NBIC-technology and strategic management tools in the organization of business and production

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Abstract. The paper is devoted to the analysis of the development of industrial production organizations, using focal points for the development and implementation of a production management strategy. It also solves the problems associated with the development of mathematical and algorithmic support for adaptive decision support systems in situational centres, taking into account expert options for institutional conditions in information systems for operational monitoring, situation analysis and assessment of production situations.

1. Introduction

The concept of socio-economic development of the Russian Federation over the past decade and a half has undergone several significant changes. The course for modernization and innovation, adopted in 2008, was based on a post-industrial model of economic growth with a predominance of service industries in the economy.

The global financial crisis and new political realities have transformed the modernized discourse in the direction of ensuring national security, strengthening the state as such and fulfilling its social obligations to citizens.

The emphasis on modernization has shifted towards high-tech and knowledge-intensive sectors of the economy, including industry, as well as social issues related to the salaries of teachers, doctors, researchers, cultural and art workers. Many researchers believe that its adoption means a qualitatively new approach to the implementation of public policy in Russia [1, 2, 3]. However, the complication of foreign policy relations required a renewed focus on the modernization of industry and the economy as a whole.

A new strategic planning system began to take shape in the Russian Federation, starting in mid-2014. It suggested new principles of strategic planning, as well as other fundamentals of developing software components, filling forecasts, as well as monitoring performance. This system of law was focused on the formation of a fundamentally different modernized configuration and a significant transformation of public administration of the economy, politics, and the social sphere. The result of this activity was the Strategy for socio-economic development until 2030.
2. Theory
The targeted national goals of Russia determine the choice of a model of economic growth. The latter, in turn, are influenced by global trends and the current socio-economic situation. V. A. Mau identifies the following key characteristics of the socio-economic situation in modern Russia:

1. There is economic growth; however, its pace is significantly behind the global average.
2. Real disposable incomes of the population, an indicator of the growth of social welfare, continue to decline.
3. Unemployment fell below 5%, growth in real wages, expenditures on the final consumption of households and retail turnover were recorded, that is, consumption growth overtook income growth.
4. Substantially increased lending to the population. The increase in loans overtook the growth in deposits for the first time since 2014. This means both a shortage of own funds and stabilization of the situation, which allows people taking loans.
5. The macroeconomic situation remains extremely favourable: very low government debt denominated in foreign currency, a federal budget surplus, a decrease in the non-oil and gas deficit, achievement of target consumer inflation, and an increase in the Bank of Russia's international reserves.
6. The risk of a future jump in inflation due to the unprecedentedly high producer price index over the past decade.
7. Low investment activity, especially private investment.
8. Increased social tension in society, which is largely associated with an increase in retirement age.

In general, the period of 2009-2018 MauV.A. characterizes as a period of economic inhibition. He writes: “In the period 2010-2018 the interweaving of global (structural) and cyclical crises in Russia, a new model of economic growth was being sought that would not be based on cheap resources (free capacity and rental income), but on the increase in total factor productivity” [4].

3. Experiment
In these conditions, not only economical but also political key tasks are to increase the rate of economic growth and ensure sustainable growth of welfare. Their solution requires the implementation of a complex set of macroeconomic, institutional and structural measures. With the adoption of some strategic documents in May 2018, a substantial shift was noted from the model of economic growth based on stimulating demand to the model of stimulating supply.

This process means that the main political and economic emphasis is shifting towards manufacturing sectors and maintaining investment activity. State resources are concentrated on investment support for the implementation of national goals and priorities, the development of industrial, transport and social infrastructure. Consumer demand is formed as a derivative of investment demand.

The institutional framework of the new model of socio-economic development is financial-industrial groups with state participation (corporations with state participation). Note that two more institutional models of economic growth are possible: a private entrepreneurial model with competitive market institutions and a model with strong government intervention.

The adopted institutional model can provide results in the form of export-expanding economic growth, diversification of production and import substitution. Also, state-owned corporations often perform social functions.

