
Priorities of intensification of technological development at the meso level of economy

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Abstract: The article discusses the priority directions of intensifying the technological development of subjects of the meso-level of the national economy. The list of subjects of the meso-level has been supplemented, enlarged groups of problems of subjects of the meso-level of the national economy in the field of technological development have been identified, and a list of environments has been formulated that determine the atmosphere for the implementation of an engineering project. Based on the analysis of the share of high-tech products in the volume of sales in the domestic and foreign markets, a conclusion was made about the priorities for increasing the intensity of economic activity on the scale of meso-level entities, and a cycle of unifying the problems of development of a meso-level entity was developed.

Keywords: project engineering, meso-level of economy, technological development, intensive development.

INTRODUCTION

It is advisable to form priority areas for intensifying the technological development of meso-level subjects on the basis of a problem-oriented analysis of the parameters of their activities. Therefore, it is important to study the features of the use of technologies by the main types of meso-level subjects for the identification of the most important problems and subsequent decomposition in order to form specific goals and objectives for the development of appropriate directions of intensification.

In modern conditions, the development of projects for the technological development of subjects of the meso-level of the economy, including the formation of long-term programs of socio-economic development, is based on the results of a comprehensive analysis of the activities of the participants of the subject of the meso-level, as well as on the structure of its income and expenses, which depend, inter alia, on the economic profile. The concept of long-term socio-economic development of the Russian Federation for the period up to 2020 (Order, 2008) directly determines that the development of the territorial and sectoral framework of the national economy is one of the main priorities for the technological re-equipment of the main types of economic activity.

METHODOLOGY

The intensification of the technological development of the subjects of the meso-level is important at the present time due to the fact that the improvement of the technological permeability of the production capacities of any of the participants of the subject of the meso-level leads to an increase in the efficiency of the entire system of relations, increases the competitiveness of specific products, improves the possibilities of creating the appropriate technological reserves, increases labor productivity and creates prerequisites for the development of regions.

According to V.P. Chichkanov with colleagues (Chichkanov et al, 2012), "the characteristics of an economic entity reflect the results of social development, historically established economic relations, state borders, administrative and political division, national, demographic characteristics, population settlement systems, previously created production apparatus, logistics infrastructure". That is, along with the natural and geographical conditions, the subjects of the meso-level differ from each other technologically, economically and organizationally. Important objective conditions that predetermine the priority areas of intensification of

technological development are the factors of globalization, which, according to Kuvshinova A.N., include (Kuvshinova, 2017):

- “high volatility of the cost of basic resources, including food, energy and labor;
- technological and organizational inconsistency in the field of joint production;
- quantitative and qualitative imbalance in production, circulation and consumption;
- currency fluctuations that are the result of liquidity gaps and growing imbalances in international trade in goods and capital flows;
- toughening of conditions of competition in the markets of raw materials, goods, services, technologies and qualified specialists; the emergence of new products, technologies”.

Therefore, it is necessary to clearly understand that, for example, different regions have different climatic conditions, different industries have different technologies for creating a product in terms of attracting and using scarce resources that determine the profitability of production. And within a corporation, there may be various organizational problems of interaction, including those related to property relations of specific companies.

Based on the foregoing, it can be concluded that one of the main directions of intensifying technological development is to level the rate of technology renewal. That is, in fact, an algorithm or technology is required to align and coordinate the inputs and outputs of various participants in the meso-level subject in terms of their technological conjugation, in terms of coordinating the quality of raw materials processing.

RESULTS

For the development and implementation of the existing potential, appropriate resources are required, therefore, to intensify the technological development of meso-level entities, it is necessary to use a project approach, including in the field of technical re-equipment of production (Zsibók, 2018). That is, project engineering is becoming an important element of the sustainability system at the meso-level of the economy.

