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Methods of Organizing the Regulatory Framework of National Strategic Planning in Russia

Y Mishin[1]

[1]Department of Mathematical Methods in Economics and Management, State University of Management, Ryazanskiy prospect, 99. Moscow, 109542, Russian Federation

E-mail: myv1@rambler.ru

Abstract. This article is dedicated to a study of organizational and methodological issues of developing a progressive database to improve the degree of substantiation of predictive and planning analytical calculations for strategic planning documents. The article provides an analysis of methodological documents on strategic planning in Russia and of methodological approaches to setting the rate of consumption of material and labor resources, as well as of capital expenditures in the USSR.

1. Introduction

Currently, strategic planning is one of the most important instruments of ensuring sustainable development and improving competitiveness of the Russian national economy. It is the primary function of public activity management consisting in the development of various variants of managerial decisions in the form of forecasts, projects of programs and plans, mechanisms of their substantiation, as well as in ensuring the possibility of implementing decisions and verifying their implementation. Planning helps to determine top priority areas, distribute and ensure efficient use of the available labor, material, and, most importantly, financial resources.

According to the best practices of the market economy, along with market mechanisms, in many countries there is a system of state regulation of economy, including centralized forecasting, planning and programming of social and economic processes. It ought to be mentioned that the state's regulatory function is in principle based on a system of planned market mechanisms.

Nowadays, strategic planning in Russia features a range of significant drawbacks, the worst of which, in our opinion, are disconnectedness of strategic document development processes performed by different agencies and mismatch of the most important goals and parameters of sectoral strategies and regional strategies, as well as of federal strategies and strategies of subjects; this inevitably results in low effectiveness of these programs. As a result, sectoral strategies do not always match development strategies, and federal strategies do not set input (endogenous) parameters for regional development strategies, whereas the latter, in their turn, do not correct federal strategies and strategies of the cities within the respective subjects. These mismatches are systemic [1-8].

2. Literature review

Russia has an enormous potential of methodological and instructional guidelines in the sphere of national strategic planning and generation of long-term state economy development plans, as well as the unique experience of implementing these guidelines by the Supreme Soviet of the National Economy and the State Planning Committee of the USSR.

The founders of theoretical and methodological foundations of the Russian national strategic planning are N.D. Kondratiev, W.W. Leontief, and L.V. Kantorovich.

In our opinion, it was Russian scientist N.D. Kondratiev [9] who made the largest contribution to the development of theoretical and methodological foundations of national strategic planning; he formulated the main organizational and economic factors of organizing efficient predictive and planning activity. It ought to be mentioned that Kondratiev waves play a large role in forecasting, as they help to justifiably determine the balance-ensuring proportions of the socioeconomic system, forecast changes in this system in the framework of various cycles, and enable identifying the self-development logic. He also formulated criteria for selecting the main predictive indicators (sufficient completeness, limited amount, maximum possible confidence, etc.), developed a system of resource balances (labor balance, material balance, and fixed assets balance) with three primary scenarios: basic (no change), optimistic (innovative/breakthrough), or pessimistic.

In his turn, W.W. Leontief [10, 11] developed an input-output tabulation method in the middle of the 1920s. In 1973, he was awarded the Nobel Prize in Economics for the development and use of this method to resolve major problems. This model is based on the original assumption that general macroeconomic balance may be achieved by means of structural interconnectedness of all stages of the process flow - production, distribution (exchange), and ultimate consumption.

Leonid Kantorovich was a Russian scientist and a prominent founder of mathematical instruments of strategic planning; he developed the linear programming method. He virtually proposed an approach to select the optimal solution based on successive approximation and enumeration of variants to select the best one according to the set optimization criterion - a mathematical form as an objective function, the extreme value whereof (the highest or the lowest) characterizes the achievable effectiveness of a plan [12, 13].

Accumulation and summation of experience of mathematical modeling in economics to resolve various planning economic problems helped research fellows of the Central Economic Mathematical Institute headed by its director - Academician N.P. Fedorenko - to formulate economic foundations and outline ways of step-by-step implementation of the optimal economic performance system (OEPS) [14-18].

The main method of generating advanced planning documents on various tiers of national economy management is the balance method that helps to develop plans as a balance accounting both resource supplies and the need therein. As manufacturing requires certain ratios of resources and capital expenditures, both the amounts of material (raw materials, materials, fuel, power, etc.), manufacturing (current productive capacity and capacity addition plans) and labor resources, and the program of finished product output according to the nomenclature and the range must be matching and balanced.