However, such structure impedes the development of competition, and this is its main drawback.

An analysis of domestic and international goal-setting practices in state strategic planning systems shows that the presence of a hierarchy of interests predetermines the use of two approaches to the formation of the goals of the system, which are fundamentally different in the direction of the “assembly” of agreed development planning guidelines.

Thus, depending on the degree of activity of the goal-forming structure of the system [5], two concepts of goal-setting can be distinguished: descriptive and normative (their meaningful characteristics are presented in Table 1).
Table 1. Content aspects of building concepts of goal setting

| Aspect                              | Conceptual model of goal formation |
|-------------------------------------|-----------------------------------|
| The role of the subject of management | Active | Active |
| System structure                    | Constant | Variable |
| The prevailing impulses of development | Domestic | External |
| Development orientation             | From the possible | To the necessary |
| Dominant development factors        | Extensive | Intense |
| Source of development               | Accumulated potential | Formed Potential |
| Development restrictions            | Deterministic | Undefined |

In the formation of target settings, various goal-setting mechanisms can be used, namely: passive, when goals are built in from the outside into the system loop, and active, when goals are selected inside the system. In the practice of managing the development of socio-economic objects, these mechanisms may intersect.

The classification of management goals can also be carried out on such grounds as the place of the goal in the management system and the hierarchy of goals, the subject area of the goal, the degree of attainability, the nature of the measurement of the goal. From the point of view of goal setting mechanisms, translational, genetic, stabilization, monitoring, competitive and value models can be used. They differ from each other in goal-setting schemes, as well as sources of factors and conditions of this process.

In substantive aspects, the goal can be aimed at maintaining the stable functioning of the socio-economic system, changing its individual characteristics or a set of characteristics, pursuing private and mainly quantitative changes in the parameters of the socio-economic system or local and mainly qualitative changes, significant qualitative changes in the structure and characteristics of an economic system. Achieving strategic goals covers a period of up to 12 years or more.

At each management level, modern scientific and methodological approaches have developed with their tools, allowing taking into account several institutional factors [6, 7].

The methodology of macroeconomic management is an intersectoral cluster approach to innovative industrialization of the country based on global trends and an interdisciplinary approach in the form of integrated macro-forecasting and national programming, as well as antechannelry approach. This allows us to solve the problem of creating an innovative breakthrough development option and structural policy priorities. The macroeconomic methodological approach implements such strategic planning tools as a system of macroeconomic and intersectoral, balance models; building a civilizational matrix based on the theory of cycles, crises and innovations of Kondratiev N.D.; socio-cultural dynamics of Sorokin P.A.; intersectoral analysis and forecasting of Leontyev V.V.; reproduction-cyclic macro model of Yakovets Yu.V. [8, 9].

The tool allows taking into account endogenous factors (formed in models) of development, due to institutional aspects of global integration processes, options for institutional conditions based on foresight forecasts of experts and state regulation of the market economy. The result of this approach is the concept of industrialization, the forecast of the technological development of Russia, the mechanisms of technological development of Russia; macro forecasts of technological and structural dynamics, as well as a long-term state strategy, a list of national programs and projects and mechanisms for their implementation [10, 11].

The management methodology at the meso-level is the project approach, which allows the formation of large complex projects to achieve the strategic goals of the economy; program-oriented forecasting: methodology of the project approach to the organization of models of the country's economy. In addition, an assessment of the impact of state support mechanisms for innovative projects on macroeconomic indicators of the country's economic development; an assessment of the long-term socioeconomic consequences of the implementation of large national economic projects for the development of the economy of the country and regions; an integrated approach to the construction of
federal program management systems; multi-project management and budgeting is applied. The result of this approach is the distribution and use of resources between federal programs through the project management centre [12, 13].

As a tool, a model complex is used for developing an effective strategy and an investment program for a lot of regional intersectoral megaprojects, taking into account the formation of options for state preferences for investment program projects as endogenous factors.