Nevertheless, when implementing engineering projects, it is important to take into account the most significant problems faced by most of the subjects of the meso-level of the national economy of Russia at present, which are presented in detail in Table 3, with a decomposition by the main types of subjects of the meso-level of the national economy. Summarizing these problems (Ushakov, 2017), we propose to single out the following sources or environments:

- 1) social environment - availability of specialists with the necessary or advanced qualifications, general level of education, opportunities for social protection, industrial culture, migration attractiveness of working conditions;
- 2) technological environment - the current level of technological development, the share of raw materials production and high-tech products in the portfolio of a meso-level entity, technological readiness for project engineering, the depth of technological chains;
- 3) information and communication environment - channels of communication, monitoring, notification, accumulation, storage, transmission and utilization of information on the technological development of a meso-level entity;

Table 1: Enlarged groups of problems of subjects of the meso-level of the national economy

Professional association	Lack of resources to protect the interests of workers Different income levels of participants Availability of participants with different skill levels	Replacing manual labor in the profession Change in technological requirements for the results of work in the profession	Incomplete communication coverage of potential participants Lack of feedback between the meso-subject and the participants Significant differences in the conditions and opportunities for obtaining information from the participants of the subject	Removal of participants due to harmful production conditions Additional efforts to restore workers' health The possibility of losing a job in a specific profession due to the abolition of the type of activity	Lack of recognized governing bodies Insufficient representation of participants in management bodies Decision-making inertia
Cluster	Shortage of personnel in a specific technology area Disproportions in the level of wages depending on the type of activity Gaps in social opportunity and needs	Differences in mating quality requirements between suppliers and customers within a cluster. Lack of coordination in the implementation of engineering projects between different participants. Different intensities of updating intermediate technologies	Deficit of non-economic communications between participants Information competition at intermediate levels of the chain Lack of a single center for storing technological information	Disposal of an intermediate link in the technological process due to environmental requirements Lack of resources of the hub company to finance supplier activities due to environmental penalties	Incompatibility of the stages of the production cycle at which the participants that form the core are located. Lack of coordination in decision making. Lack of a transparent mechanism for the distribution of added value
Corporation	The need for highly qualified specialists Disparities in the quality of life between production blocks Growth of cross-cultural differences, barriers between people of different nationalities	Disproportions in creating value added between businesses Lack of resources for technical re-equipment of production in various businesses	Various security standards in communications Low intensity of horizontal communication between participants Concentration of information	The need to cover environmental damage in one business at the expense of the resources of other businesses Image damage to the subject as a result of specific environmental events in the participants	Different management models in businesses Imbalance in ownership structure Excessive centralization of management

Industry	Lack of specialists for the production of promising products Pay gap compared to other activities Low attractiveness in the labor market Difficulties of intra-industry migration	Imbalance in resource provision of production Lack of sufficient amount of available equipment for general rearmament Lagging Product Quality Control Capabilities	Conflict between competition and development agendas Availability of information insiders Different communication standards for different participants The threat of substitutes	General level of environmental impact Industry-specific environmental requirements Human impact of production conditions	High distribution of participants Lack of real instruments for aligning interests Lack of professional consolidation
Region	Quality of training Social protection of employees Infrastructure support Cultural differences	Technological imbalances in various activities Different technology update rates	Multicomponent information environment Conflict of interests of various participants in the accumulation of information Communication gaps between different stakeholder groups	The presence of foci of environmental hazards affecting all participants in the subject. Problems of rational use of jointly consumed natural resources Inaccuracies in assigning specific resources to the participants of the subject	Low resource availability Dependence on a specific type of activity Fragmented organizational model
Problematic environment	Social	Technological	Information and communication	Environmental	Organizational

Source: compiled by the authors.

4) ecological environment - the quality, depth and volume of waste processing, the presence of emissions and other man-made impacts on the environment, the presence of production facilities harmful to humans, the intensity of consumption of natural resources;

5) organizational environment - a system of distribution of responsibility and delegation of powers, regulatory support of activities, administrative procedures, legal framework.

Solving problems in these areas, as a rule, comes down to changing the structure of resource support for activities. In most cases, a change in the technological and organizational model is required, including through the development of the technological base, the introduction of new ways of organizing interaction between the participants of the meso-level subject. Then technological development is considered as a control object of the appropriate level, for the impact on which appropriate resources and qualifications of participants in the control system are required.

Taking into account the listed problems, it can be concluded that an increase in the intensity of technological development of mesolevel subjects should take into account the gaps between the current and required state of the meso-level subject (Goel and Karri, 2020). In this situation, engineering projects are only one of the possible directions for solving large groups of problems and increasing the intensity of technological development in regions, industries, corporations, clusters and professional associations.

