basis of public-private and municipal-private partnerships." In total, it is proposed to create eight support zones in the Arctic (Kola, Arkhangelsk, Nenets, Yamalo-Nenets, Vorkuta, Taimyr-Turukhansk, North Yakutsk and Chukotka). Each zone in terms of infrastructure will be based on ports, and, accordingly, they will all be connected by the main transport route - the Northern Sea Route. At the present stage, the new seaport of Sabetta (the eastern coast of the Yamal Peninsula) has occupied an important place in the Yamalo-Nenets support zone, which has already sent the extracted oil from the Novoportovskoye field by tankers to the west. It is unlikely that anyone will deny that an integrated territorial approach is more effective than a sectoral one, especially in a region such as the Russian Arctic, with its vast expanses, large differences in natural, resource, ethnographic and environmental plans, not to mention the different levels of development of certain territories. This was well understood back in the years of the USSR, when the strategy of creating territorial production complexes (TPC) was adopted as the main concept for the

development of new territories. The social and economic effect during the formation of the industrial complex was achieved through the comprehensive and rational development of the entire production infrastructure, the use of local natural (land, water, raw materials) and labor resources. The creation of the TPK was recognized as the most effective spatial form of organization of productive forces, in which the advantages of specialization, cooperation, and combination of various elements of the economic system are realized. Large TPKs created in the Soviet years in the northern regions of Russia are still operating. Murmansk, Timan-Pechora, North Ob, North Yenisei TPK represent the industrial framework of the entire Arctic. There has never been and could not be a complete territorial development in the Arctic, due to extremely unfavorable natural and climatic conditions, and too high costs for all types of production work, social infrastructure and personnel maintenance. In addition, continuous territorial development in Arctic latitudes is also unacceptable for environmental reasons, since highly vulnerable natural systems are able to withstand anthropogenic loads that are extremely limited in space.

In a word, the focal type of development based on large deposits of strategic types of minerals, both today and in the future, remains the only acceptable one in the Arctic. But now we are faced with the urgent task of modernizing the existing heritage and especially the introduction of more energy-efficient and environmentally friendly production technologies. It is clear that Soviet approaches to the formation and development of the TPK (by the way, very effectively and creatively used in many foreign countries) today require rethinking and modernization. In the new Russia, the development of production entirely at the expense of the state budget is unacceptable, as is the use of a certain contingent in northern enterprises that does not require high wages for hard work. The ideology of TPK in spatial economics has been replaced by a cluster approach, which has been successfully operating in all Western countries for a long time and has huge potential in the Russian Federation. Clusters, as zones of high concentration of economic activity of business entities, make it possible to introduce new forms of innovative processes that increase labor productivity and the level of specialization of all participants. The purpose of the cluster approach is to intensify activities for the implementation of production projects in a certain territory, which should ensure an increase in production efficiency, diversification and improvement of the structure of the economy, increasing its competitiveness, when not an individual enterprise, but a large industrial complex will compete in the relevant market. For example, the model of the oil and gas cluster in the Arctic represents a balanced interaction of a group of production, service, scientific and educational organizations (oil refining enterprises, petrochemical, geological exploration and oil production companies, icebreaker and tanker fleet services, port infrastructure, universities and scientific organizations). However, as international experience shows, the most successful clusters are formed where a “breakthrough” is made or expected in the field of technology and production technology with subsequent entry into new market niches. “Collecting” clusters from “debris and waste” of industries and market sectors that are in a state of decline, as a rule, does not lead to success. In our opinion, in the Arctic it is advisable to develop such clusters on the basis of existing main centers for the extraction and processing of resources, maximally tying them to the intersections of transport routes: sea, river, air, railway. Leading economists including academicians A.G. Aganbegyan and A.G. Granberg, proposed to begin updating the production potential in the Arctic precisely with the restoration and further formation of local port-industrial hubs or centers, with their gradual transformation into modern aqua-territorial production complexes. An analysis of the clusters that are currently forming in the Arctic zone allows us to identify several leading sectors that, it seems, will receive the most intensive development in the near future: fuel and energy, timber industry, logistics, ecology and tourism, biotechnology, agro-industrial complex. The most industrially developed Murmansk and Arkhangelsk regions have significant potential for the formation of clusters. Each of these regions has its own specifics, both are historically focused on serving the oil and gas sector and participating in activities that support the operation of the Northern Sea Route.

However, it must be taken into account that the process of innovative restructuring with the formation of interaction between many players, from firms to regional authorities, requires a lot of time. In addition, since a difficult economic situation has developed in the Arctic zone, due to an almost twenty-year period of oblivion and stagnation, it is obvious that the cluster approach cannot be implemented here without special training, government subsidies, intensive cooperation of efforts of both business at all levels and municipal and regional authorities. In 2018, the Federation Council, together with the Higher School of Economics Research University, with the assistance of the Russian-Canadian NORDEP program, prepared “Methodological recommendations for the implementation of cluster policy in the northern regions.” The recommendations identified a wide range of issues regarding the participation of all levels of government in supporting and promoting regional clusters, carried out an analysis of existing cluster initiatives in the northern regions, and considered the tasks and instruments of cluster policy. As already mentioned, the idea of support zones in the Arctic is set out in the draft of the new Federal Law “On the Development of the Arctic Zone of the Russian

Federation," presented in the summer of 2020 for discussion by interested departments and the scientific community as the main form of spatial development of the regions. To date, there is no final decision: whether the new bill will be adopted as the main federal act or will turn into "targeted" by-laws. While it is under consideration by the Government of the Russian Federation, the analysis of proposals from the regions, as well as the financial possibilities for its implementation, continues. The prospects for the latter are not very bright: the Russian Ministry of Economic Development, taking into account the comments of the Ministry of Finance, proposed reducing expenses for the state program for the development of the Arctic from 2018 to 2025 fourfold (from 209.7 billion to 50.9 billion rubles). However, regardless of the amount of future funding, the bill raised many questions among the expert community. For example, doubts arise about the appropriateness of the proposed mechanism for managing the development of the Arctic zone. For these purposes, it is proposed to create a new authorized executive body, and for each support zone (there are eight of them, according to the number of subjects of the Federation in the zone) - a "Project Office of the Support Development Zone." Judging by the list of rights and responsibilities of new formations, two more heavy bureaucratic structures are being created, intermediate between federal authorities and enterprises operating in the region. All powers to develop scientific programs and select topics for inclusion in the state scientific research plan will be transferred to a new executive body, which will have to, together with the leadership of the Arctic subjects of the Federation and local governments, coordinate this plan and monitor its implementation. Is there a need to create a new body when there are a large number of highly professional scientific centers that have accumulated a large amount of analytical and information material on the Arctic and the North, and present scientifically developed plans for long-term research based on many years of work to study the entire range of problems? Are we, in the person of the new body, building another Skolkovo, where billions of budget funds have been invested? but scientific results corresponding to such investments have not yet been obtained. In our opinion, diverting financial resources to support and operate another bureaucratic structure with an extremely limited budget is unlikely to help solve the problems of specific enterprises that need support with preferential loans and taxes. Moreover, in the new law, the northerners did not see answers to the questions that concern them: will the Arctic be developed on a rotational basis or are full-fledged settlements with a full range of services needed; when will the problem of traditional land use for the indigenous peoples of the North be resolved; Is the regional practice of setting lease payments for reindeer pastures at the level of 300 thousand rubles legal? per year (in the Vorkuta region, despite the fact that in the Nenets district similar payments amount to 18 thousand. in year); when will the law on free and indefinite use of lands for the indigenous population be adopted; When will they finally introduce rent payments for the development of mineral resources in the Arctic, or, for example, a tax on progressive capital, so that this region can begin to fully develop?

Unfortunately, this is not the first time we have encountered quasi-approaches in regional politics, which obscure the real picture on the ground, create bureaucratic barriers to free development, introduce additional reporting and inspections, and hamper healthy initiative from the localities with their regulations. Compared to the 1990s, the situation in the regions has changed; local self-government bodies and entrepreneurs' unions have acquired economic and social literacy and a vision of their prospects. Obviously, today it is worth paying more attention to the experience of Western countries that have significantly succeeded in clustering: they provide good examples when the assistance and participation of government agencies is provided as needed and does not fetter the initiative from below). There are three stages in the process of creating and forming support zones in the Arctic. On the first (until 2020)) it is planned to develop their concept and launch an information support system, in the second (2026–2030) it is planned to launch pilot projects of support zones, filling them with scientific and technological solutions, in the third stage (2031–2035) they will begin full-fledged work. Each support zone will have its own development strategy. In general, the implementation of the state program "Socio-economic development of the Arctic zone of the Russian Federation for the period until 2035" will require 260.2 billion rubles. The Kola, Arkhangelsk and North Yakutsk zones are considered to be the most prepared today for the formation of a supporting framework for the reindustrialization of the Arctic. All of them have strong economic prerequisites for accelerated development and in recent years have focused on the formation of clusters of a certain specialization on the basis of existing industrial enterprises and companies associated in their activities with a specialized center. The implementation of the Kola Support Zone project on a full scale requires certain decisions at the federal level, in particular on granting the Murmansk seaport the status of a special port zone, as well as on the mechanisms for the formation of the so-called Pomeranian zone in the Barents region (the latter project also affects the Arkhangelsk region). Based on the industries that currently determine the specialization of the region, marine, mining and chemical and fishing clusters can be formed. They are represented by a number of large companies that are competitive not only in the national market, but also on the world stage. The region has port facilities

(operating and projected), vessels of various profiles and an icebreaker fleet, a repair base, highly qualified workers and management personnel. Creation in the Murmansk region of a non-profit organization "Association of Oil and Gas Industry Suppliers "Murmanshelf"", which included representatives of the Regional Government, the Union of Industrialists and Entrepreneurs, the Northern Chamber of Commerce and Industry, the Statoil company, marine enterprises, etc. (96 organizations in total), can be considered as the initial phase of the formation of the sea industrial cluster. Arkhangelsk support zone. In recent years, most enterprises in the Arkhangelsk region have been focused on supplying products for large-scale oil and gas projects (development of the Prirazlomnoye oil field, construction of the Varandey terminal, as well as the development of the Bovanenkovo gas field on the western coast of Yamal). Eight years ago, the Constellation association was created in the region, which included, in addition to such large enterprises as Sevmash and Zvyozdochka, hundreds of medium and small enterprises - suppliers and contractors of the oil and gas industry. High-tech engineering companies are attracted, connections are established with regional and foreign industry operators. The Yamal LNG project alone became the core for attracting 70 local companies. That is, an oil and gas cluster is practically already being created. In general, there are three more clusters operating in the region - shipbuilding, timber and social, and two more are in the process of creation - biotechnological and fishing.

Great prospects are associated with the Yamalo-Nenets and Nenets support zones, where the main centers of hydrocarbon production in the Arctic are located. These two subjects of the Federation have not only achieved success themselves thanks to the development of extractive industries and transport infrastructure, but are also major customers of various products outside their regions, attracting many enterprises, firms, research centers, forming modern-type oil and gas clusters. The proposal to create a North Yakut support zone was perceived by local authorities in the Republic of Sakha (Yakutia) as a very promising project with a large backlog. First of all, a rationale has emerged for the revival of the seaports of Tiksi and Zelenomyssky, where both concrete piers and hydraulic bases have been preserved; the river-sea class fleet is undergoing renovation, which will be provided by the modernized Zhatai shipyard. In the future, it is planned to launch the shortest meridional transport corridor from northwest China to Western Europe through Skovorodino, Yakutia and the Northern Sea Route.

Norilsk support zone in the Arctic part of the Krasnoyarsk Territory already has two powerful clusters, occupying one of the leading places in the Eastern Arctic. The core of the first of them is the Norilsk mining and chemical complex (one of the main users of the Northern Sea Route). The second is being formed on the basis of the oil and gas fields of the Vankor group, located in the Taimyr and Turukhansk regions. The Vorkuta and Chukotka support zones are still seen as a contour image on the map of the socio-economic space of the Arctic, since their exceptional raw material potential, which was already tapped to a certain extent in Soviet times, In recent years, it has been underutilized: a significant part of the local mining centers have experienced a serious decline since the beginning of market reforms or have been withdrawn from industrial use. In the near future, obviously One should not expect a quick change in the situation: the state does not prioritize the industrial development of mineral deposits in these territories as a priority task, and private investors are not willing to take risks alone. It is important, however, that these territories will be legally declared as priority development zones, which, as the domestic and international markets become in demand and interested businesses emerge, will be able to receive government support.

Conclusion

After some surge in information and discussion activity around the transition from the sectoral to the territorial principle of development of the Russian Arctic (in the format of support zones), there has been a lull in the public space since 2017.

Meanwhile, according to the implementation plan for Subprogram 1 "Formation of support zones for development and ensuring their functioning..." in 2018, the Ministry of Economic Development of Russia was supposed to present "the concept of a project for the formation of support zones for development" (June 29), "develop and carry out research work" (30 November), "adopt regulations" (December 25). In December 2018, a Decree of the Government of the Russian Federation was to be issued on the procedure and criteria for selecting projects for support zones. Planned activities were not completed within the specified time frame. The Ministry of Economic Development is considering 30 regulations aimed at creating conditions for the effective implementation of investment projects in the Russian Arctic, as well as acts on amendments to the Tax Code, the Law "On Subsoil" and other laws.

The long approval in the government of the draft Federal Law "On the Development of the Arctic Zone of the Russian Federation", entirely dedicated to support zones, pushed back until 2019 the funding of research work, the result of which should be economic calculations for projects of support zones in terms of the necessary transport, energy, telecommunications and other infrastructure, volume of natural resources production, promising cargo flows. An important methodological position for developing concepts of support zones and selecting projects, according to the authors of the article, as well as the developers of the

Concept for the formation of the North Yakutsk support zone, is the assessment of the multiplicative effects of their implementation, consistently carried out by colleagues from the Institute of Economics and Economics of the SB RAS.

In addition to regulatory and scientific activities, a significant support for the development of the RF AZ, in our opinion, should be coordinated organizational work, which presupposes the presence of a special structure (for example, a working group in the State Commission) coordinating activities on the formation and functioning of support zones, attracting scientific experts, clearly informing the public about the progress of the activities of the Subprogram on Support Zones, discussing issues of an interregional nature, in particular the organization and financing of the justification and selection of large infrastructure projects (promising railways, ports) in order to eliminate competition between zones. Russian President Vladimir Putin instructed to determine, by November 1, 2023, a list of strong hold settlements in the Arctic zone, including those performing national security functions, corresponding order published on the Kremlin website.

"To the Government of the Russian Federation, together with the executive authorities of the constituent entities of the Russian Federation, whose territories or parts of territories are classified as land territories of the Arctic zone of the Russian Federation: determine a list of support settlements of the Arctic zone of the Russian Federation, including those performing functions in the field of ensuring national security and (or) functions as a base for the development of mineral resource centers, implementation of economic and (or) infrastructure projects in the Arctic," the order says.

The President also instructed to make decisions to support investment projects that provide employment for family members of military personnel living in closed administrative-territorial entities and settlements in the Arctic zone of the Russian Federation in which military formations are stationed. The deadline for execution of the order is December 1, 2023.

"To ensure the development of master plans for the development of support settlements in the Arctic zone of the Russian Federation, defined by subparagraph "b" of this paragraph, for the period until 2035 in order to improve the living conditions of citizens, increase the availability of social services and create opportunities for self-realization of citizens," it adds. instructions.

The deadline for execution of the order is July 1, 2024.

The President also instructed to develop, on the basis of master plans for the development of support settlements in the Arctic zone of the Russian Federation, and approve comprehensive plans for the long-term socio-economic development of such settlements for the period until 2035, establishing sources of financing for the implementation of activities provided for by these comprehensive plans. The deadline for execution of the order is October 1, 2024.

Appointed responsible: Prime Minister of Russia Mikhail Mishustin, Governor of the Yamal-Nenets Autonomous Okrug Dmitry Artyukhov, Governor of the Nenets Autonomous Okrug Yuri Bezdudny, acting governor Krasnoyarsk Territory Mikhail Kotyukov, and about. Governor Chukotka Vladislav Kuznetsov, head of Yakutia Aisen Nikolaev, head Republic of Karelia Arthur Parfenchikov, head of Komi Vladimir Uiba, governor Arkhangelsk region Alexander Tsybulsky, governor Murmansk region Andrey Chibis.

In addition, the President instructed the Government of the Russian Federation, together with the Ministry of Defense of the Russian Federation and the executive authorities of the Murmansk region, to ensure the overhaul of the sports center for marine and physical training (city Severomorsk) branch of the federal autonomous institution of the Ministry of Defense of the Russian Federation "Central Sports Club of the Army" (SKA, city Saint Petersburg). The deadline for execution of the order is December 15, 2025. Those responsible for execution are Prime Minister of the Russian Federation Mikhail Mishustin, Minister of Defense of the Russian Federation Sergei Shoigu Shoigu, Governor of the Murmansk region Andrey Chibis.

The President instructed the Government of the Russian Federation, together with the executive authorities of the Murmansk region, to ensure the overhaul of the buildings of the State regional budgetary healthcare institution "Central District Hospital of the Closed Administrative Unit of Severomorsk". The deadline for execution of the order is December 15, 2025. Prime Minister of the Russian Federation Mikhail Mishustin and Governor of the Murmansk Region Andrei Chibis were appointed responsible.

In addition, the President instructed the Russian Ministry of Defense to ensure the restoration of the building of the officers' house of military unit 06982. The deadline for execution of the order is December 15, 2025. Russian Defense Minister Sergei Shoigu was appointed responsible.

Consideration of the prospects for the development of support zones presented in the draft Federal Law "On the Development of the Arctic Zone of the Russian Federation" shows that the industrial scheme for the development of the Arctic based on resource-exploiting industries is preserved. Harmonization of the development process, which takes into account the importance of all types of natural resources on land and sea, renewable and non-renewable, is not prioritized in the document, and this is alarming. Meanwhile, the initial stage of

development, typical for a significant part of the Arctic territories, especially for coastal zones, which are the most dynamic in nature and environmentally vulnerable, makes it possible to use the experience of already developed similar habitats in other countries, avoid historically accumulated mistakes, apply new world methods and technologies of the last 20 years. The new bill provides for financial support for activities and priority projects from the budget system of the Russian Federation and extra-budgetary sources, in a ratio of 1:4. But with such a distribution of financial investments, it is difficult to expect much enthusiasm from business. It is well known that in regions with difficult natural and climatic conditions, the state must lead the way and create infrastructure, which subsequently attracts business.

As in previous years, the Arctic faces a relatively low level of funding for investment programs. At the same time, it is obvious that for greater efficiency in the use of limited funds in the development of strategic documents and basic laws that will determine the conditions and directions of the Arctic zone, it would be necessary to more actively involve the already developed arsenal of scientific proposals from leading scientific centers that have been associated with the Arctic and its problems for decades. In fact, the main expected goal of the new law was to create a working algorithm for solving strategic problems for the future development of Russia in the Arctic region.

After almost 20 years of neglect of the Arctic by the state, the present period can be considered as a return to high latitudes, but with the understanding that in the 21st century. this must happen on a fundamentally new motivational and technological basis. The previous period with the most active activity in the 1950–1980s was not only characterized by high financial and labor costs with the determining role of the state, but was also marked by the acquisition of vast experience in solving complex technical and technological problems, which brought the country to the forefront of Arctic exploration in the world. However, at the present stage, when developing new development concepts and approaches, it is necessary to take into account the main conclusions from the difficult experience of past decades, namely:

*The Arctic does not forgive mistakes, its development is not a sprint, but a long marathon;

*you cannot “fight” the Arctic, you need to understand its specifics and patterns of development and competently integrate into natural processes, without destroying the ecological balance through technogenic impact, so as not to complicate life and work here for future generations;

*the use of high technologies, knowledge-intensive products, and innovative approaches is a distinctive feature of the Arctic development process; their main goals are the efficient and safe development of resources, minimizing human participation in production processes, creating materials and technical means that help reduce costs for all types of work while maintaining high reliability of their operation;

*when developing new concepts for the development of the Arctic and preparing new legislative initiatives, it is necessary to take into account existing and proven effective scientific methods for organizing the socio-economic space.

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Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.771	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 10.10.2023 **http://T-Science.org**

Issue Article

Makhliyo Sayfidinova
Navoi State University of Mining and Technologies
Corresponding author
sayfidinova.mk@gmail.com

Okhunjon Sayfidinov
Navoi State University of Mining and Technologies
Corresponding author

Mukhlisa Aslonova
Navoi State University of Mining and Technologies
Corresponding author

INVESTIGATING THE THERMAL IMPACT ON LATHE MACHINE TOOL INSERTS

Abstract: *This study employs Finite Element Method (FEM) simulations to analyze the lathe machine tool insert, employing a division into small 3D tetrahedra with multiple nodes, optimizing tetrahedron sizes for enhanced interaction time. A nominal ambient temperature of 20°C is specified at the center of the insert due to its connection to the holder, affecting its temperature. The FEM simulations scrutinize the insert, revealing the influence of various parameters on material temperatures. Materials with lower heat transfer properties and lower density exhibit lower temperatures.*

The study indicates that assembling the lathe machine tool for simulation yields more precise results. The temperature effect, though minimal for the insert, reveals advantages when using carbon and titanium. The accuracy of results for simulating the lathe machine tool assembly relies on detecting heat sources accurately, optimizing mesh sizing, and characterizing the material properties of the machine tool components.

Key words: *Finite Element Method, FEM, Simulation, Lathe Machine Tool, Temperature Effect, Material Properties, Mesh Sizing, Heat Transfer.*

Language: *English*

Citation: Sayfidinova, M., Sayfidinov, O., & Aslonova, M. (2023). Investigating the thermal impact on lathe machine tool inserts. *ISJ Theoretical & Applied Science, 10 (126),* 250-261.

Soi: http://s-o-i.org/1.1/TAS-10-126-17 ***Doi***: https://dx.doi.org/10.15863/TAS.2023.10.126.17

Scopus ASCC: *2200.*

Introduction

Errors may manifest during machining across various domains, encompassing tool wear, mechanical deflection, and thermal influences. Achieving the desired thermal error of less than ±10 μn, which the manufacturing sector seeks throughout the entire operational range of the machine tool [1], remains a challenge. Despite strenuous efforts by machine tool manufacturers, residual thermal displacements persist due to the complexity of designing for the full spectrum of operating conditions and the presence of uncontrollable external factors. Consequently, the adoption of a feedback control system emerges as a logical and pragmatic solution [2].

A significant hurdle in thermal error control lies in the real-time measurement of thermal displacement with respect to the tool and workpiece during machining [2, 3]. As a response to this challenge, process models that establish correlations between thermal deformation and temperature elevation at specific locations on the structure have been developed [4-7].

To regulate the temperature field within the structure, Sata et al. [8, 9] employed a finite element model to furnish feedback information to a control system. This approach employed a coarsely idealized mesh to expedite computations and control cycles, albeit at the cost of accuracy. Moriwaki [10], on the other hand, employed a finite difference thermal model to estimate the axial thermal displacement of a hydrostatically supported precision spindle. The predictions were subsequently utilized to trigger a feedforward open-loop controller. In order to achieve control cycles of the order of 10 seconds, this method assumed two-dimensionality in the thermal deformation process and restricted the analysis to the spindle and its housing exclusively. It becomes apparent that numerical methods, in their current forms, oscillate between being overly intricate and slow or overly simplistic and imprecise for effective feedback control applications. Furthermore, these methods relied on off-line calibration during idle running conditions to ascertain heat input to the structure, without real-time adjustments during actual machining operations.