Industrial-engineering cooperation between enterprises of respective ministries and agencies is an intersectoral labor division instrument. That is why intersectoral ratio planning is based on production and product distribution by ministries and agencies.

The resource consumption rate system (including the coefficients of direct costs of material resources, capital, and labor intensity) ensuring matching of the main economic development indicators is used as a database used to develop the intersectoral balance of production and product distribution.

Coefficients of direct costs are sector-average rates of consumption of material resources to produce one or another principal type of products. Labor intensity coefficients are used to determine the demand for labor resources and full labor input. They are needed to determine the necessary amount of required capital expenditures.

3. Research questions

The goal of the article is to substantiate methodological approaches to developing a regulatory framework for managing intersectoral balances of the core economic activities and institutional sectors of economy according to requirements of the "Procedure to develop, correct, monitor and control of implementation of the socioeconomic development forecast for Russia in the medium term" approved by Order No. 1234 of the Government of the Russian Federation dated November 14, 2015.

Methodological issues of setting the standards and rates of resource consumption used for substantiating the amount of financial resources, and for calculating cost-effectiveness of the main measures provided by federal and regional programs, and by socioeconomic development strategies play an important role in resolving this problem.

4. Methods

See Appendix 1 for the comparative evaluation of methods of calculating individual standards of consumption of material and labor resources, as well as of specific capital expenditures.

All the methods provided therein may be divided into five main groups for convenience:

1) direct counting methods; they consist in itemized calculations using the database of design and engineering, technological, and other documents. These methods include the computational and analytical method, as well as a work flow modeling method based on standardization of a typical technological process.

2) economic and mathematical models - simplex method of linear programming;

3) statistical methods - graphical analysis method, experimental method, statistical reporting method;

4) methods of defining standards of resource consumption based on the data for identical (similar) products - reference method, analog method;

5) expert evaluation methods - professional and logical method.

Direct counting methods help to determine standards of consumption sufficiently accurately, as they combine technical-economic calculations with a profound analysis of technologies, conditions of production engineering on the technical level, product quality, and development measures in a rational way.

When a work flow modeling method based on standardization of typical technological processes is used, rates of technological labor intensity are developed by differentiating the calculations to direct operational standardization of a typical technological process in the most rational conditions of production and labor management. It ought to be mentioned that the standard technological

labor intensity is based on its rigid deterministic dependence on he technical and technological factors of the typical technological process.

This method is methodologically based on the unambiguous definition and regulation of the main organizational and technical elements determining the standard technological labor intensity: typical technological process, equipment and production tooling, progressive technical-economic indicators, advanced labor management, and evidence-based time limits.

The main sources of input information are as follows: working drawings, design specifications, bills of materials, manufacturing instructions, stoichiometric equations of chemical reactions, process flow charts, cutting charts, processing approval charts, etc.

The advantage of this approach over other methods, particularly, over statistical methods, consists primarily in the possibility of a more complete accounting of impact of all the factors affecting technological labor intensity of output products, and of precise identification of labor input losses (saving potential).However, this advantage also creates the primary drawback of this method - the need in a typical technological process of manufacturing products in a given sector of economy. A typical technological process is a process for manufacturing products of each classification group in the context of simultaneous resolution of the whole set of technological objectives designed to optimally fit specific manufacturing conditions. It is designed on the basis of the approved manufacturing instructions, rational sequence of transitions and operations, optimal processing modes, use of progressive production tooling, etc. However, this method may be efficiently used only in the sectors characterized by large-scale and mass automobile production, agricultural machinery and tractor building, electrical engineering industry, because only these sectors features progressive technological processes, and specialized technological equipment, such as production lines, etc.

The scope of use of the second group of methods - optimization methods - includes blank production and supporting shops of industrial enterprises. They consist in determining the standards of consumption of material resources per unit of production to minimize costs and losses by means of the calculations of different variants of components (charge makeup at foundries, arrangement of blanks on the parent sheet, et.). The problem of identifying the optimal (from the point of view of minimization of losses and waste) standard of consumption of material resources is resolved by setting optimality criteria and a system of limitations for each specific case. The sources of input information are as follows: detail drawings, forging (stamping) drawings, cutting charts, allowances, stamp's technical data sheet, actual consumption data, operational losses, etc.

The third group of methods are as follows: graphical analysis method, experimental method, statistical reporting method; the development of standards using these methods must be based on the mathematical statistics machinery.

Graphical analysis is conducted to identify whether there is a link between the consumption of material and labor resources, and the selected deisng-manufacturing parameters of products. To do that, resource consumption rate curves (parallel rows) are plotted on the basis of this parameter's change. This method helps to determine the correlation between these parameters and the resulting value - specific resource consumption. Furthermore, plotting of these curves is also required to determine the type of dependence (linear, nonlinear) for further use in the process of a correlation analysis.

