The Model of Management of the Timber Industry Complex in the Conditions of Sustainable Development

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Abstract. Timber industry complex is one of those industries where in domestic practice there is a powerful reserve of growth. Moreover, its source can and should be the resource potential. The latter should be understood not only as wood resources, but also the whole complex of resources interrelated with the main and auxiliary resources processes. It makes sense that to increase the efficiency of industry, we need to identify both key (labor, financial, raw) and minor (land, information). Managing the whole complex of resources and attracting their new types and combinations with increasing quality is the most important task on the way to increase the efficiency of the processes in the timber industry enterprise. At the same time, the process of processing wood resources is recognized as determinant one in profits generation. The article presents the results of developing a model for managing a timber industry complex in the context of sustainable development.

1. Introduction
Russia, having a powerful forest resource base, is inferior to a significant part of the states in the efficiency of its utilization, which is caused by a totality of problems: organizational, economic, technological and psychological [1, 2]. To change the situation, the structural changes regarding approaches to the principles of development, enterprise management systems, state regulation of the industry, technical upgrading, transformation of the mental characteristics of business management, etc. are needed [3]. It is the radical reconstruction of many aspects in the industry that will allow transition from the economic mechanism of functioning (in a point of fact – survival) to the mechanism of development (expanding the range and markets, attracting population and key partners to planning activities, releasing innovative products and participating in researches, etc.) of timber industry complex [4-6].

2. Material and methods
The object of the research is the timber industry complex of Russia: aggregate indicators and information on the functioning of more than 50 different enterprises. The main methods used were analysis, statistical and mathematical planning, modeling, standard methods of conducting experiments and assessing the quality characteristics of wood processing products, forecasting, etc., which may be used in other developments.

3. Results
Traditional models are built on a plane and therefore it is difficult for them to implement the view of the internal mechanisms, processes, interactions of individual model objects [7]. To solve the problem
of transformation of management models in the industry, a number of actions can be performed [8]. Thus, changing the schematic view of management models can be the first step in this direction. Fig. 1 shows the upper level of the three-dimensional model of timber industry complex management.

**Figure 1.** Model of timber industry complex management.

In this case, the first (theoretical) level of the model includes key components: subjects (government and non-government agencies) and objects of management (a complex of timber industry enterprises), as well as an integral effect [9-11]. The latter, as can be seen, consists not only in generating traditional profits, but also in assignments to the budgets of various levels, and in the growth of personal income. But this list can be continued: environmental benefits, population employment growth, infrastructure development in the regions, etc. At the same time, the presented feedback between the entities and objects of management ultimately allows to have a significant impact on the effects of the management actions [8].

Extremely important in this model are the points of "growth" and limitations. They form the key directions of development and impose restrictive effects on the activities of the forest business in various directions. Let's analyze the individual elements of this block [12-14].

1. The balance of interest of all factors and participants of the external and internal environment. In this case, an obvious condition for the development of the timber industry complex and its structural elements is the observance of the interests of a group of interested parties and consideration of the aggregate factors of the external and internal environment. In case of failure to observe this condition, excesses in development, mistakes in development strategies, problems with the observance of sustainability in the market and the accompanying totality of problems are possible.

2. Limitation of resources. Successful activity of the contemporary business in conditions of limited resources is the key to its economic efficiency. At the same time, their search in the ever-growing hauling distance of harvested timber, reduced production capacity in forestry engineering and the chemical industry, personnel shortages in the labor market and a number of other problems should be recognized as one of the key management problems. The solution may be the allocation of staff units in the logistics, personnel, scientific and technical, procurement units, the functionality of which would allow to solve such complex problems.

3. Cost optimization. An important trend in the development of the economy of organizations is to reduce costs both core and non-core. Search for alternative sources of resources, saving in transport, energy, personnel, management, etc. – there is a significant reserve of growth in the efficiency of the traditionally low-profit forest industry.

4. Resource efficiency. This premise is formed from the need to improve the overall efficiency of the timber industry enterprises. The fullest extraction of useful properties of resources is a requirement
of the contemporary market. So, it is necessary to single out the main raw material for the forest industry - the wood resource, the wastewood from one unit of which can be used as raw material for another one, etc. [9]. It is important to note that this unique feature of the forest industry makes it possible to achieve the stated goal of developing the industry at all levels of high-level processing.