The focal point of this research entails an in-depth exploration of errors inherent in machine tools, which can manifest in various forms, including but not limited to motion-related, geometric, dynamic, and thermal aberrations, all of which impact both machine performance and the quality of the final manufactured product. This study, in particular, centers on the investigation of temperature-induced errors in machine tools.

The investigation leverages the Finite Element Method (FEM) for precise analysis and employs 3D simulations as its primary methodology. The research focuses on the cutting tool insert of a lathe machine, utilizing a variety of materials with their respective parameters to achieve the targeted research outcomes. A detailed 3D model of the tool insert is meticulously crafted using a laptop computer (ASUS, Taiwan) running NX Siemens software. The selected insert belongs to the SNMG type and is securely fitted within its holder.

The study delves into the intricacies of temperature propagation within the machine tool, drawing upon fundamental principles such as Fourier's law for conduction and Newton's law of cooling for convection. Material properties and characteristics are meticulously referenced from authoritative sources and guides.

A comprehensive exploration of the Finite Element Method is undertaken, and its principles are exhaustively examined throughout the simulation process. Mathematical and numerical computations are conducted within a one-dimensional quadratic element framework, specifically tailored to the insert of the turning machine.

Finite Element Method (FEM) simulations are carried out for both thermal and structural analyses, particularly in the context of steady-state conditions. Siemens NX12 Nastran software is employed for this purpose, yielding invaluable insights into temperature increases, thermal gradients, and the extremal values of temperature within the system.

The resulting data offer a comprehensive understanding of how temperature influences the behavior of the insert during steady-state heat transfer operations. This knowledge serves as a foundation for devising strategies and methods aimed at enhancing the overall performance and operational efficiency of machine tools.

1. Finite element analysis of heat transition

Finite Element Analysis (FEM) constitutes a numerical methodology employed to address problems associated with differential or integral equations. This computational approach involves the transformation of such equations in various ways, either by their complete removal or their conversion into algebraic equations. Additionally, partial differential equations (PDEs) can be reformulated to approximate ordinary differential equations (ODEs). Consequently, this facilitates the utilization of well-established numerical methods to derive solutions.

Finite elements, a fundamental component of FEM, can be categorized into distinct concepts, one of which involves triangular or rectangular elements.

- Nodes: Nodes are endpoints, vertices or specific points of an element. Physical changes in elements are represented by nodes. For example, in the elastic problem, the quality of linear elements with two nodes is obtained at their two nodes. Forces are also applied to these nodes. Deformation is represented as nodal displacement.
- Degrees of Freedom: A node's degrees of freedom is the number of changes within the node. For example, if the translation method is used to solve a structural problem, the nodal degrees of freedom are 3. This indicates translation in his three coordinate directions at one node.

Another example is a thermal analysis with 1 nodal degree of freedom. This will give you the temperature value for a particular node.

Mesh: A mesh is a network of elements made up of nodes used by multiple elements and is used to represent a problem domain waiting to be solved. Due to the complex spindle boundary conditions and geometry used in this experiment and the multiple types of heat sources, the modeling time was too long, and the model was inaccurate. Therefore, the model can only predict part of the error.

Therefore, finite elements are used in design to predict the thermal deformation tendency or dynamic analysis of thermal behavior and indicate the improvement direction of thermal deformation error [11].

Heat generation results of different material inserts

Here, consideration is on simulating different materials for current chosen insert. Fig. 1 presents insert parameters. As, the work intention is to find out heat generation on the lathe machine insert and its effect to the machining surface, initially work starts with choosing different materials and simulated them to find out their heat effects.

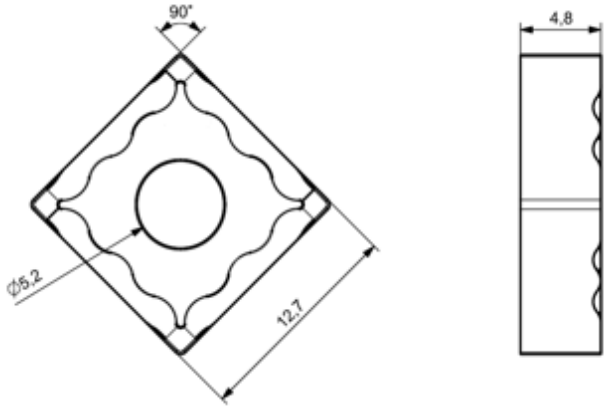

Figure 1. Drawing of lathe machine tool insert [12].

The simulation starts with following materials: molybdenum, cobalt, vanadium, tungsten, carbon, chromium, titanium, carbide. As they have different heat transfer coefficient, the following table presents different values of materials.

Table 1. Different materials heat transfer coefficients [10].

	Material	Heat transfer coefficient $k\left[\frac{W}{m^2K}\right]$
1	Molybdenum	138.00
2	Cobalt	69.21
3	Vanadium	31.00
4	Tungsten	164.00
5	Carbon	0.01663
6	Titanium alloy	7.50
7	Carbide	110

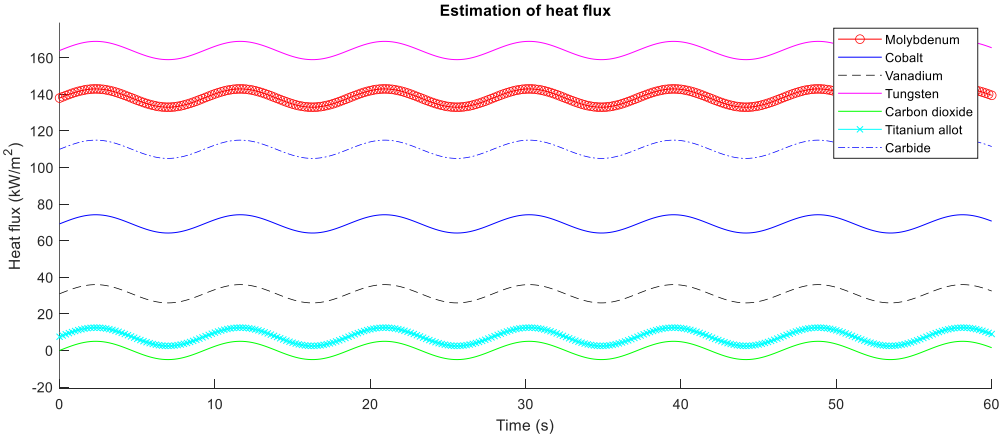

Figure 2. Simulation of heat flux equation using different materials for the same insert. Simulation was done under the following parameters: final time t = 60, time step Δt=0.2

FEM software

For the simulations to measure the heat distribution, we used a laptop computer (ASUS, Taiwan) with a 2.6 GHz Intel I CITM i7-10750H CPU, 8.0 GB RAM with NX Nastran software (Siemens Digital Industries Software, MSC Software, NEi Software, Munich, Germany).

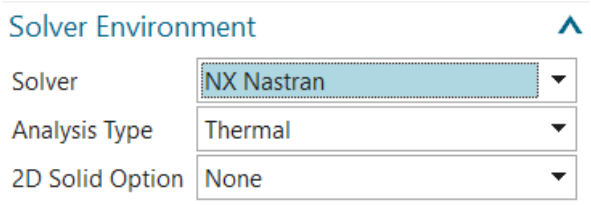

Figure 3. Solve Environment of NX.

Assigning or choosing materials

As our work is to find out thermal property and its effect to the surface, we considered to insert thermal properties of different materials on the software that is shown in Fig. 4. All the properties and data are taken from above mentioned tables.

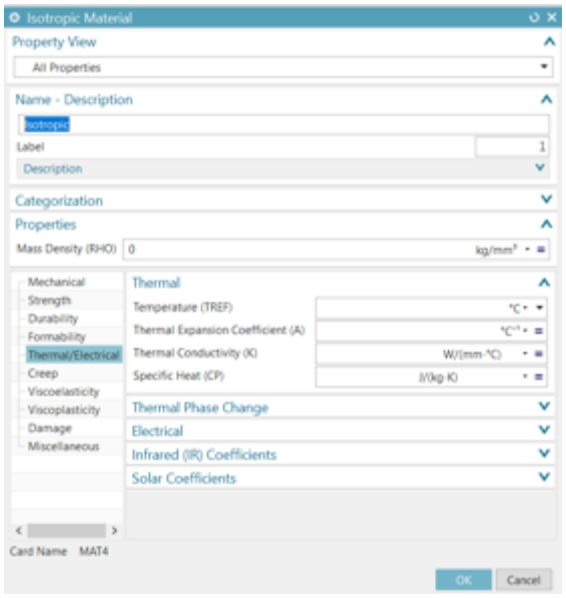

Figure 4. Assigning material panel from NX Nastran.

Mesh generation

The domain discretization is classified under different categories such as topology, method of generation, element type, conformity, body alignment. Structured and unstructured meshes are widely classified by topology. Within the structured and unstructured mesh classifications, the methods may further be subdivided into uniform and non-uniform categories (see Figure 5).

The mesh topology used and performed by NX Nastran for this experiment is non-uniform structured mesh.

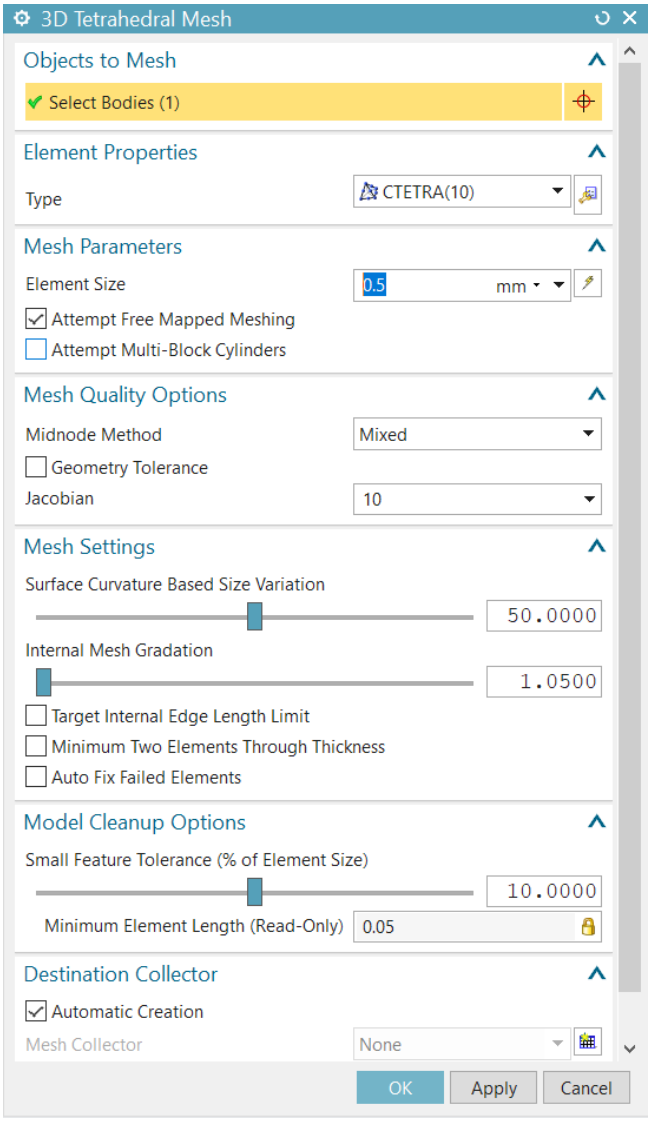

Figure 5. Tetrahedral mesh and CTETRA (10) type.

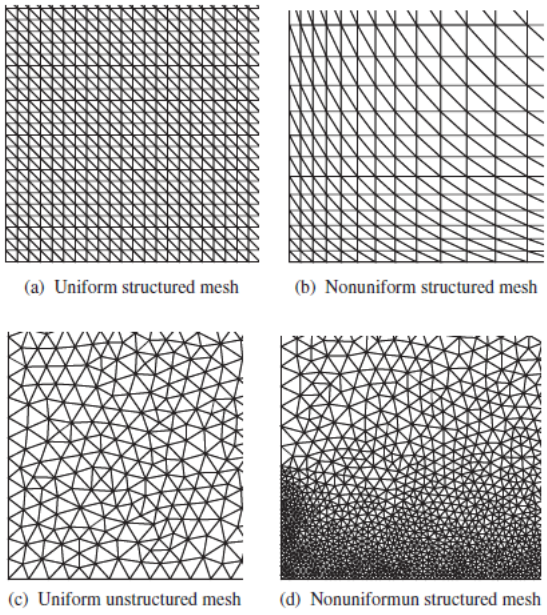

Figure 6. Types of mesh. Topology categories [13].

1.1. Heat source

In order to initiate the simulation, there has been entered thermal constrains in the hole of the insert that is defined as ambient temperature $T_{amb} = 20\,℃$ degree. It is shown in the Fig. 7 right side of the insert. The heat flux parameter is taken from the table 3 and shown in the |Fig. 7 on the left side.

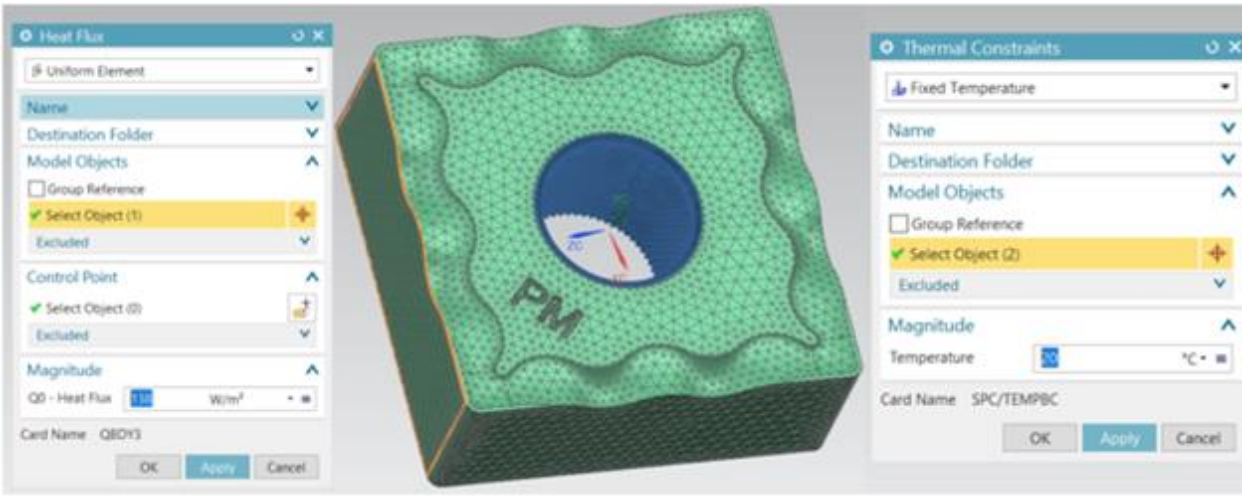

Figure 7. Load and boundary conditions.

1.2. Thermal simulation and results.

In Fig 8 shows the post processing navigation tab. In order to get the result all processes that mentioned above should be followed and can be navigated and checked here. After setting all the required parameters, the simulation initiated, and the result appears in the end of the navigation tab. Using this results tab, it is possible to see the process or simulation final result.

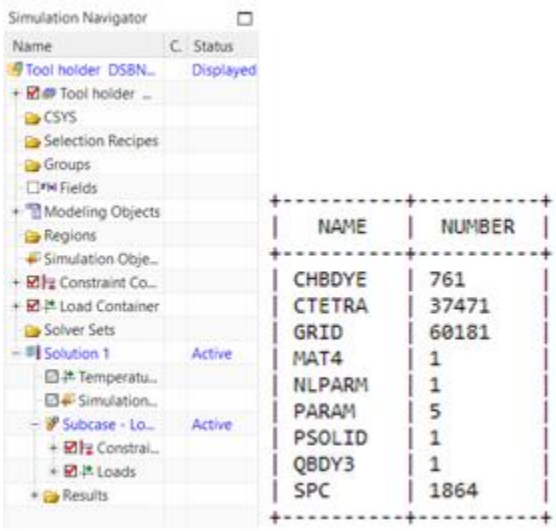

Figure 8. NX Nastran navigation tab and thermal results nodes.

As an insert with various materials is checking or simulating, in below each material simulation results are presented.

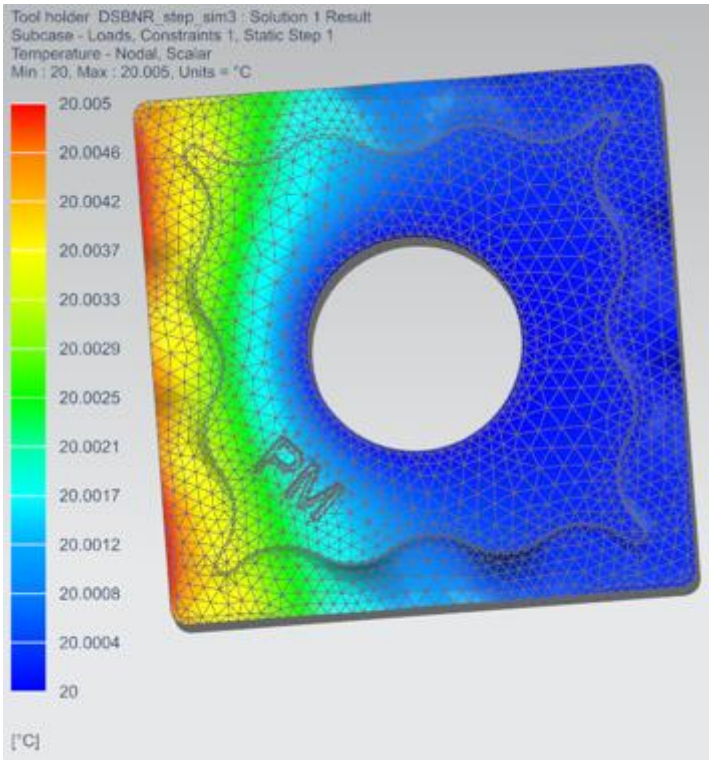

Figure 9. Thermal simulation result of molybdenum inserts

The Fig. 9 presents thermal simulation result of molybdenum insert result that the maximum heat temperature t is $Max = 20.005$.

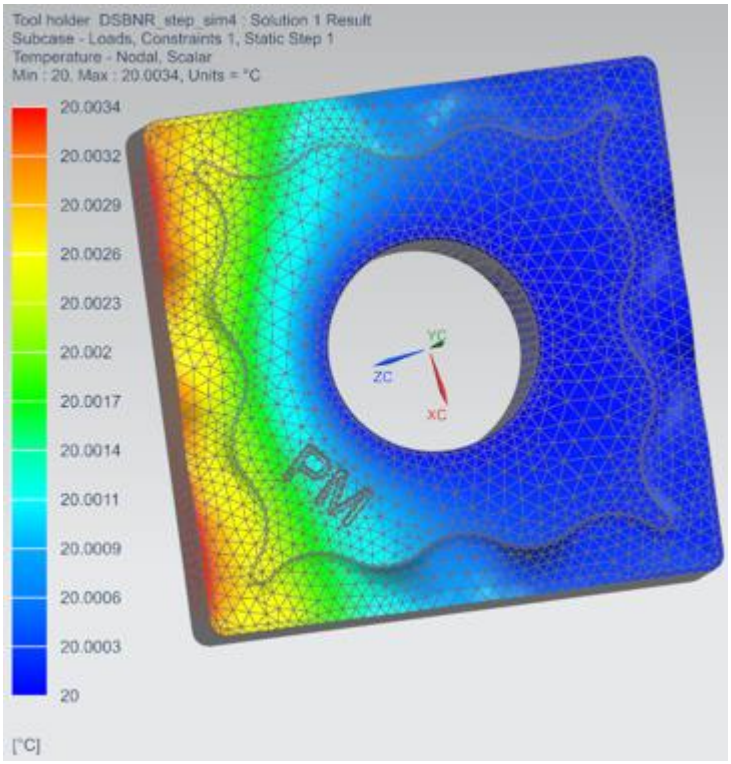

Figure 10. Thermal simulation result of cobalt insert

The Fig. 10 presents thermal simulation result of cobalt insert result that the maximum heat temperature t is $Max = 20.0034$.

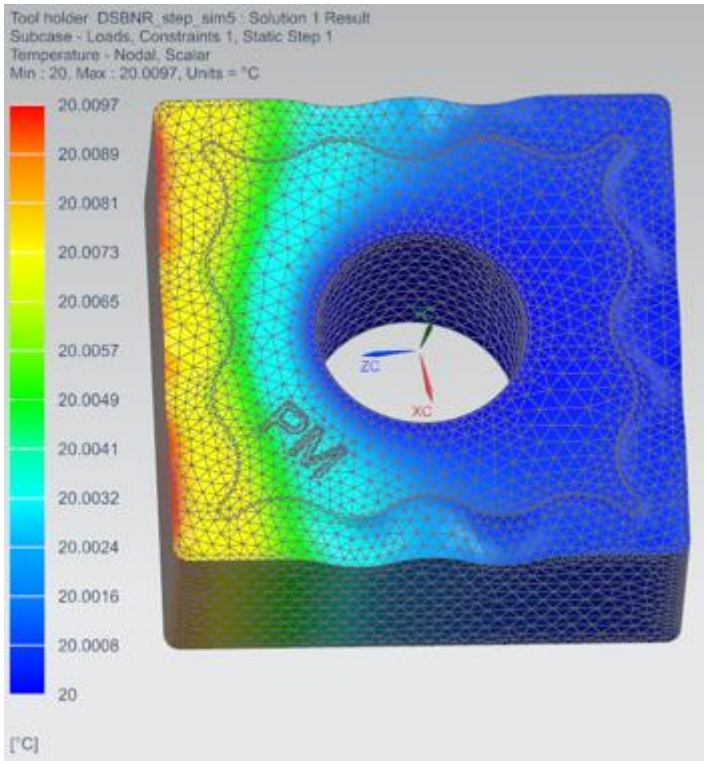

Figure 11. Thermal simulation result of vanadium insert

The Fig. 11 presents thermal simulation result of vanadium insert result that the maximum heat temperature t is $Max = 20.0097$.