In this situation, there is a slowdown in the intensity of innovative renewal of product portfolios in the types of economic activities that have the greatest innovation potential. In particular, as can be seen from Table 4, in the field of industrial production there was a certain decline in terms of the volume of innovative goods, works, services in the total output per ruble of expenditures on technological innovations. At the same time, such an increase has been observed in the field of telecommunications and computer software development over the past several years.

Table 2: Volume of innovative goods, works, services in the total volume of output by type of economic activity, million rubles.

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Industrial production									
in current prices, billion rubles.	877,68	1 165,75	1 847,37	2 509,60	3 072,53	3 037,41	3 258,25	3 723,69	3 403,06
per ruble cost of technological innovation, rub.	2,4	3,3	3,9	4,3	4,1	4,0	4,4	4,8	4,0
Activities in the field of telecommunications; development of computer software, consulting services in this area and other related services; information technology activities									
in current prices, billion rubles.	46,85	62,64	74,44	56,09	71,09	62,93	86,05	80,96	111,25
per ruble cost of technological innovation, rub.	1,4	1,6	0,5	0,7	1,1	1,3	1,3	1,5	2,0

Source: Indicators, 2019.

From Table 4, it can be concluded that the total volume of production of innovative products in industrial production increased over the period from 2009 to 2017 3,9 times, and the specific volume – 1,67 times. In the fields of telecommunications; development of computer software, consulting services in this area and other related services; activities in the field of information technology, these indicators were 2,4 and 1,43, respectively¹. (Calculated by the authors based on the data in the table 4.)

To analyze the use of the potential for intensifying the technological development of meso-level entities, it is advisable to consider the indicators of sales of innovative products in the domestic and foreign markets (Figure 4). As can be seen from the figure, for the period 2015-2017. the share is decreasing not only in the external, but also in the domestic markets, which indicates a slowdown in the intensity of technological development in most areas of economic activity.

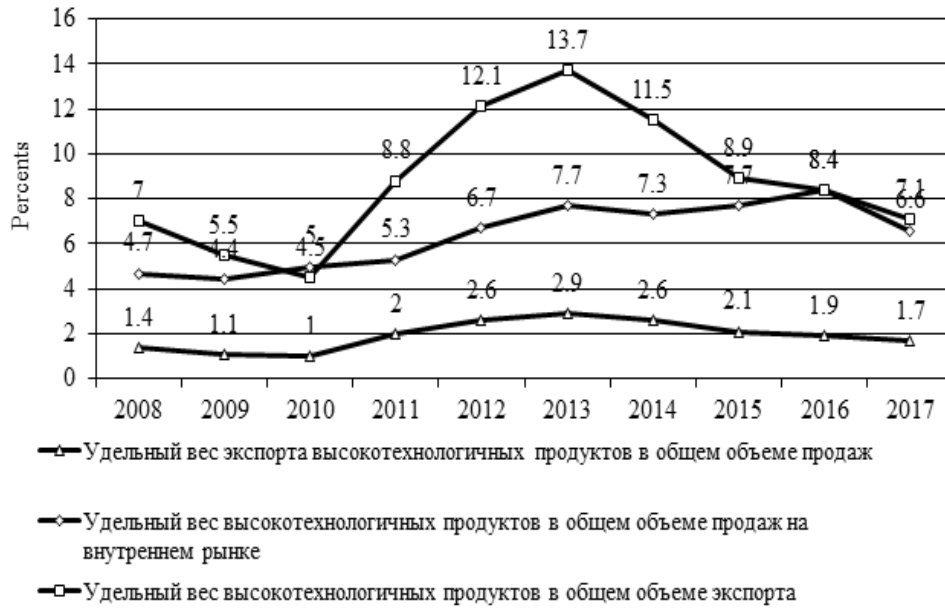


Fig.1: The share of high-tech products in volume in the domestic and foreign markets

* Удельный вес экспорта высокотехнологичных продуктов в общем объеме продаж- Specific gravity of export of high-tech products in total sales

Удельный вес высокотехнологичных продуктов в общем объеме продаж на внутреннем рынке- Specific gravity of high-tech products in total sales in the domestic market

Удельный вес высокотехнологичных продуктов в общем объеме экспорта- Specific gravity of high-tech products in total exports

Source: Indicators, 2019.