5. Technological and informational content. These points of "growth" play a crucial role in the transition to the mechanism of development. This is due to their internal logic. The introduction of technological innovations can increase productivity, lead to the creation of new products for both a particular enterprise and the entire industry, finally, improve product quality and solve many related problems. The informational content should serve to support decision-making, search and conclusion of contracts with counterparties, support on all stages of production and the movement of resources in production, control over the timber industry complex on the part of the authorities (power) [15-17].

6. Mechanisms of development (in a general sense). These tools generalize the whole complex of organizational and economic measures that facilitate the transition from the mechanism of functioning to the mechanism of development as such. It is possible to give an example of management activity tools included in these mechanisms [10, 11]. It's important to stress that the presented classification is only one of many possible. Nevertheless, it is necessary to emphasize the distinction between internal and external tools and techniques, the uses of which by various management structures are typical, but allowing achieving a significant leap in the development.

7. Cooperation and consolidation of business structures. Consolidation of enterprises to solve complex problems is far from being a contemporary innovation. This has been done since the rise of economic thought. That is why no one is surprised by the current trend towards the formation of vertically and horizontally integrated structures in the timber industry complex. One of the most promising in this direction is the formation of timber industry clusters. The success of this form of consolidation, obtained, for example, in Finland can also be transposed onto the domestic reality.

However, the creation of such large structures, despite a significant number of studies in this area [12-14], requires considerable study. Some aspects of the creation of timber industry clusters will be discussed below.

8. Import substitution. A “fashionable” term of contemporaneity is nevertheless a characteristic of the real situation in which many domestic industries are operating. And the forest sphere is no exception. At the same time, the key problem for the timber industry complex is the difficulty of obtaining state-of-the-art technology, without which, under the conditions of the domestic timber industry destroyed in the 1990s, suggesting a qualitative technological breakthrough in most enterprises is at least difficult, if not seems to be even impossible. That is why there is an emergency search for ways to solve the acute problem of the lack of foreign equipment. Gradually, domestic engineering is becoming more intense, and measures to support it are being taken at the highest level. However, at this stage, this problem is not solved. Experts suggest one of the most realistic solution scenarios – the entry of forest machinery enterprises into large consolidations (clusters, financial groups engaged in the control and development of the timber industry).

The most important element of the second layer is the mathematical apparatus used to process data on the parameters of the system functioning, forecasting of development possibilities and other equally important tasks, the solution of which is impossible without proper data processing. An example thereof can be successfully tested [18] techniques:

1. Analysis of sensitivity (Fig. 2).

These tools have been successfully applied to assess changes in various factors as a result of changes in the forest tax.

2. Use of software for processing statistical data and presentation of results in models. For example, the use of statistical software Statistica 6.0 was carried out to analyze the dependence of the company’s profits on the volume of production of round timber and the price per 1 m³ thereof. For the calculated model, the following statistical characteristics were obtained: $R$ (Correlation coefficient) = 0.98523. Variance explained (the proportion of data variation reflected by the model) = 97.067%. The resulting model in the general case has the following view:
\[ Y = 2163114 - 21330.5 \cdot x_1 - 2285.82 \cdot x_2 + 43,89681 \cdot x_{12} + 0.566285 \cdot x_2 + 12,41309 \cdot x_1 \cdot x_2 \] (1)

Graphically, the model and the dependence are presented in Fig. 3.

**Figure 2.** Analysis of sensitivity of the tax burden in the timber industry.

**Figure 3.** Analysis of the dependence of the company's profits on the volume of production of round timber and prices per 1 m³ thereof.

3. Forecasting techniques. In particular, the results of forecasting economic indicators as a result of changes in the taxation system can be shown by using the Brown’s adaptive forecasting techniques [19-21].

The third layer of this model (Fig. 2) includes corrective actions that can be applied to the entire complex of objects present in layer 1. To have this level of the model, a unified database of tools, technical, organizational and economic decisions, access to which could be given to all interested participants, should be created within the timber industry complex. The availability of such information support would allow timely and, what is important, effectively make decisions on the strategic and operational development and management of timber industry complex.
The three layers shown are not a finite number. Ultimately, the management model of the timber industry complex should go to the form, similar to what is implemented in one of the economic tools of Microsoft Office products – Microsoft Project. The key difference of this product from others is that the user sees at a time only one of the many representations (layers) of a certain project.

4. Conclusion
It is extremely important to note that thanks to the management tools used, organizational structures and the formation of new products for account the high-level processing of wood resources, the timber industry cluster should move from the mechanisms functioning to the mechanisms of development. Enterprises should gradually move from maximizing profits as the main goal of their operation to maximal development of their structures, conquering new markets and developing modern products, which will allow achieving maximum social, ecological and economic efficiency.

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