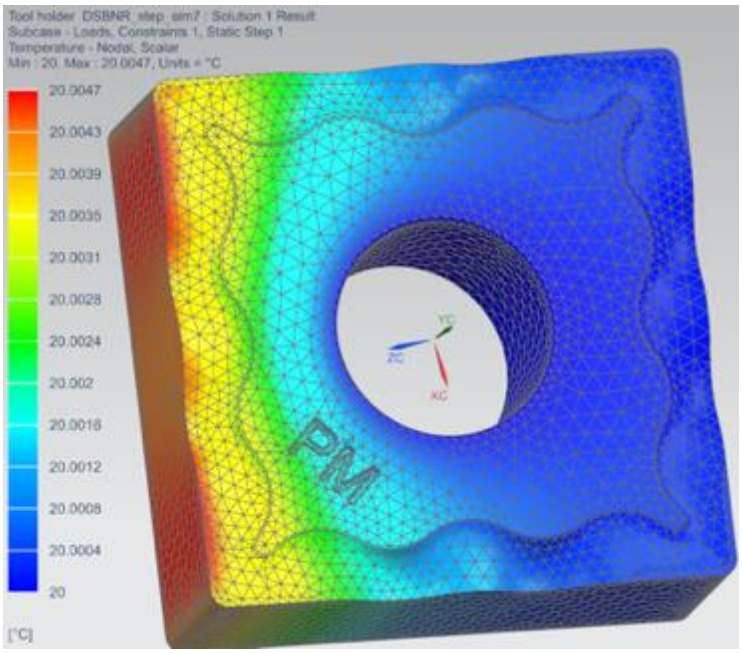

Figure 12. Thermal simulation result of tungsten insert

The Fig. 12 presents thermal simulation result of molybdenum insert result that the maximum temperature t is $Max = 20.0047$.

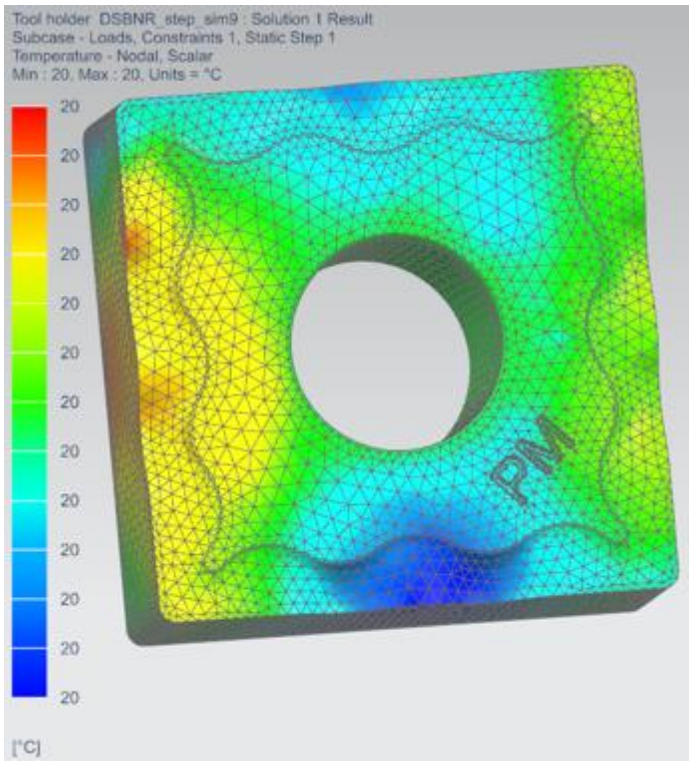

Figure 13. Thermal simulation result of carbon insert

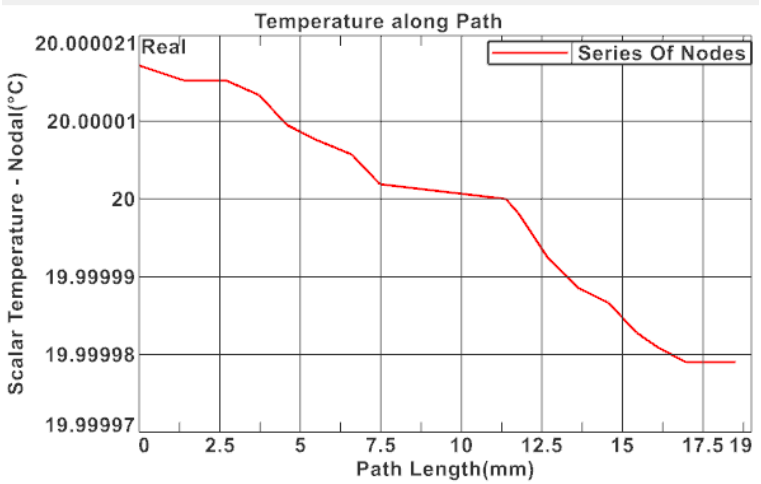

Figure 14. The graph of scaled temperature in different length

The Fig.13 and Fig 14 presents thermal simulation result of carbon insert result that the maximum temperature is $Max = 20.000021$. Here, we presented scalar temperature results due to very small heat effect on the surface [14], [15].

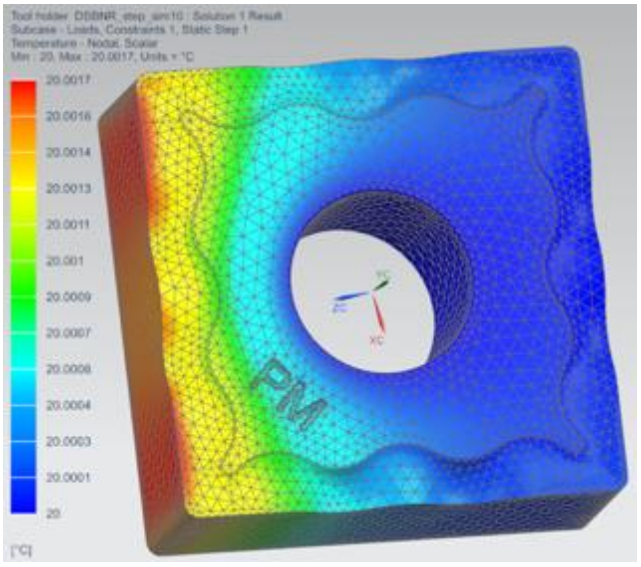

Figure 15. Thermal simulation result of titanium insert

The Fig. 15 presents thermal simulation result of titanium insert result that the maximum heat temperature t is $Max = 20.0017$. We have simulated 6 various material and have found that some materials heat transfers are almost the same like molybdenum and vanadium.

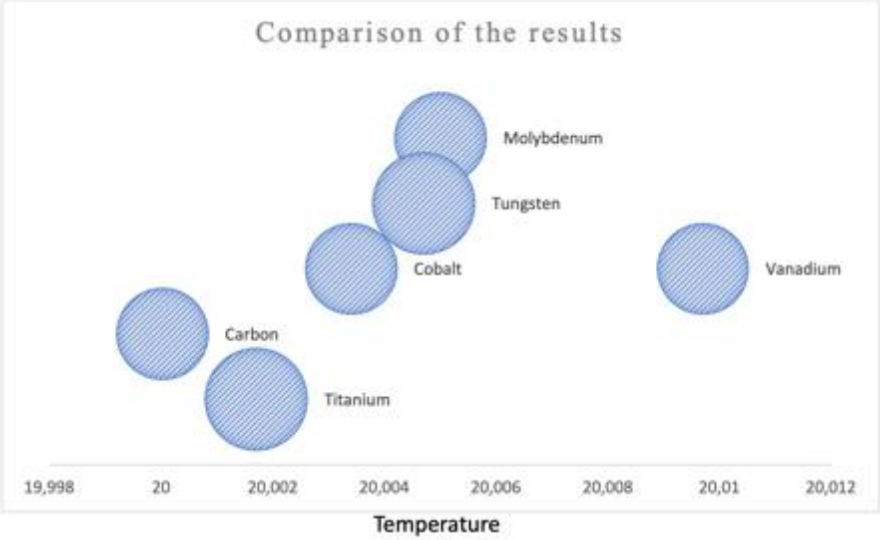

Figure 16. Comparison of different materials thermal effect results

Conclusions.

The lathe machine tool insert was analyzed by FEM simulation by dividing it into small 3D tetrahedra with 10 nodes each. The tetrahedron sizes were defined to improve the interaction time in the simulation. An ambient temperature of 20 °C was specified for the lathe simulation analysis. This was chosen in the center of the insert because this part is fixed to the holder using fixing elements that effects to the temperature of the insert.

The insert of turning machine tool was analyzed by FEM simulations dividing into small 3D tetrahedrons with four nodes each one of them. The simulation results showed that there are various parameters that effect to the materials temperature. However, when there was small heat transfer property and lower density of material, the temperature also was lower than others.

The maximum temperature transfer was estimated in steady-state form in the vanadium insert $t_{max} = 20.0097$. In contrast the minimum temperature transfer was in the carbon with value of $t_{min} = 20.000021$. The other materials like: titanium, cobalt, tungsten and molybdenum showed a little higher temperature effect in a row, respectively.

More precise and detailed result on temperature effect on the tool can be obtained when assembled lathe machine tool is simulated. Due to the size of insert there was very small temperature effect that showed disadvantage of our simulation. However, we found out that temperature effect was less than others when carbon and titanium was used. The Fig 16 presented crucial part of my findings and simulation results. This information can be used and implemented for further analysis and FEM systems.

Assemble of the lathe machine tool can be analyzed by FEM, if it is needed to focus on how the thermal effect occurs in the whole tool itself. The accuracy in the results depends on the correct detection of heat sources, the correct sizing of the mesh in simulation and the material properties of the components of the machine tool.

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Impact Factor:					
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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 10.10.2023 **http://T-Science.org**

Issue Article

S. U. Zhanatauov

Noncommercial joint-stock company «Kazakh national agrarian research university»
Academician of International Academy of Theoretical and Applied Sciences (USA),
Candidate of physics and mathematical sciences,
Department «Information technologies and automatization», Professor,
Kazakhstan
sapagtu@mail.ru

COMPETENCIES IMPLEMENTING ANALYTICAL ABILITIES

Abstract: *The article has developed a system of 4 semantic equations with 13=9+4 semantic variables: meaning (y_1), meaning (y_2), meaning (y_3), meaning (y_4), meaning (z_1),…, meaning (z_9), satisfying the matrix semantic equality of the form meaning(Z_{m9})=meaning($Y_{m4}C^{\#}_{49}$), where meaning(Z_{m9})=meaning(z_1)⊕…⊕meaning(z_9), meaning($Y_{m4}C^{\#}_{49}$)=meaning($Y_{m4}c^{\#}1$)⊕meaning($Y_{m4}c^{\#}_2$)⊕meaning($Y_{m4}c^{\#}_3$)⊕meaning($Y_{m4}c^{\#}_4$). This matrix semantic equality corresponds to the matrix equality for numerical z-, y-variables modeled as matrices: $Z_{m9}=Y_{m4}C^{T}_{94}$. The developed 4 semantic equations have 4 semantic solutions - knowledge (new extracted knowledge), cognizing 13 competencies (teach (y_1), develop (y_2), motivate (y_3) and others), introducing analytical abilities to students (with a ban on dismissal). Visualization of the mutual dynamics of curves (variability values of z-, y-variables from matrices Z_{m9},Y_{m4}) of knowledge about "weights" (from C_{99}) and z-, y-variabilities in a model with 9 z-variables, 4 y-variables showed dynamics model values of unmeasured competencies: teach, develop, motivate, critical thinking (z_1); determination (z_2); analytical skills (z_3); leadership (z_4); communication skills (z_5); creativity (z_6); ability to work in a team (z_7); multitasking (z_8); punctuality.*

Key words: *competencies, analytical abilities, multi-sense equation with known and unknown semantic variables, Cognitive Model of Analytics Competencies.*

Language: *Russian*

Citation: Zhanatauov, S. U. (2023). Competencies implementing analytical abilities. *ISJ Theoretical & Applied Science, 10 (126)*, 262-276.

Soi: http://s-o-i.org/1.1/TAS-10-126-18 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2023.10.126.18

Scopus ASCC: *2604.*

КОМПЕТЕНЦИИ, ВНЕДРЯЮЩИЕ АНАЛИТИЧЕСКИЕ СПОСОБНОСТИ

Аннотация: *В статье разработана система из 4-х смысловых уравнений с 13=9+4 семантическими переменными: смысл(y_1),смысл(y_2),смысл(y_3),смысл(y_4),смысл(z_1),…,смысл(z_9), удовлетворяющих матричному смысловому равенству вида смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), где смысл(Z_{m9})=смысл(z_1)⊕…⊕смысл(z_9),смысл($Y_{m4}C^{\#}_{49}$)=смысл($Y_{m4}c^{\#}_1$)⊕смысл($Y_{m4}c^{\#}_2$)⊕смысл($Y_{m4}c^{\#}_3$)⊕смысл($Y_{m4}c^{\#}_4$). Этому матричному смысловому равенству соответствует матричное равенство для числовых z-, y-переменных, смоделированных в виде матриц: $Z_{m9}=Y_{m4}C^{T}_{94}$. Разработанные 4 смысловые уравнения, имеют 4 семантических решений–знаний (новых извлеченных знаний), познающие 13 компетенций (обучать(y_1), развивать(y_2), мотивировать(y_3) и другие), внедряющих аналитические способности обучающимся (при запрете увольнения). Визуализация взаимных динамик кривых (значений изменчивостей z-, y-переменных из матриц Z_{m9},Y_{m4}) знаний о «весах» (из C_{99}) и z-, y-изменчивостях в модели с 9 z-переменными, 4 y-переменными показала динамики модельных значений неизмеряемых компетенций: обучать, развивать, мотивировать, критическое мышление (z_1); решительность (z_2); аналитические способности(z_3); лидерство (z_4); коммуникабельность (z_5); креативность (z_6); умение работать в команде (z_7); многозадачность(z_8); пунктуальность.*

Ключевые слова: *компетенции, аналитические способности, многосмысловое уравнение с известными и неизвестными семантическими переменными, Когнитивная Модель Компетенций Аналитика.*

Введение

Компетенции и связи – 2 непримиримые стороны по разному оценивающих одно и то же. Профессия аналитика стала популярна в последнее десятилетие во всех сферах социальной жизни, особенно в области управления. Быть аналитиком означает быть компетентным, обучаемым, развивающимся, мотивированным. Актуальной проблемой является разработка познающей модели для управляющих и для обучающихся. Термин внедрение объединяет смыслы слов обучать, развивать, мотивировать. Ниже анализируются по новому компетенции, внедряющие аналитические способности индивида, зависят (влияют на) от 9 факторов.

Компетенции – в новом сознании, межличностные (внутриклановые или коррупционные или профессиональные) связи – в отсталом мировоззрении, не анализировались когнитологией. Были отдельные социологические, философские, психологические, юридические публикации, поясняющие некоторые аспекты связей, но термин «компетенции» не воспринят научным сообществом. Потому, что он многофакторно проявляется в явлениях, в ситуациях, в системах. Начнем познавать компетенции с 4-х компетенций, вместе втроем внедряющие аналитические способности будущего не аналитика (без конкретизации предметной области). Любому человеку владеть компетенциями предпочтительнее, чем иметь (владеть нитями) связи в влиятельных кругах. Тут я вижу многих, твердо доказывающих незыблемость прежних «устоев», инертность мышления. Нужно отойти от «грязных» берегов и выйти к чистой воде когнитивного компьютинга. Измерим изменчивости 9 факторов компетенций, внедряющих компетенции аналитика – это набор моральных, личных и деловых качеств обучаемого, подвергаемых управлению управленческими решениями: обучать (y_1), развивать (y_2), мотивировать (y_3), уволить (y_4), когда обучать, развивать, мотивировать нецелесообразно. Смыслы этих факторов применяем далее в качестве 9 имен-смыслов вводимых в математическую модель y- и z-переменных.

Мы ниже проводим иной тип оценки, отличающуюся от (как сейчас принято) оценки soft skills ("мягкие" навыки) универсальные компетенции, которые гораздо труднее измерить количественными показателями) и hard skills ("жесткие" навыки) профессиональные навыки, которым можно научить и которые можно измерить.). Soft skills – личные качества, которые зависят от характера человека и приобретаются с жизненным опытом. Такие универсальные компетенции трудно измерить количественными показателями. Они практически не зависят от специфики конкретной работы, но помогают строить карьеру. К ним относятся интеллектуальные, социальные и волевые компетенции.

Исходные данные

Исходной информацией для модели являются смыслы 9 z-факторов, выражающих компетенции индивидов-обучаемых, z-факторы способствуют внедрению аналитических способностей и управляются смыслами 4-х y-факторов. Имеется много списков компетенций, воспользуемся одним из них. Основные смыслы y-факторов, влияющие на компетенции разделены на 2 группы. Смыслы факторов из группы, состоящей из 9 z-факторов, влияют на смыслы 4-х y-факторов. Смыслы 9 z-факторов состоят из фраз, выражающих интеллектуальные, социальные и волевые компетенции индивида. Их смыслы: критическое мышление (z_1); решительность (z_2); аналитические способности (z_3); лидерство (z_4); коммуникабельность (z_5); креативность (z_6); умение работать в команде (z_7); многозадачность (z_8); пунктуальность (z_9). Фразы, выражающие смыслы управленческих решений всего четыре: обучать (y_1), если обнаружился недостаток знаний, умений и навыков; развивать (y_2), когда есть базовые умения и нужно раскрыть потенциал; мотивировать (y_3), если необходимый набор знаний и умений есть, но не используется на полную; уволить (y_4), когда воспитывать и обучать нецелесообразно.

Исходными данными для модели являются назначенные экспертом исходные значения сил влияния $c_{kj}=corr(z_k,y_j)$, $k\in\{1,\dots,9\}$, $j\in\{1,\dots,4\}$ 12 индикаторов наличия знаний: $c_{11}=0.7$; $c_{31}=0.7$; $c_{81}=0,6$; $c_{14}=c_{24}=c_{34}=c_{44}=c_{54}=c_{64}=c_{74}=c_{84}=c_{94}=-0,6$. Мозаика $\{c_{kj}\}$ из элементов будущей матрицы «весов» C99 задается экспертом в соответствии со смыслами и силами парной связи $c_{kj}=corr(z_k,y_j)$ нижеперечисленных смыслов факторов компетенций. Словесная модель компетенций имеет зависимые по смыслам показатели. Специфика управляющих параметров модели отлична от специфик в других предметных областях [1-5].

Задача: разработать систему из 4-х смысловых уравнений с 13=9+4 семантическими переменными смысл(y_1), смысл(y_2), смысл(y_3), смысл(y_4),смысл(z_1),…,смысл(z_9), удовлетворяющих матричному смысловому равенству вида смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), где

смысл(Z_{m9})=смысл(z_1)⊕…⊕смысл(z_9),
смысл($Y_{m4}\mathbf{C}^{\#}_{\mathbf{49}}$)=смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{1}}$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{2}}$)⊕ смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{3}}$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{4}}$). Элементы матрицы $C^{\#}_{49}$ равны 9 элементам первых 4-х строк $\mathbf{c}^{\#}_{\mathbf{1}}$, $\mathbf{c}^{\#}_{\mathbf{2}}$, $\mathbf{c}^{\#}_{\mathbf{3}}$, $\mathbf{c}^{\#}_{\mathbf{4}}$ матрицы индикаторов C_{99}, а ее i-ая строка $\mathbf{c}^{\#}_{\mathbf{j}}$ имеет компоненты, равные компонентам матрицы индикаторов C_{99}:$c^{\#}_j$=(c_{j1},c_{j2},…,c_{j9}), i=1,…,4. Этому матричному смысловому равенству соответствует математическое матричное равенство для числовых переменных вида: $Z_{m9}=Y_{m4}C^{T}_{94}$. Таково правило соответствия матричного смыслового равенства своему матричному числовому равенству.

Применяемая система многосмысловых уравнений

Многосмысловое уравнение [6-8 8-10] конструируется из многомерной математической модели [8], где уже введены числовые параметры, переменные, функции связи, соответствующие реальным свойствам реальных многомерных объектов разных типов. Тип объектов, их свойств отражается в смыслах свойств объектов [5-13]. Суммы смыслов свойств (z-переменных) объекта могут образовать новый смысл y-переменной (взамен старому смыслу) или нет [5]. В многомерной математической модели (она является вторичной, первична матричная смысловая модель) переменные делятся на 2 вида: известные имена-смыслы z-переменных: смысл(z_1),…,смысл(z_9) и известные имена-смыслы y-переменных смысл(y_1),…,смысл(y_4). Количество 4 переменных равно количеству дисперсий disp(y_1)=λ_1,disp(y_2)=λ_2,…,disp(y_n)=λ_4. В соответствии с значениями λ_1, λ_2,…,λ_4, взятыми из пары смоделированных матриц (C_{99},Λ_{99}) проставляются числовые параметры c_{11},…,c_{99} в 4 уравнения системы многосмысловых уравнений:
смысл(y_1)=смысл(z_1)*c_{11}⊕смысл(z_2)*c_{21}⊕ смысл(z_3)*c_{31}⊕смысл(z_4)*c_{41}⊕…⊕смысл(z_9)*c_{91}.
После удаления слагаемых с «весами» c_{ij}, величины которых не удовлетворяют критерию быть индикатором скрытых знаний [6-7], количество слагаемых в уравнениях с неизвестными новыми смыслами смысл(y_1), смысл(y_2),…,смысл(y_4) сократится. И система многосмысловых уравнений будет содержать меньшее число известных z-смыслов. Более «короткие» суммы смыслов легче осмысливать для конструирования 6 фраз для 6 новых смыслов (новых семантических y-переменных) новый_смысл (y_1), новый_смысл(y_2), новый_смысл(y_4), существенно дополняющих исходные смыслы смысл(y_1), смысл(y_2), смысл(y_3), смысл(y_4). Метод смыслового преобразования исходных семантических переменных в новые семантические переменные называется когнитивной моделью коррупции.

Требуемые фразы, отражающие смыслы неизвестных 4 новых смыслов y-переменных, можно сконструировать, если смоделировать:

а) пару матриц собственной структуры (Λ_{99},C_{99}),
где C_{55} – матрица псевдособственных векторов, $C_{99}C^{T}=I_{99}$, $C^{T}{}_{99}C_{99}=\neq I_{99}$, $\Lambda_{99}=diag(\lambda_1,\ldots\lambda_9)$, $tr(\Lambda_{66})=\lambda_1+\ldots+\lambda_n=n$, $tr(\Lambda_{nn})=\lambda_1+\ldots+\lambda_n=n$, условие упорядоченности $\lambda_1\geq\ldots\geq\lambda_n\geq 0$ не требуется;

б) матрицы значений некоррелированных изменчивостей Y_{m4}, коррелированных изменчивостей (отклонений от 0) Z_{m9}, соответствующих своим системам многосмысловых уравнений с известными и неизвестными семантическими (смысловыми) переменными.

Иное название [6] элементов матрицы C_{99} введено в статьях [6-8], оно отражает смысл «весов», моделируемых в нашей модели, наш метод моделирования отличается от методов из [6-11].