At the regional level of management, the methodology of a systemic integrated economic approach to regional strategic planning is used for ensuring continuity of strategies at various levels of the territorial hierarchy with a focus on civil society institutions and business structures; the formation of institutional conditions for their implementation. The tool is an optimized intersectoral interregional model in the context of federal districts and constituent entities of the Federation, taking into account the formation of institutional conditions for the implementation of regional strategic priorities and achieving a balance of interests of the state and business structures as an endogenous factor. As a result, the composition and structure of the model strategy of the subject of the Federation are determined, including implementation mechanisms and monitoring of institutional conditions.

The macroregion development strategy is developed on the basis of long-term forecasting of the development of the macroregion, as well as a synthesis of scientific, technological and general economic approaches. The model complex serves as a tool: industry econometric and intersectoral balance models; Foresight forecast of mechanisms of interaction between the state, business and science, taking into account scientific and technological forecasts of the development of the countries of the Asia-Pacific region (APR). At the same time, expert options for institutional conditions are taken into account in alternative scenarios of structural changes in demand and supply, taking into account scientific and technological forecasts as exogenous factors. The result is a scenario forecast of the dynamics of structural shifts in the macroregion branches and the direction of institutional transformations [14].

Issikawa’s diagram, which was modelled by authors and is showing NBIC macroregion development is shown in Figure 1.

![Issikawa’s diagram showing NBIC macroregion development](image-url)

**Figure 1.** Issikawa’s diagram showing NBIC macroregion development
Strategies for the innovative development of a constituent entity of the Federation are being developed on the basis of a comprehensive approach to the construction of management systems for the innovative development of the region, consisting in multi-project management and budgeting. This approach allows embedding software projects in regional development strategies into the modern administrative management structure, as well as harmonizing the interests of the administration of the subject of the Federation, heads of federal target programs, business communities, and public organizations. This takes into account such endogenous factors as complex assessments of the effectiveness of achieving goals; regional priorities, options for the implementation of innovative projects. As a result, a management system for the innovative development of regions with a matrix organizational structure for project management in the administrations of the subject of the Federation and municipalities is formed. A project management centre: an incubator for implementing innovative projects; creative process motivation system; targeted training of innovative managers, etc. are also formed.

Situational centres at the levels of state administration implement a scenario approach in situational analysis to develop managerial solutions for regional government bodies on the basis of a simulated financial and economic model for the development of the region of the raw material taking into account such endogenous factors as administration; business communities; federal and regional tax policy options. The results are reflected in the recommendations on changing the federal and regional tax policy in order to increase the social value of the oil and gas sector.

The task of the coordination centres for managing the development and implementation of the megaproject strategy is to coordinate the investment activities of the program participants by government bodies. The tools used are a combination of network and simulation models of a megaproject investment program. Participants target priorities; investment and resource constraints; tax rules; world market prices are taken into account. As a result, recommendations are justified on changing the federal and regional tax policy and system of state support for projects. Coordination centres for managing the development and implementation of the megaproject strategy also solve the problem of developing mathematical and algorithmic support for adaptive decision support systems in situational centres, taking into account expert options for institutional conditions in operational monitoring information systems, analysis of the situation and assessment of situations. All this allows creating an adaptive decision support system, a methodology for its integration into the situation centre to increase the effectiveness of managerial decisions, to form multivariate predictive assessments of the situation taking into account decisions made and scenario conditions.

Thus, in 2018, the goals were set to carry out breakthrough scientific, technological and socio-economic development of the Russian Federation, increase the population of the country, improve the living standards of citizens, create comfortable conditions for their living, as well as conditions and opportunities for self-realization and disclosure of each person’s talent. The central place in the strategic management system is occupied by strategic planning documents. They represent documented information developed, reviewed and approved by the state authorities of the Russian Federation, state authorities of the constituent entities of the Russian Federation, local governments and other participants in strategic.