The essence of statistical reporting methods consists in the statistic determination of the relationship of the standard resource consumption value and qualitative values of its predetermining factors. The main specific peculiarity of this methodological approach consists in a presumption of a probabilistic (stochastic) link between the standard value and factors of production.

The statistical reporting method (correlation/regression analysis) helps to identify the main reasons (significant factors) that to a considerable degree determine the possibility of reducing the specific consumption, and allow planning its reduction by means of developing and implementing technical and organization measures to reduce this factorial feature.

At the same time, the main condition for efficient use of these methods is a sufficiently large (representative) amount of input information on the actual consumption of material and labor resources about a large number of enterprises.

A typical product or a range of parameters similar in terms of functional use, functional parameters or manufacturing technology is required to determine resource standards using methods of the fourth group - the reference method, the analog method, or the project method.It ought to be mentioned that the product (project) chosen as a typical representative must feature most design and technological properties specific to the relevant group of products. The primary "principles of selection" of an analog product are succession in design and technology, as well as production development prospects.

The main disadvantage of this group of methods is the absence of formalized procedures to determine and select analog products. The methodological provision that the assumption of possibility to identify identical and analogous products featuring exactly the same technical and technical-economic specifications is a presumption to choose a standard product - a reference benchmark of a kind - is obviously insufficient and useless (reference method). This statement also entails that a typical representative must feature all (or the overwhelming majority) design and technological properties specific to the relevant group of products. The primary selection criteria are as follows: succession in design and technology, as well as evaluation of production development prospects (analog method).

The fifth group includes the methods employing collective expert evaluation (committee method, brainstorming method, Delphi method, etc.) for professional and logical analysis to select the most significant technical-economic parameters accounting for resource consumption during production. Experts (product engineers, technologists, designers, product standardization specialists) choose product parameters on the basis of their professional knowledge and experience according to the aforementioned requirements.

The choice of a method to determine resource consumption standards and rates on different production stages depends on the amount and quality of the product information available to manufacturers and developers.

The combined approach appears the most effective in the given circumstances; it is a way of developing consumption standards simultaneously using two or three of the aforementioned methods, for instance, a combination of the computational and analytical method and the experimental method. Combined use of statistical and expert evaluation methods ensures better substantiation of standards and rates under the uncertainty characteristic of the market mode of economy.

Furthermore, use of the mathematical apparatus for processing statistical and expert information and intellectual systems of analytical data processing will help to put together a powerful instrument set for developing and updating the national strategic planning database of the Russian Federation.

To determine individual standards of industrial consumption of material resources, rather broad input information is required; it ought to include design-engineering documents (working drawings, design specifications, bills of materials, manufacturing instructions), measurement results of consumption of material resources and of the total output, as well as statistical and accounting statements.

Currently, the actual consumption of material resources per unit of production is not reported in Russia. Enterprises quarterly submit to a tax office and the superior body only 2 documents: balance sheet (form No. 1) and income statement (form No. 2). Annual accounting statements include a few more forms, and also contain statements of changes in equity, cash flow statements and statements on the proper use of funds received. That is why we believe that the primary reason of poor strategic planning in Russia is insufficient information support. As a result, the level of confidence (accuracy) of indicators of the federal targeted programs is rather low; this results in significant overestimation of potential deadlines and underestimation of the required federal funds.

5. Generalization and applying

Organization of the regulatory framework of strategic planing is a rather complex, time-consuming and expensive process. To design such a framework only for the primary level of the economic system - for enterprises and organizations, methodology instructions, techniques, instructions, regulations, reference books, classifiers, technical specifications and standards must be developed, as well as the required information support and scientific software.

At the same time, the key problem consists in the immense nomenclature of the materials used in industrial and construction settings, as well as of the output products. That is why the nomenclature of products and materials in the framework of the regulatory framework to organize manufacturing of complex unique products (projects) may amount to about 50-100 thousand items (brands, classes, gauges, etc.). As a result, in order to solve strategic planning problems, there is a need in developing an automated information system for generating enlarged group standards of consumption of material and labor resources, as well as rates of specific capital expenditures.

This system must be a hierarchal one, as the systems of standards and rates used in construction and industry feature multiple levels (construction employs a four-level system of standards and rates, including operating standards and prices, itemized estimate norms and single prices, enlarged estimate norms and prices, aggregated indicators of price and need in resources, whereas all industrial enterprises and organizations employ a six-level standardization system: process operation, part, assembly unit, product (kind of product) and type of work).