Новые моделируемые 2 матрицы в нашей модели должны обладать свойствами: ортогональная (не ортонормированная) матрица C_{nn} собственных векторов $\mathbf{c_j}=(c_{1j},c_{2j}\ldots c_{nj})^T$, расположенных по столбцам матрицы $C_{nn}=[c_1|c_2|\ldots|c_n]$ согласована со своим спектром Λ_{nn} корреляционной матрицы $R_{nn}=(1/m)Z^{T}_{mn}Z_{mn}$, $\Lambda_{nn}=diag(\lambda_1,\ldots\lambda_n)$ таким образом, что выполняются равенства $R_{nn}C_{nn}=C_{nn}\Lambda_{nn}$, $C^{T}C\neq I_{nn}$,$CC^{T}=I_{nn}$, $tr(\Lambda_{nn})=\lambda_1+\ldots+\lambda_n=n$. В решаемой ниже Оптимизационной Задаче: (I_{99},I_{99})=>(C_{99}, Λ_{99}) (другие методы смотрите в [10-12]) целевая функция $\lambda_1+\ldots+\lambda_n$ равна 9 при изменяемых значениях элементов 2-х матриц C_{99}, Λ_{99}, $C^{T}C\neq I_{99}$, $C_{99}C^{T}{}_{99}=I_{99}$, Матрицы U_{m9} и Y_{m9} такие, что $(1/m)U^{T}_{m9}U_{m9}=I_{99}$, $Y_{m9}=U_{m9}\Lambda^{1/2}{}_{99}$, $Z_{m9}=Y_{m9}C^{T}{}_{99}$, в матрице Y_{m9} элементы j–го столбца y_{1j},y_{2j},…,y_{mj} (j-ая y-переменная, j=1,…,9) имеют среднее арифметическое, равное нулю: $(1/m)(y_{1j}+y_{2j}+\ldots+y_{mj})=0$, и дисперсию равную λ_j: $(1/m)(y^2{}_{1j}+y^2{}_{2j}+\ldots+y^2{}_{mj})=\lambda_j$, сумма дисперсий равна n: $\lambda_1+\ldots+\lambda_n=9$. Матрицы $Y_{m9}=U_{m9}\Lambda^{1/2}{}_{99}$, $Z_{m9}=Y_{m9}C^{T}{}_{99}$, интерпретируются как многомерные выборки [12]. В нашей модели мы моделируем нестандартизованные ($C^{T}C\neq I_{99}$) коррелированные z-переменные являются многомерными данными, объединенных в матрицу Z_{m9}, в которой элементы j–го столбца z_{1j},z_{2j},…,z_{mj} (j-ая переменная, j=1,…,9) имеют среднее арифметическое равное нулю: $(1/m)(z_{1j}+z_{2j}+\ldots+z_{mj})=0$, и дисперсию не равную 1: $(1/m)(z^2{}_{1j}+z^2{}_{2j}+\ldots+z^2{}_{mj})\neq 1$, сумма дисперсий не равна 9. Элементы матрицы C_{55} интерпретируются как индикаторы знаний [13,14]. Матрица Y_{m9}, в которой элементы j–го столбца y_{1j}, y_{2j},…,y_{mj} (j-ая y-переменная, j=1,…,9) имеют среднее арифметическое равное нулю: $(1/m)(y_{1j}+y_{2j}+\ldots$

$+y_{mj})=0$, и дисперсию равную λ_j: $(1/m)(y^2_{1j}, +y^2_{2j}+\ldots+y^2_{mj})=\lambda_j$, сумма дисперсий равна 9: $\lambda_1+\ldots+\lambda_9=9$. Матрица Y_{m9}, интерпретируется как многомерная выборка. Нестандартизованные коррелированные z-переменные - данные, объединенные в матрицу Z_{m9}, в которой элементы j–го столбца $z_{1j},z_{2j},\ldots,z_{mj}$ (j-ая z-переменная, j=1,…,9) имеют среднее арифметическое равное нулю: $(1/m)(z_{1j}+z_{2j}+\ldots+z_{mj})=0$ и дисперсию, не равную 1: $(1/m)(z^2_{1j}+ z^2_{2j}+\ldots+z^2_{mj})=1$, сумма дисперсий не равна 9. Матрица Z_{m9} интерпретируется как многомерная нестандартизованная выборка.

Применяемая система многосмысловых уравнений состоит из 4-х смысловых уравнений с 13=9+4 семантическими переменными смысл(y_1), смысл(y_2), смысл(y_3), смысл(y_4), удовлетворяющих матричному смысловому равенству вида смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), где смысл(Z_{m9})=смысл(z_1)⊕…⊕смысл(z_9), смысл($Y_{m4}\mathbf{C}^{\#}_{49}$)=смысл($Y_{m4}\mathbf{c}^{\#}_1$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_2$)⊕ смысл($Y_{m4}\mathbf{c}^{\#}_3$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_4$). Элементы матрицы $C^{\#}_{49}$ равны 9 элементам первых 4-х строк $\mathbf{c}^{\#}_1, \mathbf{c}^{\#}_2, \mathbf{c}^{\#}_3, \mathbf{c}^{\#}_4$ матрицы индикаторов C_{99}, а ее i-ая строка $\mathbf{c}^{\#}_j$ имеет компоненты, равные компонентам матрицы индикаторов C_{99}:$c^{\#}_j=(c_{j1},c_{j2},\ldots,c_{j9})$, i=1,…,4. Матричному смысловому равенству смысл(Z_{m9})=смысл(Y_{m4} $Y_{m4}C^{\#}_{49}$) соответствует математическое матричное равенство для числовых переменных вида: $Z_{m9}=Y_{m4}C^{T}_{94}$.

Когнитивная модель компетенций, внедряющих аналитические способности

Информационными компонентами когнитивной модели «компетенций, внедряющих аналитические способности» являются:

1. Модельная пара матриц (C_{99},Λ_{99}): матрица собственных чисел Λ_{99}, матрица псевдособственных векторов C_{99} таких, что выполняются условия: $C_{99}C^{T}=I_{99}$, $C^{T}_{99}C_{99}=\neq I_{99}$, $\Lambda_{99}=diag(\lambda_1,\ldots\lambda_9)$, $tr(\Lambda_{99})=\lambda_1+\ldots+\lambda_9=9$, Λ_{99}=diag(2.5000,2.5000,2.5000,1.5000,0.0000, 0.0000, 0.0000,0.0000,0.0000).

2. Матрицы C_{99} и Λ_{99} моделируются при решении Оптимизационной задачи. Вид таблицы-программы Оптимизационной задачи: $(I_{99},I_{99})=>(C_{99}\Lambda_{99})$ приведен в Таблице 2.

3. Известные смысловые переменные смысл(z_1),…, смысл(z_9) в модели используются для нахождения новых смыслов для модельных y-переменных y_1,y_2,y_3,y_4, которые управляют соответствующими числовыми 9 z-переменными $(z_1,z_2,\ldots,z_9)$.

4. Четыре смысловых уравнения:

а) смысл(y_1)=смысл(z_1)*0,7000⊕смысл(z_2)*(-0,0581)⊕смысл(z_3)*0,6000⊕смысл(z_8)*0,7000); смысловое уравнение имеет семантическое решение новый_смысл(y_1)=«обучать аналитика компетенциям: критического мышления, применения аналитических способностей и многозадачности».

б) смысл(y_2)=смысл(z1*(-0,0044)⊕ смысл(z2)*0,9738⊕смысл(z3)*0,0995⊕ смысл(z4)*(-0,0042)⊕смысл(z5)*(-0,0040)⊕ смысл(z6)*(-0,0038)⊕смысл(z7)*(-0,0038)⊕ смысл(z8)*(-0,0021)⊕смысл(z9)*(-0,0038); смысловое уравнение имеет семантическое решение новый_смысл(y_2)=«для повышения уровня компетенции аналитика надо развивать: решительность и способность анализировать».

в) смысл(y_3)=смысл(z_1)*(-0,1551)⊕ смысл(z2)*(-0,0900)⊕смысл(z3)*0,8523⊕ смысл(z4)*(-0,1111)+смысл(z5)*(-0,1037)⊕ смысл(z6)*(-0,1013)⊕смысл(z7)*(-0,1015)⊕ смысл(z8)*(-0,0529)⊕смысл(z9)*(-0,1015); смысловое уравнение имеет семантическое решение новый_смысл (y_3)=смысл(z_1)*(-0,6857) ⊕смысл(z_2)*(-0,6110)⊕смысл(z3)*(-0,6000)⊕ смысл(z4)*(-0,6441)⊕смысл(z5)*(-0,6000)⊕ смысл(z6)*(-0,6000)⊕смысл(z7)*(-0,6094)⊕ смысл(z8*(-0,6000)⊕смысл(z9)*(-0,6094); смысловое уравнение имеет семантическое решение новый_смысл(y_3)=«для повышения уровня компетенции аналитика надо мотивировать решительно развивать компетенции аналитика».

г) смысл(y_4)=смысл(z_1)*(-0,6857)⊕ смысл(z_2)*(-0,6110)⊕смысл(z_3)*(-0,6000)⊕ смысл(z_4)*(-0,6441)+смысл(z5)*(-0,6000)+ смысл(z6)*(-0,600)⊕смысл(z_7)*(-0,6094)+ смысл(z_8*(-0,6000)⊕смысл(z9)*(-0,6094); смысловое уравнение имеет семантическое решение новый_смысл(y_4)=«для обучения, развития, мотивирования аналитика нельзя его увольнять: за неумение работать в команде, за решение одной задачи, за непунктуальность». Против увольнения голосуют значения коэффициентов корреляций (парной связи с y-переменной y_4) всех z-переменных: c_{14}=corr(z_1,y_4)=(-0.70047509), c_{24}=corr(z_2,y_4)=(-0.711247849), c_{34}=corr(z_3,y_4)=(-0.7), c_{44}=corr(z_4,y_4)=(-0.790882423), c_{54}=corr(z_5,y_4)=(-0.700577318), c_{64}=corr(z_6,y_4)=(-0.7), c_{74}=corr(z_7,y_4)=(-0.7), c_{84}=corr(z_8,y_4)=(-0.7), c_{94}=corr(z_9,y_4)=(-0.7)). Такие проявления сил факторов означает отрицание смыслов z-факторов, которое имеет постоянное проявление: значение disp(y_4)=λ_4=0.5750 приближено к 0, но не равно 0. Существует незначительная вариабельность, благоря ей мы обнаружили 3 смысла 3-х z–переменнх. Так как имеем семантическое решение смыслового уравнения для y-переменной y_4 вида смысл(y_4)=…, то имеем право находить решения вышеприведенных смысловых уравнений с неизвестными смыслами

3-х y-переменных y_1,y_2,y_3: смысл(y_1), смысл(y_2), смысл(y_3). Формально в математической модели y-переменные y_1,y_2,y_3,y_4 некоррелированы: $corr(y_1,y_2)=\lambda_{12}=0$, $corr(y_2,y_3)=\lambda_{23}=0$, $corr(y_1,y_3)=\lambda_{13}=0$, так как $\lambda_{12}=\lambda_{23}=\lambda_{13}=0$. но в жизни управленческое решение зависит от предыдущего решения. Поэтому мы в смысловом уравнении смысл(y_4)=… при конструировании его смыслового решения учитывали только доминирующие модельные «веса». Заметим также: если для выборки Z_{m9} (Таблица 6) вычислим ее стандартизованную матрицу Z_{m9}, то ее матрица Y_{m9} будет недиагональной: $(1/m)Y^T_{m9}Y_{m9}\neq diag()$, т.е. будем иметь для Z_{m9} матрицу коррелированных y-переменные y_1,y_2,y_3,y_4 Y_{m4}. Поэтому наше игнорирование алгебры z-факторов, влияющих на y-переменную y_4, является обоснованной: «нельзя его увольнять: за неумение работать в команде, за решение одной задачи, за непунктуальность».

5. ненулевые дисперсии $\lambda_1=0.0250$, $\lambda_2=0.02500$, $\lambda_3=0.02500$, $\lambda_4=0,1.5000$ из модельного спектра $\Lambda_{99}=diag(2.5000,2.5000,2.5000,1.5000,0.0000,$ 0.0000, 0.0000, 0.0000, 0.0000) равны значениям алгебраических формул y–изменчивостей $y_{i2},y_{i1},y_{i3},y_{i4}$, i=1,…, 24, имеют развные значения. Других значений не удалось получить при решении Оптимизационной Задачи с 3+9=12 индикаторами (управляющие параметры, соответствующие смыслам y-переменных y_1,y_4) присутствия введенных знаний.

6. Из вычисленных в рамках модели 9*9=81 индикаторов в смысловой модели используются 4*9=36 (в том числе 2 назначенных экспетом) индикаторов наличия модельных знаний, как показано на Рисунках 1-4, адекватных реальным знаниям.

7. Каждая из четырех смысловых формул из пункта 3 когнитивно сконструирована из смыслов 9 неизмеряемых и зависимых друг от друга z-показателей. Три смысла: новый_смысл(y_1), новый_смысл(y_2), новый_смысл(y_3) (необходимых для внедрения компетенции аналитика) не коррелируют друг с другом: $(y_1,y_2)=corr(y_2,y_3)=corr(y_1,y_3)=0$ так как $\lambda_{12}=\lambda_{23}=\lambda_{13}=0$. Эти равенства – следствие исходной гипотезы модели: они по смыслам друг на друга не влияют.

8. Смыслы z-показателей являются входными данными модели, они сформулированы в пункте «Исходные данные» статьи.

9. Состав исходных индикаторов (12 штук, Таблица 2) не отличен по значениям от смоделированных индикаторов, формально найденных при решении Оптимизационной Задачи.

10. Модельные матрицы Y_{m4}, Z_{m9} (Таблицах 5 и 6) (полученные путем вычисления по алгоритму и путем компьютерного моделирования случайных матриц V^0_{m9}, U_{m9} удовлетворяют равенствам алгебраической системы уравнений, соответствуют найденным выше 4 многосмысловым уравнениям.

Таблица 1. Модельная матрица C_{99} псевдособственных векторов с 12 исходными или модельными индикаторами Λ_{99}=diag(4.2500,0.0250,0.0250,0.0250,0.5750)

1	2	3	4	5	6	7	8	9
0,7000	-0,0044	-0,1551	-0,6857	-0,1256	-0,0062	0,0000	0,0000	0,0000
-0,0581	0,9738	-0,0900	-0,6110	-0,1185	-0,0694	0,0000	0,0000	0,0000
0,6000	0,0995	0,8523	-0,6000	-0,1246	-0,0944	0,0000	0,0000	0,0000
0,0000	-0,0042	-0,1111	-0,6441	-0,0998	0,1126	0,0000	0,0000	0,0000
0,0000	-0,0040	-0,1037	-0,6000	0,7833	0,0031	0,0000	0,0000	0,0000
0,0000	-0,0038	-0,1013	-0,6000	-0,0167	0,7934	0,0051	0,0000	0,0000
0,0000	-0,0038	-0,1015	-0,6094	-0,1059	-0,0052	0,7792	0,0000	0,0000
0,7000	-0,0021	-0,0529	-0,6000	-0,0554	-0,0028	0,0000	0,3796	0,0000
0,0000	-0,0038	-0,1015	-0,6094	-0,1059	-0,0052	0,0000	0,0000	0,7792
1,3434	**0,9583**	**0,8153**	**3,4410**	**0,6946**	**0,6559**	**0,6071**	**0,1441**	**0,6071**
0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	**0,0000**

Оптимизационная Задача

Для моделирования матрицы C_{99} индикаторов наличия скрытых знаний сформируем 2 диагональные единичные матрицы (I_{99},I_{99}). Для процедуры GRD2, необходимы функции ограничений, помогающие процедуре GRD2 уменьшить работу при поиске решения (матрицы C_{99},Λ_{99}). Простыми ограничениями, не вызывающих возражений, являются: c_{11}=0,7; c_{31}=0,7; c_{81}=0,6; c_{i4}=-0,6, i=1,…,9. Значение c_{11}=corr(z_1,y_1)=0,7; c_{31}=corr(z_3,y_1)=0,7; c_{81}=corr(z_8,y_1)=0,6 выражают условия: тесная парная связь между «обучением» и «критическим мышлением» (смыслz$_1$) нами назначена 0.7 (c_{11}=corr(z_1,y_1)=0,7); тесная парная связь между «обучением» и «аналитическими способностями» (смыслz$_3$) нами назначена 0.7; тесная парная связь между «обучением» и «» (смысл **z$_8$**) нами назначена 0.6.

Решается Оптимизационная Задача: (I_{99},I_{99})=>(C_{99}, Λ_{99}) целевая функция λ_1+…+λ_n равна 9 при изменяемых значениях 9*9+9 элементов 2-х матриц C_{99}, Λ_{99}, а ограничения: $C^TC\neq I_{99}$, $C_{99}C^T_{99}=I_{99}$, $\Lambda_{99}=diag(\lambda_1,\ldots\lambda_n)$, tr($\Lambda_{99}$)=$\lambda_1$+…+$\lambda_n$=n, без ограничений вида $\lambda_1\geq\ldots\geq\lambda_n\geq 0$.

Мы проведем моделирование матрицы псевдособственных векторов C_{99}:(I_{99},I_{99})=>(C_{99},Λ_{99}), $C^T_{99}C_{99}\neq I_{99}$, $C_{99}C^T_{99}=I_{99}$ и моделирование для нее диагональной матрицы Λ_{99}. Особенность матрицы псевдособственных векторов C_{99} состоит в том, что и позволяют моделировать коррелированные z-переменные с дисперсиями, большими 1. Такая z-переменная более изменчива, чем y-переменная y_4. Сильно изменчивые z-переменные (z_2, z_3, z_3, z_5, z_6) через формулы передают заметные ненулевые дисперсии y-переменным y_1, y_2, y_3. Значения z-переменных (z_1, z_2, z_3, z_4, z_5,…, z_9) являются многомерными данными, объединенных в матрицу Z_{m9}, в которой элементы j–го столбца z_{1j},z_{2j},…,z_{mj} (j-ая переменная, j=1,…,5) имеют среднее арифметическое равное нулю: (1/m)(z_{1j}+z_{2j}+…+z_{mj})=0, и дисперсию не равную 1: (1/m)(z^2_{1j}+z^2_{2j}+…+z^2_{mj}) ≠1, сумма дисперсий не равна 9.

Решая Оптимизационную Задачу: (I_{99},I_{99})=>(C_{99},Λ_{99}), мы надеемся получить другие значения элементов матрицы Λ_{99}, отличающиеся от диагональной матрицы Λ_{99} из статьи [1]. Чтобы принудить процедуру GRD2 (программа в надстройке «Поиск решения») автор применил облегчающие его работу ограничения, например, вводил в окно «Ограничения» условие $\lambda_1\geq 2$ (расширяющее область поиска) или $\lambda_1\leq 2$ (сужающее область поиска). Основным вычислительным регулятором является мозаика исходных индикаторов и назначенные экспертом значения 18 индикаторов. Вид таблицы-программы Оптимизационной задачи с 12 исходными индикаторами приведен в Таблице 4.

Конструирование смыслов y-факторов с 12 исходными индикаторами

Смысловое равенство смысл(Z_{m9})= смысл($Y_{m9}C^T_{99}$) можно записать по-другому: смысл(z_1)+…⊕смысл(z_9)=смысл(y_1*$\mathbf{c^T_1}$)⊕…⊕ смысл(y_9*$\mathbf{c^T_9}$). Так как не существует 9 смыслов, а имеем только 4 y-смысла (смыслы смысл(y_5*$\mathbf{c^T_5}$), …, смысл(y_9*$\mathbf{c^T_9}$ отсутствуют), то сокращается количество смыслов из правой части равенства. Имеем смысловое равенство смысл(z_1)⊕…⊕ смысл(z_9)=смысл(y_1*$\mathbf{c^T_1}$)⊕….⊕смысл(y_4*$\mathbf{c^T_4}$). В матричном виде данное равенство имеет вид: смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$). Отсюда следует, что смысловому равенству соответствует математическая модель вида: $Z_{m9}=Y_{m4}C^T_{94}$. В правой части участвуют 4 1-ые компоненты 9-ти псевдособственных векторов **c_1, …,c_9**. Четверка «весов» из псевдособственного вектора, умноженные на значения 4-х y–изменчивостей, дают 4 произведения y*c, а сумма их равна значению одной из 9-ти z–изменчивостей. Количество z–изменчивостей равно 9, а их смыслы заданы в исходных данных. Если бы количество z–изменчивостей совпало бы с количеством y–изменчивостей, то мы бы решали смысловое уравнение смысл(Z_{m9})=смысл($Y_{m9}C^T_{99}$) со своей математической моделью вида: $Z_{m9}=Y_{m9}C^T_{99}$. Но мы по постановке задачи рассматриваем матричное смысловое равенство вида смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), поэтому формула $Z_{m9}= Y_{m9}C^T_{99}$ в данной когнитивной модели не применима.

Рассмотрим 1-ую смысловую неизвестную переменную смысл(y_1)=«обучать (y_1), если обнаружился недостаток знаний, умений и навыков», являющуюся неизвестной семантической переменной смысл(y_1)=смысл(z_1)*0,7000⊕смысл(z_2)*(-0,0581)⊕смысл(z_3)*0,6000⊕смысл(z_8)*0,7000.
Для неизвестной переменной смысл(y_1) из левой части сконструируем сумму смыслов (новый_смысл(y_1)) слагаемых из правой части равнства. Проверим фразу из вновь сконструированного ниже смысла новый_смысл(y_1) и фразу «обучить: критическому мышлению, применению аналитических способностей и умению решать много задач» из смысл(y_1)=«обучать, если обнаружился недостаток знаний, умений и навыков» на отсутствие противоречия по их смыслам. Если отсутствует противоречие по их смыслам, то считаем, что смысловое уравнение смысл(y_1)=смысл(z_1)*0,7000+смысл(z_2)*(-0,0581)⊕смысл(z_3)*0,6000+смысл(z_8)*0,7000

имеет семантическое решение, равное новый_смысл(y_1). Проводим конструирование суммарной фразы для неизвестной семантической переменной новый_смысл(y_1). В анализируемом уравнении присутствуют 4 смысла 4-х z–переменных: критическое мышление (z_1), аналитические способности(z_3), многозадачность (**z_8**) и слабо выраженное отсутствие решительности (z_2). Знак минус при «весе» (c_{21}=(-0,0581)) и учет исходного смысла переменной смысл(y_1)= «обучать, если обнаружился недостаток знаний, умений и навыков» позволяет нам словесно сконструировать суммарную фразу для переменной *новый_смысл*(y_1)=«Обучать, чтобы научить: критическому мышлению ((z_1), с силой c_{11}=0,7000) аналитическим способностям ((z_3), с силой c_{31}=0,6000), многозадачности мышления ((z_8), с силой c_{81}=0,7000)».

Рассмотрим матричное равенство смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), Оно разлагается в систему многосмысловых уравнений вида:
смысл(y_1)=смысл(z_1)*0,7000+смысл(z_2)*(-0,0581) ⊕смысл(z3)*0,6000⊕смысл(z_8)*0,7000);
смысл(y_2)=смысл(z_1*(-0,0044)⊕смысл(z2)* 0,9738⊕смысл(z_3)*0,0995⊕смысл(z4)*(-0,0042)+ смысл($_{z5}$)*(-0,0040)+смысл(z6)*(-0,0038)⊕ смысл(z_7)*(-0,0038)⊕смысл(z8)*(-0,0021)⊕ смысл(z_9)*(-0,0038);
смысл(y_3)=смысл(z_1)*(-0,1551)⊕смысл(z_2)*(-0,0900)⊕смысл(z_3)*0,8523⊕смысл(z_4)*(-0,1111)⊕ смысл(z_5)*(-0,1037)⊕смысл(z_6)*(-0,1013)⊕ смысл(z_7)*(-0,1015)+смысл(z_8)*(-0,0529) ⊕ смысл(z_9)* (-0,1015);
смысл(y_4)=смысл(z_1)*(-0,6857)⊕смысл(z_2)*(-0,6110)⊕смысл(z_3)*(-0,6000)+смысл(z_4)*(-0,6441) ⊕смысл(z_5)*(-0,6000)⊕смысл(z_6)*(-0,6000)⊕ смысл(z_7)*(-0,6094)⊕смысл(z8*(-0,6000)⊕ смысл(z_9)*(-0,6094).