4. Conclusions
A systematic approach to managing strategic management processes and territorial planning involves consideration of all levels of this system:
- the federal level at which the state strategy of socio-economic development is developed and implemented;
- the inter-regional level (the level of macro-regions - federal districts), at which the implementation of large-scale socio-economic programs and priority national projects in the districts, as well as the actions of the administrations of the constituent entities of the Russian Federation that are part of the districts, is coordinated;
the regional level at which the regional socio-economic policy is formed and implemented the policy of the subject of the federation, the main tasks of which are the tasks of solving the socio-economic problems of the Russian regions based on the development and use of regional production factors;
- the municipal level, which is the habitat and communication, the place where the human community is formed, a part of civil society, where each individual has the opportunity to realize needs, interests, abilities;
- micro level.
Thus, the regional community is the ultimate subject of strategic management; regional authorities are the direct one.

References
[1] Nazarova M N, Palaev A G 2017 Diagnostics and repair of centrifugal oil transfer pump rotor shaft. *IOP Conference Series: Earth and Environmental Science* 87 092016
[2] Gabov V V, Romanova V S 2017 Investigation of Layer-by-layer Destruction of Rocks in High-frequency Cone Crusher *IOP Conf. Series: Earth and Environmental Science* 87 22006 DOI:10.1088/1755-1315/87/2/022006
[3] Strizhenok A V, Korelskii D S 2016 Assessment of the state of soil-vegetation complexes exposed to powder-gas emissions of nonferrous metallurgy enterprises *Journal of Ecological Engineering* 17(4) 25-29
[4] Grosse K U 2012 Non-destructive testing and technology for monitoring the technical condition of structures for quality control and supervision of construction sites. *ALITinform: Cement. Concrete. Dry mixes.* 6 62-77
[5] Ardashkin I B, Yakovlev A N, Martyushev N V 2014 Evaluation of the resource efficiency of foundry technologies: Methodological aspect *Advanced Materials Research* 1040 912-916 DOI: 10.4028/www.scientific.net/AMR.1040.912
[6] I Yu Loshkarev, and A S Chernyshov 2013 Unbrakable control. Features of methods of nondestructive testing. *In the collection: Actual problems of power engineering of agrarian and industrial complex Materials of IV International scientific and practical conference. Edited by A.V. Pavlova.* 184-186
[7] Malozyomov B V, Babaeva O V, and Andreev A I 2014 Posteriori analysis of the reliability of transport systems. *Scientific problems of transport in Siberia and the Far East. 1-2* 93-95
[8] Vorfolomeev G N, Evdokimov S A, Malozyomov B V, Schurov N I, and Shalnev V O 2004 Reliable sources of a feed of the direct current. *In the collection: 8th Korea-Russia International Symposium on Science and Technology Proceedings: KORUS 2004. sponsors: Tomsk Polytechnic University, University of Ulsan, Novosibirsk State Technical University* 316-320
[9] Daimer J 2005 Graphite electrode for electrothermal reduction furnaces, electrode column and method for making graphite electrodes. *Patent for invention RUS 2374342 12.05*
[10] Shabalina A V, Lapin I N, and Belova K A 2015 Graphite electrodes for electric arc furnaces. *Black metals. 12 (1008) 20-21*
[11] Malozyomov B V, Wilberger M E, and Kulekina A V 2015 The most typical damage and methods of diagnosing the traction motor. *Transport: science, technology, management.* 10 60-65
[12] Nikolaev A A, Nikolaev A V, Kirpichev D E, and Tsvetkov Yu V 2008 Formation of a diffuse cathode spot on a graphite electrode with an arc discharge. *Physics and chemistry of material processing* 43-48
[13] Shchurov N I, Porsev E G, and Vil'berger M E 2009 Asymmetrical and nonsinusoidal operation modes of multipulse rectifiers. *Russian Electrical Engineering.* 80(12) 680-684
[14] Borisenkov S, Votintsev A, and Roth H 2003 Quality control: non-destructive testing of brazed joints using X-ray radiation. *Components and technologies.* 28 168-170