DISCUSSION

Speaking about the most important or typical results of engineering projects for technological development, it is necessary to highlight the priorities for increasing the intensity of economic activity on the scale of meso-level entities (Lintelo et al., 2020). The basic priorities, in our opinion, are:

- decrease in the predominance of the raw materials component in the final product of the meso-level entities, including by increasing the share of production and intellectual components;
- anticipatory reduction of the incompatibility of the basic levels of technological development, which are the participants of the meso-level entities that form the production core;
- elimination of problems of integration into technological chains of auxiliary and service services, ensuring the intensification of technological development due to local technological re-equipment of individual business operations and reducing the risks of implementing engineering projects by removing risks from large economic entities;
- delegation of the functions of technological development to the level of individual participants with the approval of a unified methodology for the selection of engineering projects to intensify the technological development of the meso-level entity as a whole;
- redistribution of technological and investment powers in accordance with the scale of responsibility for the implementation of engineering projects and technological development;
- shifting the development priorities of meso-level entities from purely financial results to economic, environmental and social consequences of decisions;
- alignment of interests of various categories of participants in the management system of the subject of the meso-level of the national economy.

As an additional direction, providing an indirect effect of project engineering, one can point to an increase in competitiveness in foreign and domestic markets by increasing the intensity of promotion, increasing advertising budgets and relations with society (Digehsara et al., 2018). The source of funding for these actions will be the

savings in production costs as a result of technological development. That is, the intensification of the technological development of the meso-level subject allows us to expand the range of market problems (Figure 5).

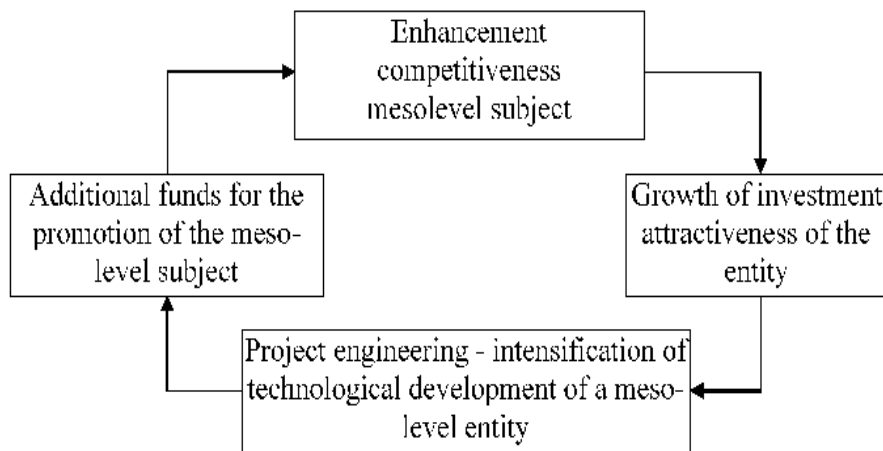


Fig.2: The cycle of unifying the development problems of the meso-level subject

Source: developed by the authors.

It is obvious that the entire complex of tasks to intensify the technological development of a meso-level subject cannot be solved at once. Therefore, consistent and coordinated work of all interested parties is required (Ofori-Sasu et al., 2019). For example, at the level of a meso-level subject, it is advisable to create additional conditions for the implementation of engineering projects through the use of available incentives, including the provision of resources, reducing the size of encumbrances, priority training of personnel. Therefore, as mentioned earlier, in the process of solving development problems, the development of a mechanism for consolidated management of project engineering begins to play an important role.

CONCLUSION

As a result of the analysis of the priority directions of intensifying the technological development of meso-level subjects in the context of tightening requirements for environmental, social and economic improvement of economic activity, in our opinion, from a scientific point of view, it is advisable to focus on the following important issues requiring scientific substantiation:

- development of a mechanism for the consolidated management of project engineering in the process of technological development of the subject of the meso-level of the national economy;
- formation and updating of indicators for assessing the quality of project engineering as a subsystem of technological development of the subject of the meso-level of the national economy;
- creation of a modern methodology for selecting engineering projects to intensify the technological development of a meso-level entity.

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