Начнем с формулы смысла y-переменной y_4. Из формулы смысла y-переменной y_4 вида: смысл(y_4)=смысл(z_1)*(-0.6857)⊕смысл(z_2)*(-0.6110)⊕смысл(z_3)*(-0.6000)⊕смысл(z_4)*(-0.6441)⊕смысл(z_5)*(-0.6000)⊕смысл(z_6)*(-0.6000)⊕смысл(z7)*(-0.6094)⊕смысл(z8*(-0.6000)⊕смысл(z_9)*(-0.6094) видно, что знаки всех 9 индикаторов равны минусу. Нельзя увольнять (с высокими степенями проявления: c_{14}=(-0.70047509), c_{24}=(-0.711247849), c_{34}=(-0.7), c_{44}=(-0.790882423), c_{54}=(-0.700577318), c_{64}=(-0.7), c_{74}=(-0.7), c_{84}=(-0.7),c_{94}=(-0.7)). Такие проявления сил факторов означает отрицание смыслов z-факторов. Нельзя уволить (y4): из-за критического мышления ($\neg z_1$); из-за проявления решительности ($\neg z_2$); из-за проявлений аналитических способностей ($\neg z_3$); из-за непроявлений лидерства ($\neg z_4$), коммуникабельности ($\neg z_5$), креативности ($\neg z_6$). Смысл y-переменной y_4 передается фразой «Нельзя уволить (y_4): за неумение работать в команде (z_7), за решение отдельной задачи (z_8), за непунктуальность (z_9)».

В формулах других y-переменных y_1,y_2,y_3 (обучать (y_1), развивать (y_2), мотивировать (y_3),) силы проявлений z-факторов имеют разные знаки плюс или минус.

Рассмотрим для y-переменной y_1 с смысловой неизвестной переменной смысл(y_1)=« **обучать** (y1), если обнаружился недостаток знаний, умений и навыков". Строим фразу с учетом используемых фраз из смыслов, присутствующих в смысловом равенстве Обучать критическому мышлению (z1, с силой c_{11}=0.7;), Обучить применять свои аналитические способности (z_3, с силой c_{31}=0.6), обучать решать много задач (z_8, с силой c_{18}=0.7). Развивать(y_2) свои аналитические способности (z_3), с силой c_{32}=0,0995, Мотивировать (y3) развиать свои аналитические способности (z3, с силой c_{33}= 0,8523, проявляя при этом небольшую дозу лидерства (z_4) с небольшой силой c_{43}=(0,1111).

В сокращенном виде фраза «обучать аналитика компетенциям: критическо мышления, применения аналитических способностей и многозадачности» передает смысл неизвестной смысловой переменной новый_смысл(y_1).

Рассмотрим 2-ую смысловую неизвестную переменную смысл(y_2)=« развивать (y2), когда есть базовые умения и нужно раскрыть потенциал». Правая часть уравнения смысл(y_2)=смысл(z1*(-0,0044)+ смысл(z2)*0,9738+смысл(z3)*0,0995+ смысл(z4)*(-0,0042)+смысл(z5)*(-0,0040)+ смысл(z6)*(-0,0038)+смысл(z7)*(-0,0038)+ смысл(z8)*(-0,0021)+смысл(z9)*(-0,0038) равна сумме смыслов 9 z–переменных z_1,z_2, …,z_9.

Развивать компетенции аналитика за счет существенного развития с силой c22=0,9738 решительности (z2, c22=0,9738), развития способности анализировать (z3, c32=0,0995, но без воздействия z-факторов: z1 - с силой c12=(-0,0044), z4 - с силой c42=(-0,0042, z5 - с силой c52=(-0,0040), z6 - с силой c62= (-0,0038), z7 = с силой c72= (-0,0038), z8 - с силой c82= (-0,0021), z9 - с силой c92= (-0,0038).

В сокращенном виде фраза «для повышения уровня компетенции аналитика надо развивать: решительность, способность анализировать» передает смысл неизвестной смысловой переменной новый_смысл(y_2).

Рассмотрим 3-ю смысловую неизвестную переменную смысл(y_3)=«Мотивировать (**y_3**), если необходимый набор знаний и умений есть, но не используется на полную». Правая часть уравнения смысл(y_3)=смысл(z_1)*(-0,1551)⊕смысл(z_2)*(-0,0900)⊕смысл(z_3)*0,8523⊕смысл(z_4)*(-0,1111)⊕ смысл(z_5)*(-0,1037)⊕смысл(z_6)*(-0,1013)⊕ смысл(z_7)*(-0,1015)⊕смысл(z_8)*(-0,0529)⊕ смысл(z_9)*(-0,1015) равна сумме смыслов 9 z–

переменных $z_1,z_2, \ldots,z_9$.

Развивать компетенции аналитика за счет существенного развития с силой c_{33}=0,8523 аналитических способностей (**z_3**), c_{33}=0,8523), но без воздействия **z**-факторов: **z_1 - с силой** c_{12}=(-0,0044), z_4 - с силой c_{42}=(-0,0042, z_5 - с силой c_{52}=(-0,0040), z_6 - с силой c_{62}= (-0,0038), z_7 = с силой c_{72}= (-0,0038), z_8 - с силой c_{82}= (-0,0021), z_9 - с силой c_{92}= (-0,0038).

Три фразы отображают смысл когнитивной модели «компетенции аналитика». «для повышения уровня компетенции аналитика надо обучить: критическому мышлению, применению аналитических способностей и научить решать много задач», «для повышения уровня компетенции аналитика надо развивать: решительность, способность анализировать», «для повышения уровня компетенции аналитика надо мотивировать решительно развивать компетенции аналитика» передает смысл неизвестной смысловой переменной новый_смысл(y_3).

Если выполнен смысл y-переменной y_4: «Нельзя уволить (y_4): за неумение работать в команде ($\neg z_7$), за решение отдельной задачи ($\neg z_8$), за непунктуальность ($\neg z_9$)», то реализуются 3 смысла 3-х y-переменных y_1,y_2,y_3.

Три функции требуется реализовать в когнитивной модели компетенций, внедряющих аналитические способности»: «**обучить:** критическому мышлению, применению аналитических способностей и умению решать много задач»», «развивать: решительность, способности анализировать», «мотивировать решительно развивать компетенции аналитика».

Моделирование числовых матриц Y_{m4}. Z_{m9} y- и z–отклонений для 4-х многосмысловых уравнений по математической модели, где отдельно моделировались матрицы U_{m9} и Y_{m9} [18] такие, что $(1/m)U^T_{m9}U_{m9}=I_{99}$, $Y_{m9}=U_{m9}\Lambda^{1/2}{}_{nn}$, затем моделировалась матрица $Z_{m9}=Y_{m4}C^{\#}_{49}$. Матрица значений z-переменных $z_1,z_2,z_3,\ldots,z_9$ $Z_{m9}=Y_{m4}C^{\#}_{49}$. ($C_{99}C^T_{99}\neq I_{44}$, при этом $C_{99}C^T_{99}=I_{99}$). Легко вычисляется в ЭТ Excel. Матрицы Z_{m9} и Y_{m4} содержат модельные значения неизмеряемых изменчивостей (отклонений от 0), соответствующих неизмеряемым факторам.

Матрица $Y^{(t)}_{m9}$ t=1,…,∝, обеспечивает случайность будущих значений y- и z–отклонений из матриц ($Y^{(t)}_{m9}$, $Y^{(t)}_{m4}$, $Z^{(t)}_{m9}$). В матрице Y_{m4} элементы j–го столбца $y_{1j},y_{2j},\ldots,y_{mj}$ (j-ая y-переменная, j=1,…,4) имеют среднее арифметическое, равное нулю: $(1/m)(y_{1j}+y_{2j}+\ldots+y_{mj})=0$, дисперсию равную λ_j: $(1/m)(y^2_{1j}+y^2_{2j}+\ldots+y^2_{mj})=\lambda_j$, j=1,…,4, при этом сумма дисперсий равна 9: $\lambda_1+\ldots+\lambda_9=9$. Матрицы Z_{m9}, Y_{m4} приведены в Таблицах 5 и 6.

Таблица 2. Вид таблицы-программы Оптимизационной задачи: ($I_{99}I_{99}$)=>(C_{99} Λ_{99}) в модели с 9 z-переменными, 4 y-переменными

	1	2	3	4	5	6	7	8	9	
z1	0,7000	-0,0044	-0,1551	-0,6857	-0,1256	-0,0062	0,0000	0,0000	0,0000	1,0000
z2	-0,0581	0,9738	-0,0900	-0,6110	-0,1185	-0,0694	0,0000	0,0000	0,0000	1,0000
z3	0,6000	0,0995	0,8523	-0,6000	-0,1246	-0,0944	0,0000	0,0000	0,0000	1,0000
z4	0,0000	-0,0042	-0,1111	-0,6441	-0,0998	0,1126	0,0000	0,0000	0,0000	1,0000
z5	0,0000	-0,0040	-0,1037	-0,6000	0,7833	0,0031	0,0000	0,0000	0,0000	1,0000
z6	0,0000	-0,0038	-0,1013	-0,6000	-0,0167	0,7934	0,0051	0,0000	0,0000	1,0000
z7	0,0000	-0,0038	-0,1015	-0,6094	-0,1059	-0,0052	0,7792	0,0000	0,0000	1,0000
z8	0,7000	-0,0021	-0,0529	-0,6000	-0,0554	-0,0028	0,0000	0,3796	0,0000	1,0000
z9	0,0000	-0,0038	-0,1015	-0,6094	-0,1059	-0,0052	0,0000	0,0000	0,7792	1,0000
	1,3434	0,9583	0,8153	3,4410	0,6946	0,6559	0,6071	0,1441	0,6071	9,0000
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
lam	2,5000	2,5000	2,5000	1,5000	0,0000	0,0000	0,0000	0,0000	0,0000	9,0000
c11=	0,7		1,00000							
c31=	0,7					0,01000	1,0000			
c81=	0,6									

c .4	-0,6

Таблица 3. Матрица V^0_{m9} значений равномерно распределенных в интервале [-1;1] случайных чисел

	1	2	3	4	5	5	7	8	9
1	0,3687	0,3003	0,2741	0,1403	0,2482	0,457	0,0042	-0,0284	-0,4705
2	-0,3343	-0,3839	-0,283	-0,1886	0,3503	-0,3309	0,231	0,368	0,4495
3	-0,2981	-0,3462	0,3423	0,4407	-0,1064	-0,3008	-0,0848	-0,2152	0,1464
4	-0,2295	-0,2415	-0,166	0,2616	0,0587	0,141	0,3848	-0,045	-0,3107
5	0,3822	0,393	0,416	-0,2462	-0,2589	0,4272	0,4541	0,0089	-0,3358
6	-0,325	-0,1424	-0,3796	-0,4345	0,3606	-0,3177	-0,4705	-0,4295	-0,0084
7	-0,1784	0,208	0,2778	0,1668	-0,4484	0,166	-0,2797	0,3446	0,4333
8	-0,0186	0,2351	-0,4893	-0,3124	-0,3358	0,4982	-0,0614	0,0076	0,3687
9	0,0502	0,43	0,1019	-0,3065	-0,3432	0,142	0,4108	-0,0268	0,1557
10	0,2254	0,4246	0,4244	0,1482	-0,4527	-0,1618	0,2266	-0,1426	-0,194
11	0,5764	0,011	0,4924	0,531	-0,4403	-0,3742	-0,3348	0,2076	-0,1418
12	-0,3964	-0,3637	-0,2321	-0,2301	-0,4229	-0,072	-0,088	0,4945	-0,5128
13	-0,4076	-0,2198	-0,2316	0,4867	0,3366	0,1335	0,0691	-0,3263	0,3265
14	0,0894	-0,4202	-0,26	-0,2789	-0,0112	-0,1234	0,2509	-0,1383	-0,5002
15	0,5186	0,209	-0,2226	-0,2214	0,4804	-0,2054	0,2152	0,3672	0,3743
16	0,4108	-0,0252	-0,1042	-0,2407	0,3576	0,024	0,4072	-0,0061	-0,501
17	-0,1629	-0,0548	0,163	0,0821	0,334	0,0531	-0,0393	-0,385	0,3829
18	-0,3761	0,0949	-0,0779	0,5431	-0,1516	-0,2272	-0,2028	-0,0716	0,1412
19	-0,3594	-0,4613	0,4901	0,0044	-0,183	0,056	-0,3092	-0,4262	-0,457
20	-0,2291	0,2689	-0,46	0,1075	0,3419	0,3935	0,1242	0,5308	-0,1239
21	0,4146	0,292	0,0891	-0,4044	0,1138	-0,3301	-0,1759	-0,3018	0,3965
22	0,0618	0,423	-0,1237	-0,1027	0,3479	0,0503	-0,3521	-0,0424	0,2964
23	0,2827	-0,3641	0,2274	0,1414	0,1634	0,0494	-0,2112	0,4828	-0,2474
24	-0,0652	-0,2666	-0,2684	-0,0876	-0,339	-0,1478	-0,1686	-0,2269	0,3321
	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

Таблица 4. Матрица U_{m9} u–изменчивостей

	u 1	**u 2**	**u 3**	**u 4**	**u 5**	**u 6**	**u 7**	**u 8**	**u 9**
1	0.3122	-0.0458	1.5236	-1.6705	-0.485	-0.4535	-0.4319	-0.2572	-1.5076
2	-1.005	-1.5947	-1.6717	1.0271	-1.0289	0.3562	-0.4104	-0.7472	1.6304
3	-0.2935	-0.485	-1.1049	-0.3814	-0.4893	-0.3138	0.4749	1.7296	0.6634
4	0.4064	0.6967	-1.1771	-1.1509	-0.0369	0.4533	-1.3873	0.3191	0.1625
5	-0.1978	-1.135	-0.5199	-0.5829	1.0772	0.1408	-0.2111	-0.4977	-2.1978
6	-1.2312	0.8164	1.6982	0.5657	1.0291	-1.6406	-0.2754	-0.2674	1.6946
7	-0.2867	-1.4059	0.5986	0.424	-0.0558	1.9189	1.5238	0.5855	-0.1622
8	2.3419	0.1983	0.792	0.2369	1.7688	1.5491	0.576	-1.1662	0.2441
9	-0.9429	-0.4287	-1.3366	0.0766	1.5231	0.6667	0.6199	-0.7471	-0.8894
10	-1.4094	1.2482	-1.1436	-0.0507	0.5778	-0.1135	0.7732	0.6618	-1.5678
11	0.9978	1.3187	0.219	1.2564	-1.7471	-0.2557	1.072	1.6083	-1.4009
12	-1.0741	0.1461	0.671	1.976	0.5036	1.5056	-1.8207	0.7189	0.1811
13	1.1725	0.3454	-0.7698	-2.1544	-0.3786	0.1644	0.1128	0.2745	1.5124
14	0.9405	0.7669	-0.6957	0.8023	0.672	-0.9356	-1.8538	-0.0025	-0.0148
15	0.1142	-0.0906	-0.7616	0.8431	-1.6747	-0.5418	0.4861	-1.9949	-0.068
16	0.169	0.5088	-0.5035	-0.163	-0.3231	-1.2574	-1.5188	-1.0051	-0.8688
17	0.1274	-1.3958	-0.2817	-1.3925	0.0699	-0.8711	0.7859	0.0272	0.8124

18	-0.9702	2.0872	-0.1227	-0.5776	-0.4154	0.7911	0.7561	1.0556	0.7655
19	-0.3607	-1.6511	1.0722	-0.428	1.1684	-0.9481	-0.7926	2.0659	0.0582
20	-0.9526	0.7441	0.9939	-0.9984	-0.9298	1.8567	-0.9406	-1.2776	0.2214
21	-0.2336	-0.025	0.1039	0.9787	0.4338	-1.7776	1.5695	-0.8683	-0.0675
22	-0.7899	0.3576	1.7394	-0.4289	-0.2571	-0.3328	1.1186	-1.0052	0.3822
23	1.0787	-1.5125	1.0928	0.7035	-1.9988	-0.0023	-0.7611	0.4406	-0.4943
24	2.0873	0.5356	-0.4158	1.0888	0.9969	0.0411	0.5349	0.3493	0.911
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Таблица 5. Матрица Y_{m4} y–изменчивостей

№	y 1	y 2	y 3	y 4
1	0,49363	-0,0724	2,40902	-2,0459
2	-1,589	-2,5214	-2,6432	1,25794
3	-0,4641	-0,7669	-1,747	-0,4671
4	0,64257	1,10158	-1,8612	-1,4096
5	-0,3127	-1,7946	-0,822	-0,7139
6	-1,9467	1,29084	2,68509	0,69284
7	-0,4533	-2,2229	0,94647	0,51929
8	3,70287	0,31354	1,25226	0,29014
9	-1,4909	-0,6778	-2,1134	0,09382
10	-2,2285	1,97358	-1,8082	-0,0621
11	1,57766	2,08505	0,34627	1,53877
12	-1,6983	0,231	1,06094	2,4201
13	1,85389	0,54613	-1,2172	-2,6386
14	1,48706	1,21258	-1,1	0,98261
15	0,18057	-0,1433	-1,2042	1,03258
16	0,26721	0,80448	-0,7961	-0,1996
17	0,20144	-2,207	-0,4454	-1,7055
18	-1,534	3,30015	-0,194	-0,7074
19	-0,5703	-2,6106	1,6953	-0,5242
20	-1,5062	1,17653	1,57149	-1,2228
21	-0,3694	-0,0395	0,16428	1,19866
22	-1,2489	0,56542	2,75023	-0,5253
23	1,70557	-2,3915	1,72787	0,86161
24	3,30031	0,84686	-0,6574	1,3335
	0,0000	0,0000	0,0000	0,0000
	2,490	2,500	2,258	1,326

Таблица 6. Матрица Z_{m9} z–изменчивостей

№	z1	z2	z3	z4	z5	z6	z7	z8	z9
1	1.3135	0.8806	3.5149	0.9930	1.3646	0.9303	2.8275	0.6419	-0.6437
2	-1.3386	-2.5304	-3.7758	-0.6312	-1.7234	-2.4648	-2.3669	-1.1493	0.6729
3	0.3328	-0.1690	-1.4332	0.4582	0.0985	-0.1494	-0.8432	-0.1000	0.1541
4	1.6125	1.9114	-0.4293	1.1699	1.5411	1.8839	-0.4801	0.8179	-0.1283
5	0.4564	-1.0576	-0.4301	0.3879	0.2700	-0.9044	-0.0729	0.0080	0.0114
6	-2.0234	0.8465	0.9539	-0.4105	-2.2198	0.3777	1.5920	-1.5558	0.0396

7	-0.7397	-2.3327	0.2681	-0.6353	-0.7630	-2.1503	0.3928	-0.4459	0.0600
8	1.7305	-0.6606	2.6550	-0.6616	2.5962	-0.1089	0.2768	2.2550	-0.4729
9	-0.5857	-0.2168	-2.5696	0.2497	-1.0044	-0.3632	-1.3253	-0.8665	0.3945
10	-0.9780	2.3792	-2.5530	0.6771	-1.5224	1.8068	-0.9691	-1.3366	0.3914
11	-0.2247	0.6356	0.1326	-0.9612	0.2749	0.6635	-0.8887	0.6493	0.0404
12	-2.8019	-1.0652	-1.3540	-1.4822	-2.8924	-1.3434	-0.5780	-1.6853	0.4811
13	3.0571	1.8881	1.4299	1.7089	3.1610	2.1005	0.5818	1.8382	-0.5257
14	0.3382	0.3325	-0.8139	-0.5277	0.6882	0.4489	-1.5125	0.7943	0.1102
15	-0.4160	-0.6840	-1.5607	-0.5648	-0.3532	-0.6198	-1.4631	-0.0467	0.2798
16	0.4053	0.8740	-0.4275	0.2775	0.4109	0.8272	-0.4533	0.2544	0.0114
17	1.3776	-0.9494	0.7281	0.8888	1.2290	-0.6799	0.7358	0.5400	-0.2460
18	-0.4010	3.7053	-0.4531	0.9879	-0.7596	3.0745	0.4326	-0.8387	0.0325
19	-0.2034	-2.0925	1.4748	-0.0767	-0.3058	-1.9005	1.5519	-0.3291	-0.1774
20	-0.2830	1.9359	1.3630	0.8908	-0.6099	1.5366	1.9590	-0.7902	-0.2182
21	-1.0591	-0.7176	-0.7550	-0.7577	-1.0255	-0.7600	-0.5796	-0.5107	0.2263
22	-0.7898	0.8055	2.0682	0.2187	-0.9486	0.5178	2.3110	-0.8376	-0.2413
23	0.1463	-3.1461	1.7541	-1.1763	0.6418	-2.6000	0.4865	0.8297	-0.1883
24	1.0744	-0.5728	0.2129	-1.0235	1.8524	-0.1233	-1.6152	1.8640	-0.0639
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.519	**2.671**	**2.406**	0.666	**2.023**	**2.086**	1.400	1.101	0.080

Визуализация знаний о «весах» и z-, y-изменчивостях в модели с 9 z-переменными, 4 y-переменными

Точки на Рисунках 1-3 показывают взаимные динамики “скачки-падения» точек переменных (z_1,zz_2,z_3,z_8,y_1). Визуализация динамик факторов компетенций отличается от визуализаций динамик факторов из других предметных областей [16-22] На Рисунке наблюдаем разное количество усиления проявлений 3-х z-факторов: число пиков вверх не равно числу пиков вниз. На динамику ведушего фактора y_1 со смыслом «» (динамика изменчивости на кривой «y_1») за счет воровства (5 пиков на кривой «z1»), вымогательства (1 пик на кривой «zz2»), подкупа (неоднократные сильно выраженные по результатам: пики на кривой «zz3») и влезания в долги (мало заметная на кривой «zz4»). На Рисунке видны различия амплитуд. Когнитивная модель компетенций, внедряющих аналитические способности.

На целевой y-фактор «обучать (y1), если обнаружился недостаток знаний, умений и навыков» (с дисперсией $\lambda2$=**2.5**) с большими амплитудами влияют: (с дисперсией s^2_1=**1.519**) и с силой $c^2_{11}=0,7^2$ z-фактор критическое мышление (**z1**); (с дисперсией s^2_3=**2.406**) и с силой c^2_{31}=**0,6000**^{2} z-фактор «аналитические способности” (**z3**); (с дисперсией s^2_8=1.101) и с силой c^2_{81}=**0,7000**^{2} z-фактор «многозадачность» (**z8**);. Эти силы воздействия y-фактор «**обучать** (y1), если обнаружился недостаток знаний, умений и навыков» наглядно видны по взаимным динамикам кривых на Рисунке 1.