An automated system for generating enlarged resource consumption standards and rates must conform to the requirements below. First of all, it must ensure processing of a broad nomenclature of material resources (about 100 thousand items).Secondly, it must aggregate (summarize) information on the primary level (level of enterprises: data aggregation by subsidiaries and daughter companies) and the corporate structure level (integration of the data pertaining to subordinate enterprises and organizations by types of economic activity and institutional sectors of economy). Thirdly, it must ensure access to the resource regulatory framework both in kind and in value terms.

6. Conclusion

Comparative analysis of methodological approaches to calculation of individual consumption standards and requirements to generation of enlarged standards and rates proposed in this article may serve as a basis for development of a multilevel database of the national strategic planning system in Russia.

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Appendix

Table A1. Comparative evaluation of methods of calculating standards of consumption of material and labor resources, as well as of capital expenditures.

Method 1.	**Methodological approach** 2.	**Input information** 3.	**Scope of use** 4.
Computational and analytical	Technical-economic itemized forward calculations	Working drawings, design specifications, bills of materials, manufacturing instructions, etc.	Standardization of consumption of the primary materials
Experimental	Actual resource consumption measurements in experimental production (experimental laboratory) conditions, processing of obtained results	Measurement results for consumption of material resources and the total output	Standardization of consumption of auxiliary materials
Statistical reporting	1. Selection of the most significant structural and technological parameters of products affecting consumption of material resources and labor intensity of production the most. 2. Identification of cause-and-effect relations between the selected factorial features and consumption of material resources and labor intensity of production, selection of the most significant relations 3. Selection of a type of features and relations between indicators (regression equation) 4. Determination of parameters of regression equations and indicators	Statistical and accounting statements on the actual consumption of material resources per unit of production (specific consumption)	Standardization of consumption of material resources and the standard technological labor intensity

	of strength of relationships between them. 5. Calculation of sampling errors, confidence evaluation of the regression and correlation values obtained using sample data.		
Optimization	Formulation of the optimal charge makeup and cutting of strip and profile rolled steel with minimum expenses and waste on the basis of the simplex method of linear programming	Detail drawings, forging (stamping) drawings, cutting charts, allowances, stamp's technical data sheet, actual consumption data, operational losses	Blank production shops and plants (foundries, forging shops, cutting shops, extrusion shops, stamping shops, welding shops, etc.)
Reference (analog)	An analog (representative product) or a range of parameters similar in terms of functional use, design parameters or manufacturing technology	Technical specifications, technical product descriptions, data sheets, specification sheets, design, technological, and planned economic documents.	To determine the limit of labor intensity of the new products that have analog products.
1.	2.	3.	4.
Professional and logical analysis	Expert selection of the parameters best characterizing intended use and consumer properties of products and considerably affecting specific consumption of material resources for the production	Expert opinion on the technical specifications of machines and mechanisms affecting indicators of specific consumption of material resources the most.	For further use for graphical and correlation analysis
Graphical analysis	1. Arrangement of all factorial features and the actual (resulting) specific consumption of material resources in the descending/ascending order. 2. Determination of average values of the factorial feature and the effective feature 3. Determination of the larger value out of factorial and effective features and their respective arithmetic means 4. Calculation of the Fechner coefficient	Data on the actual specific consumption of material resources and the actual direct labor input to manufacture products, as well as enlarged technical construction specifications and parameters thereof	Determination of strength of relationship between the factoral feature and the effective feature

Labor process modeling on the basis of standardization of the typical technological process	Standard (typical) production process involving development of the production technology best suited to specific manufacturing conditions	1. Approved regulations, consumption rates for raw materials 2. Rational sequence of transitions and operations, optimal processing modes 3. Progressive production tooling 4. Type and technical specifications of the primary equipment	Calculation of the standard technological labor intensity
Representative objects	Information on the most representative (typical), inexpensive, and optimal productive capacity for each sector (subsector) of projects	Amount of capital expenditures on the most cost-efficient projects of enterprises and objects in each sector (subsector), optimal productive capacity	Enterprises and objects of the optimal capacity of typical plants, subsectors and sectors
Expert evaluation	1. Intuitive and logical analysis of dependence of labor intensity of production on the product's technical specifications. 2. Appraisal of this dependence on the quantitative and qualitative levels. 3. Integration and processing of the obtained data.	Expert opinion on the technical specifications of machines and mechanisms affecting labor intensity of production.	To determine the limit of labor intensity of conceptually new and extremely complex products that do not have analog products.