На целевой y-фактор «**развивать** (y2), когда есть базовые умения и нужно раскрыть потенциал» (с дисперсией $\lambda2$=2.5) с большими амплитудами влияют: (с дисперсией s^2_1=1.519) и с силой $c^2_{12}=0,0044^2$ z-фактор критическое мышление (**z1**); (с дисперсией s^2_3=2.406) и с силой $c^2_{32}=0,0995^2$ z-фактор «аналитические способности” (**z3**); (с дисперсией s^2_8=1.101) и с силой $c^2_{82}=0,0021^2$ z-фактор «многозадачность» (**z8**). Эти силы воздействия y-фактор «развивать (y2), когда есть базовые умения и нужно раскрыть потенциал» наглядно видны по взаимным динамикам кривых на Рисунке 2.

На целевой y-фактор «Мотивировать (**y3**), если необходимый набор знаний и умений есть, но не используется на полную» (**z3**) (с дисперсией λ_3=2.5) с большими амплитудами влияют: (с дисперсией s^2_1=1.519) и с силой $c_{13}=(-0,1551)^2$ z-фактор критическое мышление (**z1**); (с дисперсией s^2_1=**2.**406) z-фактор «аналитические способности” (**z3**); (с дисперсией s^2_8=1.101) z-фактор «многозадачность» (**z8**). Эти силы воздействия на y-фактор наглядно видны по взаимным динамикам кривых на Рисунке 3.

На целевой z-фактор «аналитические способности» (**z3**) (с дисперсией s^2_3=2.406) с

большими амплитудами влияют: (с дисперсией s^2_2=2.671) и с силой c_{22}=0,9738 z-фактор «решительность» (z2); (с дисперсией s^2_5=2.023) z-фактор «коммуникабельность» (z_5); (с дисперсией s^2_6=2.086) z-фактор креативность (z_6). Эти силы воздействия z-фактор «аналитические способности» (z_3) наглядно видны по взаимным динамикам кривых на Рисунке 4.

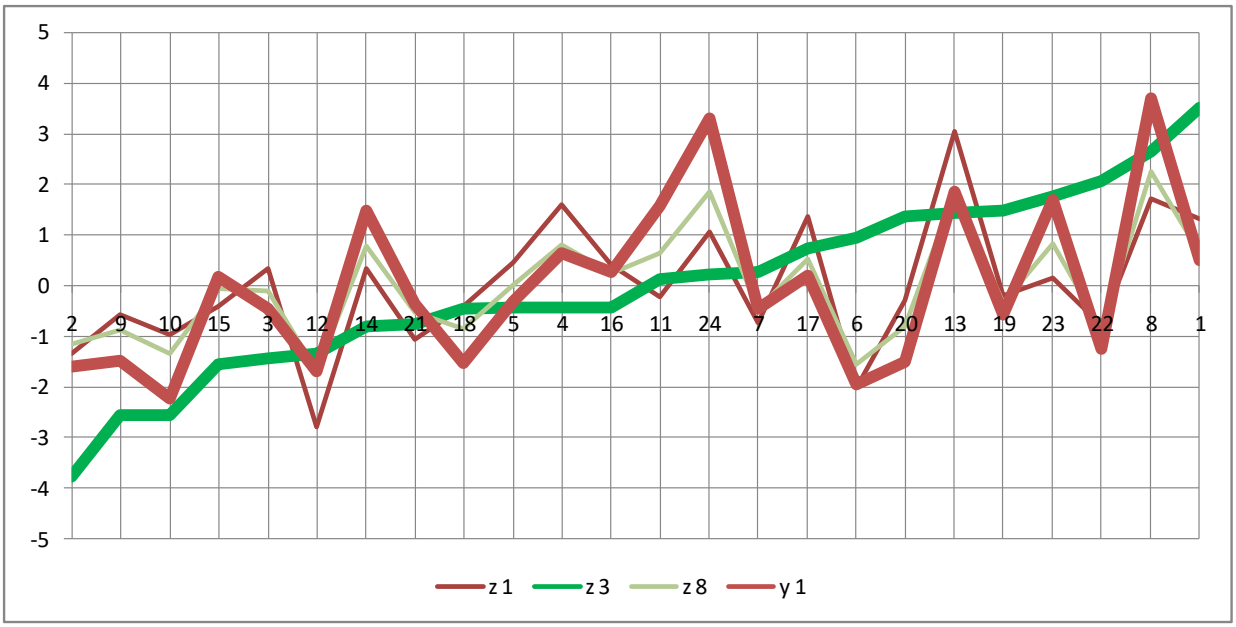

Рисунок 1. Взаимная динамика 3-х z -изменчивостей z_1, z_3, z_8, влияющих на на возрастающую динамику изменчивость на y –изменчивости фактора y_1 со смыслом «обучить: критическому мышлению, применению аналитических способностей и умению решать много задач»

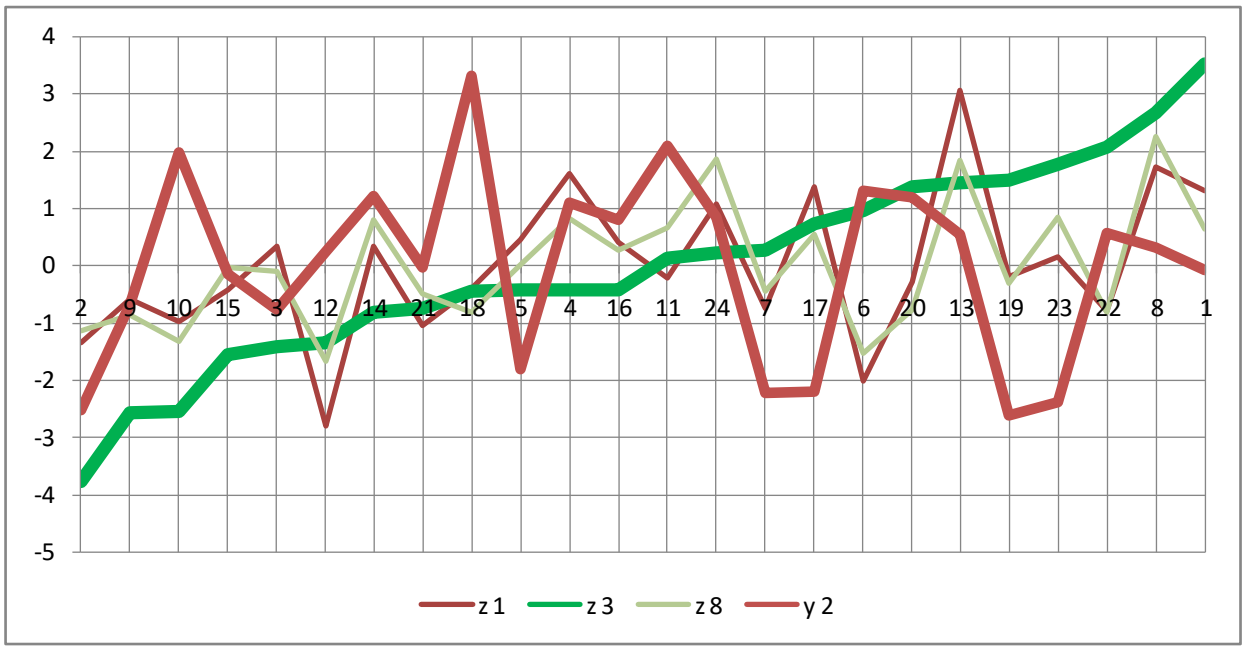

Рисунок 2. Взаимная динамика 3-х z -изменчивостей z_1, z_3, z_8, влияющих на изменчивость на возрастающую динамику y –изменчивости фактора y_2 со смыслом «развивать: решительность, способности анализировать»

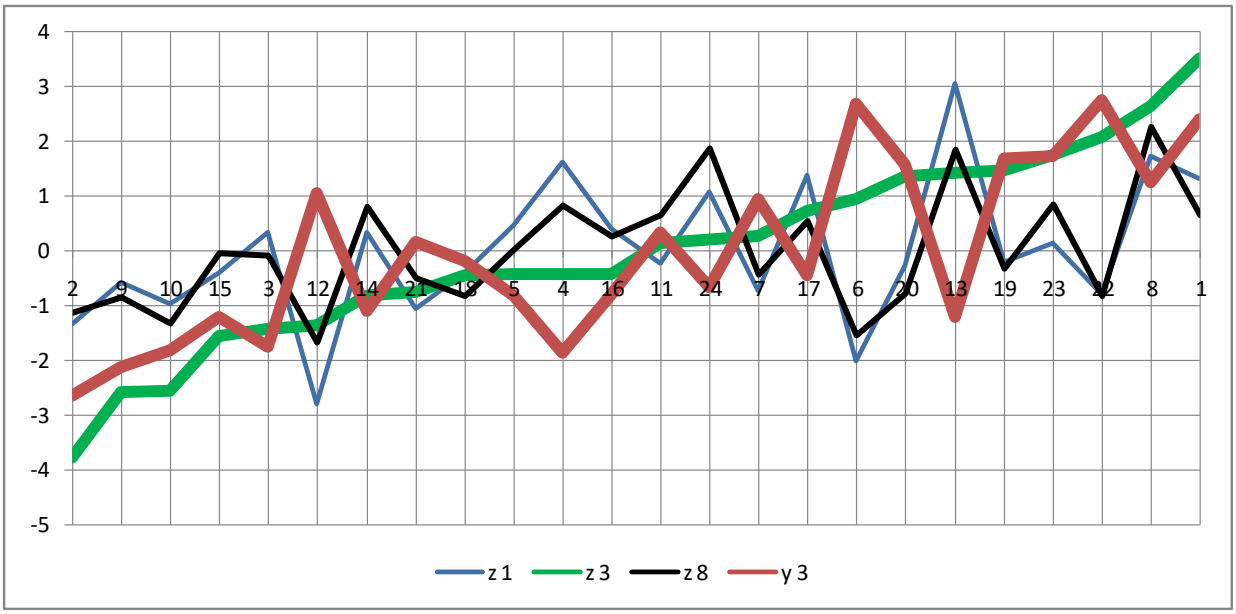

Рисунок 3. Взаимная динамика 3-х z – изменчивостей z_1, z_3, z_8, влияющих на возрастающую динамику y –изменчивости фактора y3 со смыслом «мотивировать решительно развивать компетенции аналитика» «…»

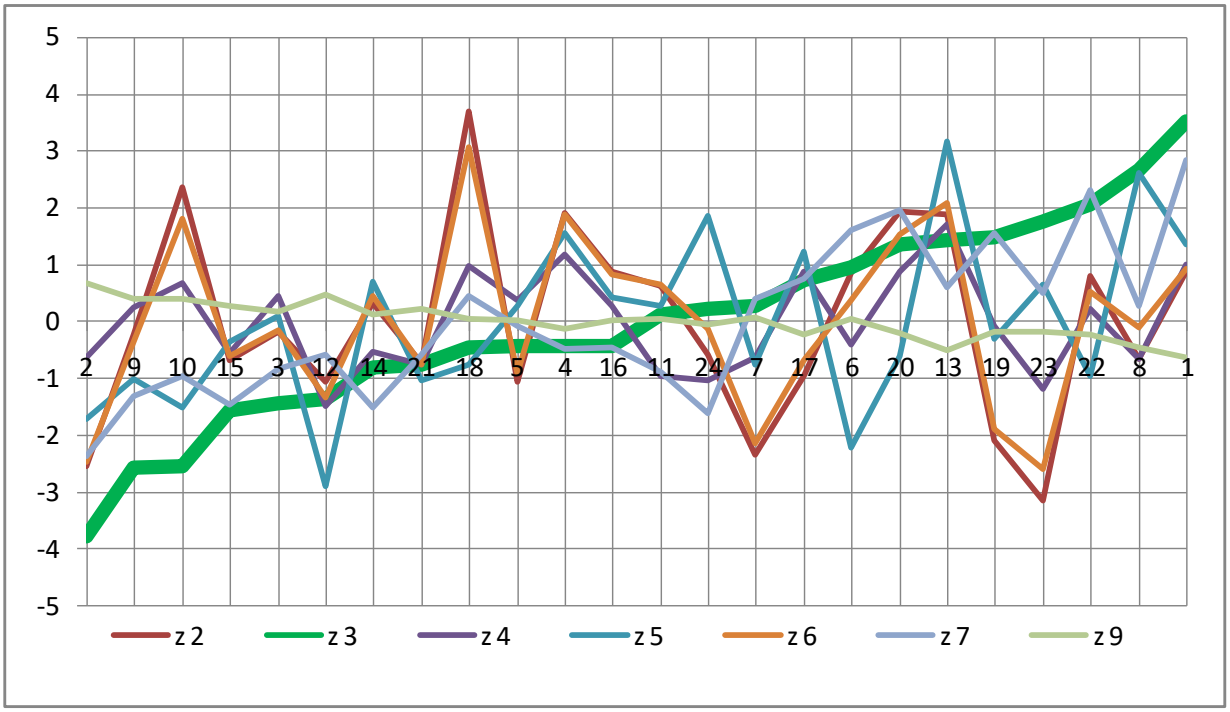

Рисунок 4. Взаимная динамика 8 z –изменчивостей, влияющих на на возрастающую динамику y-изменчивости фактора y_3 с новым смыслом «для повышения уровня компетенции аналитика надо мотивировать решительно развивать компетенции аналитика»

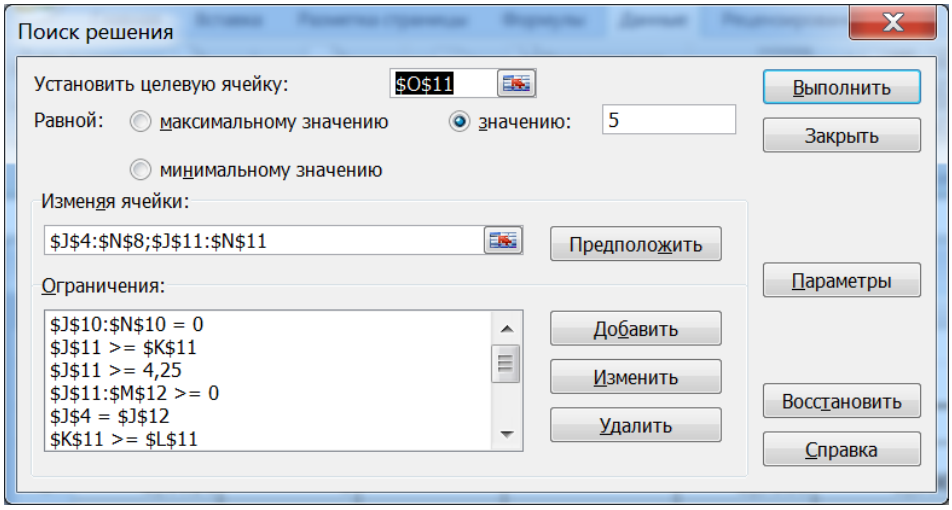

Рисунок 5.

Заключение

Выше разработана Когнитивная модель компетенций, внедряющих аналитические способности обучаемого индивида. реализовать, обосновать их формульное, фразеологическое, визуализированное на графиках описания поведений кривых соответствует ожидаемому. Разработана система из 4-х смысловых уравнений с 13=9+4 семантическими переменными: смысл(y_1),смысл(y_2),смысл(y_3),смысл(y_4), смысл(z_1),…,смысл(z_9), удовлетворяющих матричному смысловому равенству вида смысл(Z_{m9})=смысл($Y_{m4}C^{\#}_{49}$), где смысл(Z_{m9})= смысл(z_1)⊕…⊕смысл(z_9), смысл($Y_{m4}\mathbf{C}^{\#}_{\mathbf{49}}$)=смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{1}}$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{2}}$)⊕ смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{3}}$)⊕смысл($Y_{m4}\mathbf{c}^{\#}_{\mathbf{4}}$). Этому матричному смысловому равенству соответствует матричное равенство для числовых z-, y-переменных, смоделированных в виде матриц: $Z_{m9}=Y_{m4}C^{T}_{94}$.

Разработанные 4 смысловые уравнения, имеют 4 семантических решений–знаний (новых извлеченных знаний), познающие 13 компетенций (обучать(y_1), развивать(y_2), мотивировать(y_3) и другие), внедряющих аналитические способности обучающимся (при запрете увольнения). Визуализация взаимных динамик кривых (значений изменчивостей z-, y-переменных из матриц Z_{m9},Y_{m4}) знаний о «весах» (из C_{99}) и z-, y-изменчивостях в модели с 9 z-переменными, 4 y-переменными показала динамики модельных значений неизмеряемых компетенций: обучать, развивать, мотивировать, критическое мышление (z_1); решительность (z_2); аналитические способности (z_3); лидерство (z_4); коммуникабельность (z_5); креативность (z_6); умение работать в команде (z_7); многозадачность (z_8); пунктуальность (z_9). Введенные в модель переменные наделены математическими и статистическими свойствами, а параметры постоянны. Они смоделированы в Оптимизационной Задаче и зависят от количеств переменных и от значений индикаторов, образующих мозаику внутри квадрата 9-на-9. Как некоррелированные (y-), так коррелированные (z-) изменчивости умножаются на свои «веса» - силы проявления фактора. Получены интересные знания после визуализации. Модель извлекла новые знания и адекватны реальным представлениям людей о субъектах обучения. Модель исправляет неправильно назначенные экспертом значения индикаторов. Свои замены значений индикаторов модель «обосновывает» как смысловыми (с семантическими переменными), так и алгебраическими (с числовыми переменными) равенствами.

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Impact Factor:					
	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.771	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 11.10.2023 **http://T-Science.org**

Issue Article

Almir Anfirovich Miniakhmetov
Askino Secondary School №1
Headmaster's assistant, Teacher of Physics, Computer Science and Information Technologies
Republic of Bashkortostan,
Russian Federation
minalmir@yandex.ru

Gulnaz Fardatovna Akhmadullina
Askino Secondary School №1
Teacher of Russian and Literature,
Republic of Bashkortostan,
Russian Federation
gulamolod@mail.ru

Ekaterina Nikolaevna Borisova
Askino Secondary School №1
Teacher of Russian and Literature,
Republic of Bashkortostan,
Russian Federation
borisovaen2016@gmail.com

Elvira Galeevna Lutfullina
Askino Secondary School №1
Teacher of Russian and Literature,
Republic of Bashkortostan,
Russian Federation
elvira2015@yandex.ru

GENERAL THEORETICAL AND METHODOLOGICAL TECHNIQUES FOR THE COMPARATIVE DESCRIPTION OF THE DESCRIPTION OF AUTUMN IN THE POEMS OF A.A.FET AND F.I.TYUTCHEV FROM THE CYCLE "THE GILDED WEALTH OF THE SILVER PERIOD" (ON THE BASIS OF "GROWTH POINTS" ASKINO SECONDARY SCHOOL №1 REPUBLIC OF BASHKORTOSTAN)

Abstract: *The article discusses methodological techniques for compiling a comparative description of the description of autumn in the poems of famous Russian poets Fet Afanasy Afanasyevich and Tyutchev Fedor Ivanovich as part of the study of the cycle "The Gilded Wealth of the Silver Period". For students of rural general education schools, the most significant qualities of human morality in our time are revealed as the inner beauty of an individual personality. The connection between the concept of human beauty and autumn as a season is given. Particular attention in the lessons of the Russian language and literature is given to the Silver Age as one of the most important periods for Russian writers and their works. Throughout the entire course of study of the subject "Literature" from grades 5-11, the image of any season is based on the perception of each individual student of the environment. This*

allows you to clearly and specifically formulate the thesis as the basic basis for writing the final essay of the Unified State Exam in accordance with the Federal State Educational Standards of the new generation. A comparative analysis of poems about the autumn of these poets is carried out in detail, which allows students to trace the subtle connection between similarities and differences in works. The history of the birth, life and work of Russian poets is briefly introduced, which allows students to trace the rich heritage of Russian culture. The similarities in the description of autumn are widely disclosed in terms of the construction of the poem, the observance of rhyme, metaphors, and epithets of each stanza. The work was written along the lines of "Points of Growth", a structural unit of a rural secondary school within the framework of the "Modern School" for digital, natural science and humanitarian profiles.

***Key words**: education, upbringing, rural educational institution, autumn, poem, Fet Afanasy Afanasyevich, Tyutchev Fedor Ivanovich, silver period, concept beauty, growth point, modern school, rhyme, metaphor, epithet, stanza, synecdoche, Beethoven, alliteration, metonymy, tonality, trails, iambic, comparison, antithesis, anapest, personification, final essay, Unified State Exam, Russian language, literature, Federal State Educational Standards.*

***Language**: English*

***Citation**: Miniakhmetov, A. A., Akhmadullina, G. F., Borisova, E. N., & Lutfullina, E. G. (2023). General theoretical and methodological techniques for the comparative description of the description of autumn in the poems of A.A.Fet and F.I.Tyutchev from the cycle "The gilded wealth of the silver period" (on the basis of "Growth points" Askino secondary school №1 Republic of Bashkortostan). *ISJ Theoretical & Applied Science, 10 (126)*, 277-285.*

***Soi**: http://s-o-i.org/1.1/TAS-10-126-19 **Doi**: https://dx.doi.org/10.15863/TAS.2023.10.126.19*

***Scopus ASCC**: 3304.*

Introduction.

UDC 373.1

Our world is diverse, filled with different shades of events that have absorbed all the beauty of the palette of happy moments. But, unfortunately, the moral qualities of a person have ceased to be significant in modern society [1]. The flame of the soul with which our grandfathers and great-grandfathers lived ceased to burn with the strength of conscientiousness, the thirst to help and support others.

Trying to catch up with the latest fashion trends, we paint our faces, destroying ourselves, completely forgetting about our inner beauty. We are like crazy, running after the standards of society, trying to be in trend and look rich.

However, even in those distant times, life was much easier. It was at the time when every person appreciated the moment of his life, when everyone dreamed of doing good in the name of the people and accomplishing a noble feat, going down in history, became the dawn of the Silver Age [2]. We live once in a lifetime, and why not it live in pleasure for ourselves and everyone around us, without causing pain, suffering, but on the contrary, illuminating everyone with our smile.

On this occasion, the great Omar Khayyam writes the following in his *"Rubaiyat"* [3], which we will give in the form of a line-by-line translation:

We will never be in this world again,
Never meet with friends at the table.
Catch every flying moment –
Never wait for him later.

Time rushes with great speed and changes people, subordinating to its own rules. It turns out that having a busy work schedule; we turn into slaves of time, paying for its flight with precious dreams that live in our hearts.

According to the authors [4], the Silver Age is not just a period that revealed talented writers and poets, but it is an invaluable wealth, a heritage of our culture. The works created by the light hand of our brothers are endowed with magical powers. Miracles, mystery are saturated in every line of their creation, piercing all the strings of our soul, softening the matter of any heart.

Almost every poet in his poems touches on important problems of our society, but despite this, each verse is sweet, charming and beautiful in its own way. When the poet undertook to write a poem, he thought. But, he thought in his own way, he represented a certain image, a picture.

Therefore, in the lessons of the Russian language and literature, we ask students reasonable questions why different writers, such as A.A. Fet [5] and F.I. Tyutchev [6], gave different qualities to the same object?

To answer all these and other questions, we decided to conduct our own theoretical study and comparative analysis of the poems of these poets in the subjects *"Russian language"*, *"Literature"* on the basis of *"Points of Growth"* Askino Secondary School №1 Republic of Bashkortostan [7].

2. Purpose of the study.

In this regard, the *purpose* of this work is a brief description of poems about autumn by famous Russian poets A.A. Fet and F.I. Tyutchev, establishing a connection between poems, to prove and show students that they have similarities and differences, to make sure that the beauty of originality is present in both poets.

The *research problem* is to indicate the similarities and differences in the description of

autumn by different poets, in its presentation and presentation of material to students.

We also identified the *object* and *subject* of the study, these are poems by A.A. Fet *"Autumn"*, *"The sheets trembled, flying around"*, *"What a cold autumn!"*; poems by F.I. Tyutchev *"Autumn evening"*, *"There is in the autumn of the original"*, *"Wrapped in a thing with drowsiness"*.

We were faced with the *task of research*, to conduct a comparative analysis of the poems of these poets.

For students, a research *hypothesis* was proposed and the assumption was made that the image of autumn is based on the perception of the environment by each individual.

For subject teachers, such *research methods* as comparison and analysis are proposed.

Finally, this work has its own *scientific* and *practical significance*, as it is an original comparison and analysis of poems about autumn by these poets.

3. Analysis of poems by Fet A.A.

According to [8, pp.319-336], Afanasy Afanasyevich Fet – the Great Russian poet, was born in 1820 in the estate of Novoselki, Mtsensk district, Oryol region, Russian Empire. The real surname is Shenshin. His father was Afanasy Shenshin, a wealthy nobleman. With their mother, Charlotte Fet, they got married abroad, since it was impossible to do this in Russia.

At the age of 14, the documents were declared invalid, and the boy had to take his mother's surname. After changing his surname, all the privilege of a rich life was a memory for Fet. Therefore, all his life he hated his last name.

He later wrote to his wife: *"You can't even imagine how much I hate the name Fet. I beg you never to write it to me if you don't want to disgust me. If you ask what all the sufferings, all the sorrows of my life are called, I will answer: their name is Fet"*.

He studied at a German school, and then entered the boarding school of Professor Pogodin in order to prepare for entering the university at the Faculty of Philology. Already in his student years, Fet shows his poetic talent, and becomes famous thanks to his poems. And the romance to the verses of the 23-year-old Fet *"At dawn you don't wake her ..."* (1842) was known even in Germany and became, according to Apollon Grigoriev [9], *"a song that has become almost a folk song"*.

The appearance of the poet was defiantly anti-poetic: overweight, thick-set, heavy, with a rude and frowning, often peevish face. It seems to us that his character and mental state were reflected in the appearance of the poet. The fact is that a misfortune happened to him: his wife and the only love of his life died. He was very worried about the loss of his beloved, thereby becoming a callous person who had difficulty finding a common language with people. He had a gloomy idea of life, which was reflected in the poems. Therefore, his poetic masterpieces became sad and heavy.

However, nature has always been of interest to the poet. Perhaps it was in her that he found strength and helps to live on, after bereavement. Looking at the noisy rivers, endless fields and forests, he was not so lonely. Therefore, it is important for students to show that if he loved nature and observe it, then he loved to convey its beauty in his poems. These works include all three poems that we have taken as a basis for analysis.

At the time of writing the poem *"Autumn"* (October 8, 1883) [10, p.128], the poet was sixty-three years old. In his unhappy and sad life, he achieved a lot. In his life, the time has come when you can rethink your life path and start enjoying life.

It must be emphasized for students that this poem echoes and shows us about his condition and mood during this period. Although the author enjoyed autumn and admired it, the poem *"Autumn"* turned out to be rather sad. At the same time, it is impossible to say unequivocally here. The poem consists of three stanzas, and each has its own mood, its own tone. Either it causes melancholy, despondency and sadness – all the gloomiest feelings, then, on the contrary, everything inside ignites at the sight of autumn golden foliage, the sparkling sun.

The theme of this work is autumn. The author wanted to show that autumn, as a person, is able to live and experience sad and happy moments. In the first stanza, we observe all the sadness, loneliness, loss of the author. Here is a literal translation of a fragment of the work.

How sad are the dark days
Silent autumn and cold,
What languor desolate
They are asking for our souls!

But, in the second stanza, the thought changes sharply, and autumn appears in a different image, filled with color, warmth, happiness. Students should understand that the contrast of the first and second pictures, playing with the feelings of a person, make them see its originality, diversity. Let's show it taking into account the literal line-by-line translation.

But there are days when in the blood,
Golden-leaved headwear,
Burning autumn is looking for eyes,
And the sultry whims of love.

In the third stanza of the poem there is neither color nor sadness. The author tells neutrally, moderately, without unnecessary coloring. The peculiarity of the poem is that the author does not change the actions or characters, but changes emotions, and the poem turns out to be unusual and beautiful in its own way.

When preparing for the Unified State Exam in the Russian language, literature, final essay, it is important to be able to find tropes and epithets. Here

it is *"gloomy days"*, autumn *"silent, cold"*, *"gold-leafed"* attire. Also epithets are the days of *"sad"*, languor *"dreary"*, *"gloomy"* days. We should not forget about metaphors, here they are *"in the blood of golden-leaved headdresses"*; there is a gradation here of *"gold-leafed attire"*, *"burning eyes"*, *"and sultry whims of love"*. Let's show the translation of each line separately.

The bashful sadness is silent,
Only the defiant is heard,
And, fading so magnificently,
She no longer regrets anything.

In the classroom, students may be a little surprised and puzzled by the appearance of the image of love in this poem. It may even seem to them that autumn is an image of despondency, peace, the so-called hibernation of the soul. But A.A. Fet writes *"burning autumn is looking for the eyes and sultry whims of love"*.

The poem is written in iambic tetrameter with an unstressed third foot. Such a rhythmic pattern is very suitable for conveying reflections and a distant, sad state of mind. And the drama is given to the work by an inclusive rhyme that highlights the final word of each stanza, which carries the main semantic load.

Another wonderful creation is the poem *"The sheets trembled, flying around"* (July 13, 1887) from the same source [10, p.153]. The image of autumn is for A.A. Fet is the time of departure and farewell, the very time when you can calmly indulge in reflection. Reading this poem, thoughts about emptiness and eternity, fear and excitement, hiding in the autumn landscape, involuntarily come.

It is important for students to show that already the first lines are devoted to the image of a storm with the metaphors *"evil storm"*, where the verbs *"tear"* and *"toss"*, which indicates unfavorable weather. A.A. Fet compares the image of a storm with a furious predator, eager to catch the victim at any moment. Thus, the epithet *"evil"* emphasizes the predatory nature of the storm, filling it with negativity and disgust.

And the green leaves act as a victim. They are young, full of energy and do not feel the cold of the impending danger, but having recognized its fiery impulses, they try to cling to every branch in order to survive.

The author compares young, naive autumn leaves with a rebellious, power-hungry storm, creating a contrast between the two images. This process tells the reader that late autumn reigns outside the window, preparing the throne for the reign of winter.

The verb *"tremble"* very accurately conveys the state of the leaves, and, reading such lines, you seem to be immersed in an atmosphere of cold, fear and anxiety. All this is conveyed with the help of personifications, the sheets *"trembled"*, the clouds *"closed"*, the storm *"tear and mosque and howl"*. The epithet here is the storm *"evil"*. Here is a line-by-line translation of the quatrain for a more accurate transfer of meaning.

The sheets trembled, flying around,
The clouds of the sky covered the beauty,
From the field a storm, bursting, angry
Vomits and mosques and howls in the forest.

In the second stanza, A.A. Fet tells about a small, warm nest, talking about a tiny bird that embodies the image of courage, stamina and courage. The students are very interested in what is obtained in the context, the bird is not afraid of the storm, is not afraid of its ferocity. There is a feeling that fear is equated with death, and life with courage.

If we compare the first and second stanzas, then we will see and show the students changes in mood, in the presentation of information. The first stanza is strict, ominous; it exudes cold, darkness, gloominess. The second, on the contrary, is light, like the flight of a bird, warm and soft, like its nest.

Thus, the nest becomes a symbol of protection and salvation from adversity. If you delve deeply, then students will understand that a larger meaning is encrypted under the word nest, the meaning of home, fortress, protection is hidden.

In the description of the storm, the author uses verbs (*"swiftness"*, *"carrying a predatory destructive beginning"*), which accurately convey the feelings and emotions of the poet, while in the description of the bird, short adjectives (*"bright chest"*, *"light"*, *"small"*), which contributes to the creation of a bright, radiant image. Here is a literal translation of each line with the possibility of preserving the true meaning.

Only you, my dear bird,
Barely visible in a warm nest,
Bright chest, light, small,
Not afraid of the storm alone.

The third stanza is characterized by melancholy and loneliness, well, not many are able to survive a strong storm! Students may notice that despite the black colors of the autumn landscape, there is a small spark of color that illuminates the verse with light, beauty, lightness.

We are a little sorry for her; nevertheless, she alone resists the storm, one drop of color in the gloom of darkness, with the help of the metaphor *"roaring"* the roll of thunder. The epithets here are the darkness *"black"*, the nest *"warm"*, the bird *"bright chest, light, small"*. We give a literal translation of each line individually for a more accurate transfer of the true essence of the stanza.

And the roll call thunders,
And the noisy haze is so black...
Only you, my dear bird,
Barely visible in a warm nest.

The idea of this poem is conveyed easily, simply and gracefully, the author tries to convince us that all the difficulties that we experience are the little things of our life, like fog over the river in the morning. If early in the morning a thick fog prevents us from

getting out of its veil, then after a while, under the fiery rays of a heavenly torch, it will dissipate, and everything will be even better than it used to be!

But even earlier, almost 40 years ago, A.A. Fet writes a poem *"What a cold autumn!"* (1847) [10, p.71]. In the first stanza from the very first line, the author exclaims about the cold, heartless, insensitive pore.

When describing the picture of a harsh and frozen autumn, in the head of each student, in the blink of an eye, the image of clouds ignites, as if with a sparkle of sparks, the color of a noble black opal, she frowns, showing her despondency from the sky.

The picture sets us on fire, with a wind piercing to the bones, blowing the leaves into a waltz, involuntarily forcing the leaves to dance to its tune, with the help of the epithet *"cold autumn"*. Here is a fragment from the first stanza with a literal translation.

What a cold autumn!

Put on your shawl and hood.

In the second part of the first stanza, the author presents a contrasting landscape, where autumn, blazing with fire, acquires warm, bright colors, using the epithet *"dormant pines"* and the comparison *"as if a fire rises"*. We will also make a literal translation of each line of the second part of the first stanza.

Look: because of the dormant pines,

As if a fire is rising.

One gets the feeling that the poet, talking about nature, tells about the inner world of an individual. A burning fire is not extinguished by the passion of the soul; the cold of autumn is the pain of a person who was not listened to, pushed away.

Of course, a person will feel awkward, languish, oppress himself, but he will not be able to give up his skills, his passion. Just as a pianist cannot part with a piano; an artist with an easel or a gardener with a vegetable garden.

And a close person who saw such pain of his friend, and trying to kindle a fire in his soul, seeks to show the beauty of the autumn world, so that he, looking at the wealth surrounding him, believe in himself and understand how wonderful his talent and skill are!

From the second stanza, the poet paints a picture with vivid words, using the epithet *"phosphorus nights"*, metaphors *"radiance of the northern night"*. The personifications *"eyes shine"*, *"eyes do not warm"*, thanks to such a selection of expressive means, the verse turned out to be airy, saturated, although it curls with the smell of frost and people. We will give a detailed translation of each line separately, trying to preserve the meaning.

Radiance of the northern night,

I remember always near you.

And phosphorescent eyes shine,

They just don't warm me up.

Thus, the poems of A.A. Fet reproduces a great impression on students, his work embellishes, enriches the poetic collection in our, Russian history and literature, his poems reflect the essence of nature, the inner world of Russian people. He is able to make a person think deeply about many things that surround us every day, and even with such force that after reading at least one of his works, the view of any phenomenon or process will change almost instantly.

On the other hand, A.A. Fet became one of the favorite poets for students, his biography showed us all what it is, true love, probably not everyone will be able to remain faithful to their beloved. He also fell in love with us, and students, and teachers, and a simple reader with his ability to give everyone unusual images and pictures of the golden age!

4. Analysis of the poems of Tyutchev F.I.

According to the school textbook [8, pp.226-242], Fyodor Ivanovich Tyutchev was born on December 5 (November 23), 1803, in the family estate of Ovstug, Bryansk district, Oryol province. He was educated at home under the guidance of S.E. Raich [11].

Young Fedor was interested in versification and classical languages, where he was supported by a teacher. He studied ancient Roman poetry, and by the age of twelve he was translating Horace's odes [12].

The appearance of Fyodor Tyutchev was discreet: a man of asthenic physique and short stature, clean-shaven with disheveled hair, casually dressed, often absent-minded talented poet, but the diplomat was transformed during salon communication. It was necessary for Tyutchev to speak, as those around him fell silent, there was so much reasonable, figurative and original meaning in his words.

His spiritual high forehead, brown eyes, thin lips, folding into a mocking smile, made a tremendous impression on those around him. However, Fyodor Tyutchev, in addition to great virtues, was characterized by narcissism and adultery.

Studying the life history of the poet, we focus the attention of students on the fact that Tyutchev was close to nature, and nature plays an important role in his work. Describing landscapes of different seasons, he enlivens the phenomena, objects of nature, simply and clearly describing the qualities inherent in objects.

There is philosophy in his work. Day, night, winter, summer, in an endless cycle replace each other, presenting themselves in new images to readers, revealing other sides of their character.

Especially subtly, the poet in his poems about autumn beautifully describes the actions that take place in nature, the breath of the wind, the crunch of leaves, the palette of autumn colors. But the most important thing is the description of feelings. Reviving objects, he characterizes it from all sides, conveys emotions and feelings. Gentle emptiness with the cold caress of autumn, flows in gusts of air, and, being picked up by gusts of breeze, intoxicate the human mind.

It is important to convey to students that it is precisely such feelings, when a person's soul begins to comprehend life again, when the heart, calming down from the bright fires of the passion of summer, begins to cool down and look at life more thoughtfully, ceasing to surrender to ambition, are born in the lines of this masterpiece.

One such example is the poem by F.I. Tyutchev *"Autumn Evening"* (1830) [13, p.20], which plunges us into the world of amazing lightness, unobtrusive anxiety, transparent sadness and warm hope. The poem makes us think about life. If students think well, they will understand that the author compares the various manifestations of the weather. At first, he describes calm, calm weather, and then anxiety, fear, and ends with harmony.

Students should think about the thoughts that Tyutchev tried to convey to us, namely, the ability to believe and hope in any unclear weather, because someday it will definitely clear up.

Captivating are the first two lines, in which peace and silence of the autumn sunset reign, illuminating with the light of charm. He seems to smirk at the withering of nature, knowing that after warm, dry days, the severity and audacity of bad weather will surely come. Here is a detailed translation of each line mentioned.

Is in the lordship of autumn evenings,
Sweet, mysterious beauty…

And in fact, already in the third line, the mood of the poet changes. He feels a hidden threat from the movement of the air of falling leaves, and to convey such a subtle foreboding of fear, he uses sound-painting, using the hiss of hissing and aching consonants, as well as adding contrasting, saturated colors, adding drops of anxiety, using the antithesis. We also give a detailed translation of the third and fourth lines.

The ominous brilliance, variegation of trees,
Crimson leaves languid, light rustle…

A picture is created, saturated with anxiety, fear of what can be expected in the next minutes. But instead of the expected wind, storm and rain, calmness, silence and stillness come to replace it. Everything calmed down.

Fear and anxiety dissipated along with the rays of the ardent sun, and azure came to the place of crimson and orange, the brilliance of the rays is replaced by a light haze of fog. Here is a line-by-line translation of the next part of the poem.

Foggy and quiet azure
Over the sad orphan land,
And, like a premonition of descending storms,
A gusty, cold wind at times…

Here, students already understand that the poet personifies life itself, showing how easily it can change at any second. From a sleepy and immobile state, gusts of cold wind become a harbinger of a future harsh winter, although the author is filled with positive and writes with a feeling of warmth.

Finally, the last lines no longer cause sadness, suffering, although they have words with the same meaning. But the author's heart is calm, does not worry and does not worry, but only lives in the faith that everything will end, everything will pass. Because no matter how dark the night is and how many fears it does not hide in itself, time will pass, and the rays of the sun will dissolve the horror of darkness, endowing everyone with a smile of their light! Let's translate the last quatrain word for word, preserving the true meaning of each line.

Damage, exhaustion – and on everything
That gentle smile of fading,
What in a rational being do we call?
Divine bashfulness of suffering.

When analyzing the entire poem, it is important to convey to students that the poetic size of the text is iambic pentameter with a two-syllable foot and stress on the second syllable, with cross-rhyming. Syntactically, this astrophic poem is one complex sentence. The epithets here are *"ominous brilliance"* and *"variegation of trees"*, *"crimson"* leaves, *"sadly orphaned"* earth.

Also epithets are *"touching, mysterious"* charm, *"foggy and quiet"* azure, *"gusty, cold"* wind. There is also alliteration in this poem, with the help of which the effect of falling leaves is created – *"crimson leaves languid whisper"*, fresh breath of the wind – *"and, as a premonition of descending storms"*, *"gusty, cold wind"*. The personification here is the *"rustle"* of crimson leaves.

Another poem by F.I. Tyutchev *"There is in the original autumn"* (August 22, 1857, on the way from Ovstug to Moscow) [13, p.79], which, when read, evokes a pleasant feeling, enjoyment of emotions. He loves nature and understands it. The lyrics are light and pleasant. Here, the students focus on the fact that the author talks about the relationship of nature with man, about beauty, about the extraordinary nature of this season, but most importantly, he touches on the problem of eternity.

Comparing the days when people worked hard on the field and the autumn season, when there was not a single living soul on the field, shows how fleeting time is, how changeable our life is, that in a year, two or three everything will repeat itself, and so it will be forever. From the main line we are convinced by his admiration for the first season of autumn. Consider the literal translation of the first quatrain.

Is in the autumn of the original
A short but wonderful time –
The whole day stands as if crystal,
And radiant evenings...

Pointing to the beauty of autumn at this moment, when it is still dry, and autumn has just come into its own, the author clearly endows the evening with warmth, and with trepidation uses the comparison

"crystal day", showing the purity and freshness of these moments.

The field attracts a lot of attention. The author shows a close relationship between nature and man, while talking about eternity, about eternal processes that are performed over and over again in our lives. Here is a literal translation of each line of the second quatrain.

Where a peppy sickle walked and an ear fell,
Everything is empty, space is everywhere?
Only cobwebs of thin hair
Shines on an idle furrow.

Emptiness. Cold. The first line of the third quatrain contains sadness, as if it is devastated, dehydrated, but fortunately, the final three lines fill us with joy, we understand that winter is far away, and we rejoice in warm, summer days. Here is a line-by-line translation with the maximum possible preservation of the true meaning.

The air is empty; the birds are not heard,
But far from the first winter storms –
And pure and warm azure pours
On the resting field…

For students, we present a joint detailed analysis of the poem. The theme of this poem is early autumn. The idea is to show the special charm of early autumn, the verse is written using the means of artistic representation. For example, the epithets *"cheerful"* sickle, *"wonderful"* time, *"idle"* furrow, *"crystal"* day, and *"radiant"* evenings. The metaphor here is *"and pure and warm azure is pouring"* on a resting field. The metonymy here is *"vigorous sickle"*. The personification here is the sickle *"walked"*. The synecdoche here is *"hair shines"*, *"ear fell"*. The rhyme here is cross. Sound writing and alliteration in two lines: (1) The whole day stands as if crystal, and (2) Evenings are radiant...

Finally, as a last example, let's look at the poem *"Wrapped in a prophetic drowsiness"* (September 15, 1850, St. Petersburg) [13, p.61], which was authored by F.I. Tyutchev is no less saturated with feelings of autumn colors. The non-standard description makes you delve deeply into the meaning of his poem; he considers beauty through ugliness, and rebirth through chaos, although the first verse is calm and humble, does not foreshadow violent changes and passions. We give her a detailed translation of each line of the first verse.

Enveloped in a thing of drowsiness,
The half-naked forest is sad...
Of the summer leaves perhaps the hundredth,
Shining with autumn gilding,
There is still rustling on the branches.

As if grinning at the phenomena of nature, he laughs without seeing a reason; he is sad and upset, despite the fact that he wants the first lightning clouds. Here is a literal translation of the second verse with the possibility of preserving the true meaning.

I look with tender sympathy,
Breaking through the clouds,
Suddenly through the dotted trees,
With their old and weary leaves,
A lightning beam will burst forth!

The third verse is very unusual, unlike the rest. It is very important to show students that if we read these lines superficially, we will not comprehend it; we will not understand the depth of this stanza.

Therefore, the author, personifying objects, turns them into images of people. While philosophizing about life, he compares completely different concepts of beauty and ugliness.

One gets the feeling that we are talking about a period of feelings of one person who loved, was attached, and trusted a person close to them, but after a while, he was disappointed in him.

Remembering the happy moments spent with this person close to him, he realized his importance in his life. But I realized how in an instant he became a stranger, how disgusting and disgusting communication with him now became, that the response of his feelings became something like this.

Let us complete the analysis of the entire poem with a complete translation of each line of the third verse.

How fading cute!
What a delight it is for us,
When, what bloomed and lived like this,
Now, so weak and frail,
Smile for the last time!

The verse is unique, which makes it very interesting due to the means of artistic expression. Let's look at them in detail. The metaphors here are *"enveloped in a thing's drowsiness"*, *"I look with tender pity"*, *"glittering with autumn gilding"*. The epithets here are *"prophetic"* drowsiness, *"half-naked"* forest, *"speckled"* trees, and *"exhausted"* leaves. The personification here is the forest *"sad"*, from the summer leaves perhaps the hundredth *"rustles"*, *"splashes"* the ray that *"bloomed and lived"*, *"smiles"* once.

The meter here is the first two feet are iambic, and the third foot is an anapest. Such dimensions give the poem a quick change of events.

F.I. Tyutchev has a very unique style, combining different types of sizes, threading some artistic means into others. When reading his poems superficially, it is not always possible to understand the author's intention or feel the atmosphere of the poem, but this only improves his originality and the desire to read his poems.

We, together with the students, were glad to work with the creativity of F.I. Tyutchev, it was through his poems that we discovered autumn in a different light, in different colors. Autumn time and the image of autumn time in the poems of F.I. Tyutchev, like a bright imprint will shine in our hearts at the sight of autumn, golden leaf fall in golden

groves and with the azure sky between the light touches of the wind.

5. Similarities in the description of autumn.

The decoration of Russian literature of the second half of the 19th century was the work of F.I. Tyutchev and A.A. Fet. These poets, representatives of *"pure art"*, were able to express a touching romantic attitude towards nature. In their understanding, it is, as it were, multidimensional, that is, it is described as a landscape.

It is important to convey to every student that it is through pictures of nature that these authors convey the states of the human soul. In particular, nature in Tyutchev's works has many faces, like *"chaos"* and *"abyss"*. If we compare three poems by each of the two poets, we will see both common features of writing and special features. In particular, autumn for both writers is inclined to an early period, when the still gilded leaves smoothly wave to us as a sign of greeting, and the sky, in the radiance of its beauty, intoxicates people's heads.

By character, A.A. Fet autumn weighs down with the weight of threat, cold and ice. Despite the fact that his poems are like frosty weather, penetrating everything, transforming it into white frost, and pinching the heart to the depths of the soul, he dissolves in the lines of his poem a drop of love, but not for people, but for nature, for its changes, and its objects.

We just want to compare the work of A.A. Fet in literature with the work of Beethoven [14] in music. But this is not because of the external sad, gloomy appearance, but because they both have the same style, both in music and in literature. With their massive works they pull a person deep into the space of human consciousness, without giving any reason for fun and joy. With precise chords, playing on the strings of the soul, they deafen extraneous thoughts and sounds passing around; they convey to us, through direct transmission, the simple sound of the soul, their feelings that they want to convey to us.

But F.I. Tyutchev's character is softer in relation to nature; for him she is in the image of light beauty, from which she carries charm. His poems are more confusing, scattered and juxtaposed. But his poems are wonderful, weightless. He, unlike A.A. Fet, sees beauty in ugliness, and, admiring the ugliness, sees a reflection of the beautiful.

Thus, A.A. Fet and F.I. Tyutchev philosophize very deeply in their poems, while having both general and special features in their stunning, charming, incredibly deep, stunning poems.

6. Conclusion.

A.A. Fet and F.I. Tyutchev gave us unforgettable, priceless treasures. We must love and appreciate each of their works. It is in the poems of such poets that we draw invaluable knowledge and skills.

In this extensive article, we found out that according to Tyutchev, love destroys a person; it is devoid of harmony. This element that suddenly comes destroys an established life, bringing only suffering. He remembers and does not forget his youthful love for a minute, but does not turn away from its tragedy and believes that for true love there is a special judgment – he cannot be separated from his beloved.

Both poets are trying to know the Creator through nature, because the world is the creation of the Creator for both the first and the second poet. But if Fet looks at the world with a tragic and philosophical gaze, then Tyutchev, like a nightingale, sings a song to its eternal beauty.

We believe that there is a special connection between the poems considered; they have both differences and similarities, and each poem has its own style, its own beauty and zest.

Therefore, despite the fact that each poet is rich in his own way with a special literary mastery of the word, each of them will remain on the pages of history and literature due to the fact that the role of each poet is great and enormous. The content of their poems has a large, precious role not only for our development and education, but also for our students, pupils and graduates of an ordinary rural school.

However, today there are a lot of people who do not know Russian classics. By doing such research and research, we learn not only to analyze and compare, for example, poetry. We will learn more interesting things about the life and work of Russian poets.

Why? Because the poems of Russian classics have hidden riches that gift readers, allowing them to feel the mood of nature, see the beauty in everything around them.

We are proud that our country is rich in such great, wise poets and philosophers who left behind many beautiful poems.

Therefore, modern youth need to study and read more classics, because in it the gates of honesty, kindness, and the ability to see the small and beautiful in everyday things open.

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Impact Factor:	ISRA (India) = 6.317	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 3.939	PIF (India) = 1.940
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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 11.10.2023 **http://T-Science.org**

Issue Article

Elyorbek Muzaffarbek o'gli Anvarov
Tashkent Islamic Institute
Lecturer of the Department of "Foreign languages"
Phone: +998909854309,
anvarovelyorbek1996@gmail.com

THE DEVELOPMENT OF QIRAAT SCIENCE UNDER THE TIMURIDS EMPIRE

Abstract*: This article provides information about the development of Qur'anic sciences during the Timurid period and scientists of the field who worked in Samarkand and Kesh (Shahrisabz) the capital cities of the country. During this period, it can be observed that many fields of science were revived and advanced to the stage of development in the cities of Central Asia. For example, as many fields as the exact sciences and architecture have developed, so have the Islamic sciences. Wherever Amir Temur went, he brought famous scientists and artisans to Samarkand. As a result, the capital Samarkand became a center of science and cultura.*

Key words*: Timurid state, Qur'anic sciences, qiraat, tajweed, Jazariy, hadis, faqih.*

Language*: English*

Citation: Anvarov, E. M. (2023). The development of Qiraat science under the Timurids empire. *ISJ Theoretical & Applied Science, 10 (126),* 286-288.

Soi: http://s-o-i.org/1.1/TAS-10-126-20 ***Doi***: https://dx.doi.org/10.15863/TAS.2023.10.126.20

Scopus ASCC*: 1200.*

Introduction

The emergence of centralized states in Central Asia, the development of the economy, the emergence of new routes for commercial caravans, the development of crafts and agriculture, in turn, led to the growth of cultural and spiritual life. In addition, the gathering of scientists from different countries in the central cities of Movarounnahr and Khorasan also had a positive effect on this. Especially in the period of Timurids, this situation can be clearly seen. During these periods, hundreds of works related to Qur'anic science and recitation were written by Central Asian scholars.

During the reign of Amir Temur, the science of Quqiraat developed in Movarounnahr. When he defeated Sultan Bayazid in the battle of Ankara in 805/1402 and brought the people of knowledge and virtue of the country to Movrounnahr, he also brought the famous recitation scholar Imam Jazari with him. Muhammad ibn Jazari wrote his treatise on Tajweed "Muqaddimat al-Jazariyya" here. Most of the residents of Kesh and Samarkand learnt from him.

In Kesh, Abdul Qadir ibn Tilla Rumi, Hafiz Bayazid Keshi and Hafiz Mahmud ibn Muqri learned ten kinds of recitation from him and received the title of sheikh of recitations [3, p. 13]. Also, the scholar's world-famous work "Taqribun-nashr fil-qiraatil-ashr"[4, p. 6] contains the summary of his knowledge gained over the years, walking from city to city, the sanads of the reciters, the narrators of ten recitations and their brief biographies has been studied as a primary source for all Qur'an up to the present day.

In the period of Timurids, Mawlana Mu'iniddin Farohi (d. 907/1501-1502), Amir Ikhtiyoriddin Hasan Turbati, Mawlana Mu'iniddin Vaiz, Jamaliddin Atullah (d. 905/1499-1500), Amir Syed Asliddin Abdullah Husayni (d. 883/1478), Hafiz Ghiyas (d. 872/1468), Shamsuddin Muhammad ibn Sharafuddin Usman (d. 901/1495), Nizamuddin Abdullah, Khwaja Imoduddin Abdulaziz Abhari, Sheikhul Islam Saifuddin Ahmad Taftazani (d. 916/1511), Kamaluddin Husain Vaiz Koshifi, Shamsuddin Muhammad Tabadghani (d. 891/1486) were active scholars of other sciences such as recitation, tafsir, hadith, fiqh, and mysticism. It should be noted that these mentioned scientists have greatly contributed to the development of Quranic and recitation sciences in our country

Sayyid Sharif Jurjani is one of the scholars who lived in Samarkand during the time of Amir Temur, participated in the scientific movement and became famous all over the world. Sayyid Sharif Jurjani was born on March 2, 140 Hijri, on the 24th day of the month of Sha'ban / 1340 AD, in the city of Toku, which belongs to the Astrobad region of Jurjan. After reaching adulthood, he studied for a long time in Egypt and Onadoli, which were scientific centers of that time, and went to Shiraz in 779 A.H., 1368 AD. When Alloma Taftazani introduced him to King Shah Shuja, Sultan Sayyid Sharif appointed Jurjani as the headmaster of the "Dorush Shifa" madrasa

He taught at this dargah for ten years, engaged in fatwa and wrote books. Gradually, Sayyid Sharif Jurjani's fame spread around. He became famous in a wide circle, especially as a scholar of intellectual sciences.

Amir Temur Koragoni took Sayyid Sharif Jurjani with him to Samarkand when he conquered Shiraz in 789 Hijri, 1378 AD. It is no exaggeration to say that the eighteen years spent in Samarkand were the most productive years of his great life. He wrote many of his works in Samarkand. He gave many lessons in various sciences and educated his famous students. He held various scientific debates, debates and discussions with famous scholars of that time, such as Allama Taftazani, may God bless him and grant him peace.

Amir Temur Koragoni highly respected Sayyid Sharif Jurjani for his knowledge. Among the scholars, he was a special member because he was from the lineage of the Prophet, peace and blessings of God be upon him. Sayyid Sharif Jurjani was also highly regarded among scholars.

Sayyid Sharif Abulhasan Ali ibn Muhammad ibn Ali Jurjani Husayni, may God bless him and grant him peace, met and stayed with Khoja Alauddin Attar Bukhari, may God bless him and grant him peace. He was one of the caliphs of Khwaja Bahauddin Naqshband, may God bless him and grant him peace. Acquaintance with that person made Sayyid Sharif Jurjani feel the special importance of Sufism, and he became a member of the Naqshbandi order.

In Samarkand, Sayyid Sharif Jurjani became friends with Maulana Nizamiddin Khomush, another great leader of the Naqshbandi order, and actively participated in his Sufism meetings.

Amir Temur died in 807 AH, 1405 AD. Then Sayyid Sharif Jurjani returned to his native Shiraz and continued his scientific activities until the end of his life. Sayyid Sharif Jurjani died in Shiraz on Wednesday, 816 Hijri, the sixth of the month of Rabi'us Sani (July 14, 1413 AD) [5, p. 547, 135].

Yormuhammad Samarkandi, a scholar who lived in Samarkand in the 16th century, wrote a work called "Qavaid al-Qur'an" about recitation and tajvid. In the book, Osim describes the style of Qiraati, its narrators and rules in detail. Manuscript copies of the work are also kept at the Institute of Oriental Studies of the Russian Federation FA. Even Maulana Ali al-Qari used this work in his commentary on Muqaddimat al-Jazariyya.

Alisher Navoi, the great poet of the Uzbek people, also had knowledge of the Holy Qur'an, its recitation and tajwid, and loved these subjects. In his article dedicated to the historian Sharafuddin Ali Yazdi (d. 1454) in the magazine Majolis un-nafais, he recalls an event from his six-year-old age: "Ittifaqa manzil happened at the door of Ali Yazdi's (Ali Yazdi's) room... when I was about six years old, I became my husband... Faqir alar (Ali Yazdi) I was able to go there. Whatever they asked, I answered. They smiled and complimented me and asked:

Do you go to school?

I said: - I went.

I said: - How far did you study?

I said: — until the prayer of “Tabarak surah” [6, p. 524],

They said: When we begged you to be part of this congregation, you came and became acquainted with us, and they bestowed their blessings on you, saying that you are the son of blessing” [2, p. 14].

It is clear from this story that Sharafuddin Ali Yazdi asked Alisherbek which chapter of the Qur'an he was reading. From the interview, it is known that the first Alisher Nawai came when Sharafuddin called a group of children to test their knowledge, and at that time the initial education for children began with learning to read the Qur'an. Also, we can know that Navoi had a certain level of knowledge of the Qur'an at the age of six.

The fact that Alisher Navoi created wide opportunities for the development of Qur'anic sciences can also be seen in his care for the sciences. Alisher Nawai's contribution to Quranic sciences can be seen when he wrote several commentaries on the Quran during his time. In particular, two of these commentaries - "Jawahir at-tafsir li tuhfat al-Amir" (Jewel of Tafsirs attributed to Amir) and "Mawahibi Aliyya" (High Gifts) were written at the direct suggestion and patronage of the poet.

Hafiz Badriddin Bukhari, who is known by the nickname "Hafizi kalon" (the great hafiz), also wrote a work on the science of recitation called "Durrat al-farid" (The Picked Gem). In the 17th century, Hafiz Dost Muhammad ibn Yodgor al-Waziri finished a work entitled "Majma' al-Ajaib" (Collection of Wonders), in which he described seven, ten, and ten recitations one by one[1, p. 214]. Muhammad Baqi ibn Tursun Muhammad ibn Babajan ibn Mawlana Miron al-Bukhari as-Soktari dedicated to Subhanqulikhan and commented on Imam Shatibi's qasida in full in Persian. This work was published in Tashkent in 1914 with comments by Maulana Ali Qori and Muhammad Sho'la.

The development of cultural life is visible first of all in various spheres of creativity. For example, it can

be seen that architecture in Central Asia developed in several stages. For example, the existing buildings were renovated, and in turn, important structures serving the field of science and education were erected. In particular, the architectural structure called "Darulhuffoz" (House of Memorizers of the Holy Qur'an) was built in almost all major cities of Central Asia, where scholars of the Holy Qur'an and scientists who studied all recitations were trained. One of these structures is the "Chor Bakr" memorial complex in Bukhara.

CONCLUSION

Dozens of works related to recitation and tajvid were created in the cities of Samarkand, Bukhara, Tashkent, Kokand in the 18th and 19th centuries and are still waiting for their researchers. In general, the contributions of the scientists of our country to the sciences of recitation and Tajweed are incomparable, as they are in other Islamic sciences, but they have not been studied enough.

It is clear from this information that the period of Timurids was a particularly important period in the history of Qur'anic sciences. As a result of the wide opportunities created for scientists, hundreds of scientists who were pioneers in this field were able to come out and write rare works. Undoubtedly, the research and study of these rare sources is one of the urgent tasks facing scientists at the same time

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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2023 **Issue:** 10 **Volume:** 126

Published: 18.10.2023 **http://T-Science.org**

Issue Article

Saidakhror Saidakhmedovich Gulamov
Research Institute for Statistical Research and Retraining of the Republic of Uzbekistan
Academician, Doctor of Economics, Professor, Head of the Department

Abbas Tairovich Shermukhamedov
Research Institute for Statistical Research and Retraining of the Republic of Uzbekistan
Doctor of Ph.D., Professor

NEW APPROACHES TO STATISTICAL DATA EXCHANGE

Abstract: *The article is devoted to the development of the SDMX standard in international statistical practice. SDMX - (Statistical Data and Metadata Exchange Initiative) problem and exchange of statistical data. In particular, the issues of electronic exchange of statistical data, which are widely used by EUROSTAT, IMF, BIS, ECB, are considered. SDMX very important for the official international statistical organizations.*

Key words: *statistics, statistical research, business process, foreign trade statistics.*

Language: *English*

Citation: Gulamov, S. S., & Shermukhamedov, A. T. (2023). New approaches to statistical data exchange. *ISJ Theoretical & Applied Science, 10 (126),* 289-291.

Soi: http://s-o-i.org/1.1/TAS-10-126-21 ***Doi***: https://dx.doi.org/10.15863/TAS.2023.10.126.21

Scopus ASCC: *1400*

Introduction

SDMX is an international standard for Data and Metadata exchange, which corresponds to the approved ISO standard (17369:2013), designed to ensure effective exchange of statistical data and metadata and facilitate their dissemination among national and international statistical organizations. Standardization within the format is achieved through the use of approved lists of codes and descriptions of statistical data structures and metadata. In the case of the European Statistical System (ESS), this is an exchange between the Statistical Office of the European Union (Eurostat) and the national statistical offices of the EU member States.

However, SDMX is currently also used by organizations outside the world of official statistics. The SDMX format may be of interest to any organization that collects, processes, analyzes and distributes statistical data and metadata.

As is known, in international practice, the most common are two options for using SDMX [1-3]:

- SDMX as a format for reporting and collecting reports, like SDMX-EDI.
- Dissemination of statistical data through websites.

The SDMX standard defines formats for the exchange of aggregated statistical and metadata data and is used as a method of collecting and processing statistical information to improve its quality, and at the same time it is necessary to use uniform identifiers of individual objects of statistical accounting. The main purpose of this standard is to simplify the exchange of statistical data between organizations.

This standard not only makes it easier to access statistical data, but also makes it more accessible for use in statistical organizations with the help of data metadata.

The SDMX standard contains components like [3-7]:

- information model (Information Model);
- XSD-structure description schemes;
- content models and data types;
- Content-oriented Guidelines - a set of programs and tools for working with SDMX. Standardization of statistical information in SDMX simplifies data analysis and their dissemination between organizations.

The use of web services makes it possible to simplify the processing of arrays of information and ensure the connection of adjacent systems, providing

any user with the opportunity to obtain and compare the macroeconomic indicators of interest to him.

The advantages of the SDMX standard are at the heart of an interdepartmental project currently being implemented in the EU and Russia to introduce the standard into the practice of distributing statistical data, both as part of information exchange with international organizations and as part of providing data to an unlimited number of users using portal technologies.

The results of the work are recommendations on the use of individual elements of the information infrastructure for the collection and analysis of statistical data. In the existing information infrastructure of the digital economy, there are a number of information sources, the use of which contributes to improving the quality of statistical data collection and processing. Standards for the exchange of statistical and metadata data as SDMX (Statistical Data and Metadata eXchange), which facilitates their exchange using modern information technologies.

With the development of the first SDMX standard, a number of other projects are being carried out aimed at supporting and developing new electronic standards for data exchange. SDMX projects are aimed at using new Internet technologies and the experience of those who deal with business requirements and IT support for the collection, compilation and dissemination of statistical information.

Currently, four projects are being carried out within the framework of the SDMX organization: practical research of new electronic data exchange standards; batch data exchange: development and support of the "Common Statistical Protocol for Time Series - Version 3.0", creation of a common dictionary of data metadata and development of a standard approach for creating and using data metadata repositories.

The SDMX system is aimed at defining information standards (concepts and definitions, classifications and nomenclatures, indicators, measurement methods, information quality criteria) for representing social, economic, environmental, technological and other phenomena and processes for all infrastructural information systems [7-11].

At the same time, special attention is paid to the information systems of central and regional government bodies, for the effective dissemination of statistical information between countries due to its universalism. Official statistics cover all spheres of social and economic life of society, technological and environmental phenomena and processes.

That is why official statistics, especially the national statistical Service (Government statistical organizations, regional offices) should play a coordinating role by developing information standards for use by other stakeholders of the country's information infrastructure.

SDMX message formats have two main types: SDMX-ML (using XML syntax) and SDMX-EDI (using EDIFACT syntax and based on the GESMES/TS statistical message).

The standards also include additional specifications (e.g. registry specification, web services). As you know, version 1.0 of the SDMX standard was recognized as an ISO standard in 2005. The standard provides for the transfer of both data and metadata.

At the same time, two types of data metadata are distinguished: structural and reference. Structural metadata data acts as identifiers and descriptors (for example, variables, code lists, data sets) and is necessary for defining data (name of a dynamic series, time interval and unit of measurement).

Reference metadata includes such data as: "conceptual" (the concepts used and their practical implementation; "methodological" (describe the methods used to produce statistical data); "qualitative" (various measurements of the quality of the statistical data obtained).

As our analysis has shown, the description of the data structure (DSD) includes three main components: measurement attributes (dimensions) that describe statistical data and form their identifier (key) to the corresponding data (for example, time, area, gender); values (measures) that reflect the value of a statistical quantity over a period of time; attributes (attributes) additional information about any part of the data set under consideration that may characterize a data set, an observation, or a group of measurements [1-13].

The general mechanism for organizing data exchange in accordance with SDMX is as follows:

- determination of data to be transmitted (within the framework of the standard, data is distributed across the main thematic areas of statistics (statistical domains):
- demographic and social statistics, economic statistics, environmental and multisectoral statistics);
- definition of the conceptual data transmission scheme;
- creating a list of codes;
- creation of special data structures (DSD) and metadata (MSD);
- formation of data flows, including metadata;
- creating links between national data and DSD;
- creating a data set;
- setting up the mapping process;
- formation of data in SDMX format.

The toolkit that allows data transmission in accordance with the standard consists of:

-DSD Constructor (an application capable of converting and editing frequently used metadata formats into SDMX-ML formats. Includes an interface that allows you to create DSDS and edit data according to requirements.

- Fusion Registry (fully integrated SDMX data and metadata management system, providing the

creation of structural metadata, reference data metadata, data collection, validation and transformation and dissemination.

- SDMX Converter

- SDMX converter that converts statistical data sets into a file that meets the requirements of SDMX

- Stat Suite is an open source platform that provides the dissemination of statistical data.

This data is guided by the Standard Statistical Information Model (GSBPM) and SDMX. The program to create a modern, ICT-based information infrastructure of the country contributes to the development of official statistics. This program should play an important role in the country's information infrastructure through the use of information standards.

The possibility of integrating SDMX methodological approaches into the Big Data architecture was noted by developers at the stage of creating its first project. SDMX can be identified by its values, a specified control date, and attached attributes.

Currently, work is underway aimed at simplifying and improving the data reference metadata model;

-supporting microdata; supporting geospatial data;

-supporting code list expansion and disjunction code list aggregation; improving structure mapping;

-improving code hierarchies for data discovery;

-improving restrictions on structural data metadata artifacts, REST web services application programming interface, and improvement and simplification of metadata data exchange formats [12].

Standardization of statistical information within the SDMX standard significantly simplifies the dissemination and analysis of data. The use of web services makes it possible to simplify the processing of arrays of information and ensure the connection of related systems, providing any user with the opportunity to obtain and compare macroeconomic indicators of interest to him in different countries of the world.

These advantages of the SDMX standard form the basis of projects currently being implemented in a number of countries to introduce the standard into the practice of statistical data dissemination.

Prospects for the development of the SDMX standard in international statistical practice. In 2019, the European Central Bank launched a project to create a platform that should replace the macroeconomic statistics information system that has been in place for more than 26 years. The system being developed is focused on big data processing, and the technological stack of Hadoop software products was chosen as the basis for creating the platform.

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Contents

p.

15. **Vilisova, M. L., Okhrimenko, O. I., Blagorodov, A. A., Prokhorov, V. T., & Volkova, G. Yu.** 201-230
Clusters – special economic zones (SEZ) – territories of priority socio-economic development (PSED) – support zones of development (SDA) – comprehensive projects for the socio-economic development of the Arctic Zones of the Russian Federation. Message 2.

16. **Vilisova, M. L., Okhrimenko, O. I., Blagorodov, A. A., Prokhorov, V. T., & Volkova, G. Yu.** 231-249
Clusters – special economic zones (SEZ) – territories of priority socio-economic development (PSED) – support zones of development (SDA) – comprehensive projects for the socio-economic development of the Arctic Zones of the Russian Federation. Message 3.

17. **Sayfidinova, M., Sayfidinov, O., & Aslonova, M.** 250-261
Investigating the thermal impact on lathe machine tool inserts.

18. **Zhanatauov, S. U.** 262-276
Competencies implementing analytical abilities.

19. **Miniakhmetov, A. A., Akhmadullina, G. F., Borisova, E. N., & Lutfullina, E. G.** 277-285
General theoretical and methodological techniques for the comparative description of the description of autumn in the poems of A.A.Fet and F.I.Tyutchev from the cycle "The gilded wealth of the silver period" (on the basis of "Growth points" Askino secondary school №1 Republic of Bashkortostan).

20. **Anvarov, E. M.** 286-288
The development of Qiraat science under the Timurids empire.

21. **Gulamov, S. S., & Shermukhamedov, A. T.** 289-291
New approaches to statistical data exchange.

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«Theoretical & Applied Science» (USA, Sweden, KZ)
Scientific publication. The circulation is 90 copies.
http://T-Science.org E-mail: **T-Science@mail.ru**

Printed «Theoretical & Applied Science»