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Model for the effective development of the timber industry complex of the Russian Federation based on business process analysis

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ABSTRACT

The modern timber industry complex of the Russian Federation is characterized by the complexity of the production process, which makes it difficult to apply the latest innovative solutions and prevents an increase in the level of competitiveness. The article presents the results of scientific research aimed at increasing the level of innovative development and the efficiency of the current activities of timber industry enterprises in the Russian Federation. The author's environmentally-oriented model is proposed, which takes into account the necessary components of timber production. In particular, the presented model analyzes environmental innovations, without which it is impossible to carry out innovative development at forestry enterprises. A process approach was used to assess the situation and find bottlenecks in the production chain. Business processes have been studied and the author's generalized model of the flow of business processes in the implementation of financial and economic activities of timber industry enterprises has been formed, which fully reflects the entire production chain of the timber industry in the Russian Federation. Based on this model, the author's system of evaluation criteria for ongoing business processes at forestry enterprises is proposed, which allows for a fairly clear assessment of the level of efficiency of business processes at forestry enterprises.

Keywords: Timber industry complex, innovative development, environmental innovation, business processes, analysis, assessment, production efficiency.

1. INTRODUCTION

One of the key tasks of the forestry complex of the Russian Federation is the need to apply rational approaches to the formation and optimal change of existing environmental protection areas operating at Russian forestry enterprises [1]. Today, the management of forestry enterprises is interested in creating, together with executive authorities, a favorable and environmentally friendly environment in the regions during the production of forest products.

In turn, executive authorities at the regional level are given the role of shaping the external conditions of an environmentally safe environment, providing the necessary assistance in developing optimal ways aimed at developing environmentally-oriented management [2,3].

The formation of an environmentally safe environment in the regions is influenced by various factors, these include an increase in greenhouse gas emissions caused by the concentration of timber industry enterprises and the territorial specifics of their location, the structure of the forestry complex of the Russian Federation, the specific features of the economic sectors included in the complex, the low level of development of transport and logistics infrastructure (roads, intermediate bases, warehouses), constantly changing natural and climatic conditions in a particular region.

In modern economic research, there are many approaches aimed at introducing «green» innovations [4].

In order to create a favorable and environmentally friendly environment for the regions in the production of timber products, a model is proposed that takes into account the specific features of the functioning of forestry enterprises, Figure 1. The model is built on the principle of hierarchy and has a distinctive appearance with interdependent elements: «Radical change» -

«Forecasting» - «Environmental analysis» - «Control» - «Implementation».

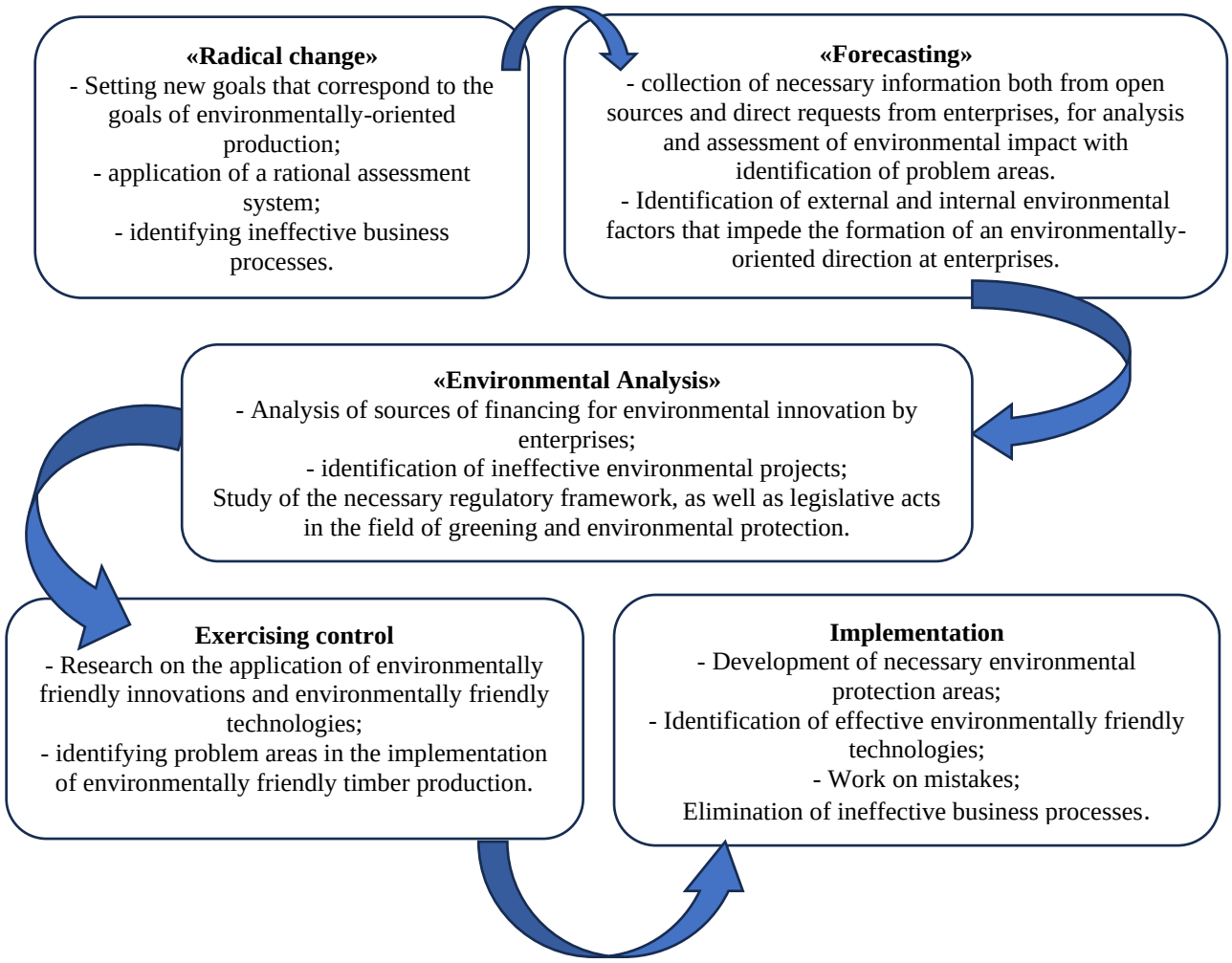

Fig 1: An environmentally-oriented model that takes into account the effective use of environmental innovations in the forestry sector

The presented model reflects the possibility of quickly responding to ongoing changes caused by a decrease in the efficiency of environmentally-oriented technologies used. The main element is business processes. The activities of any enterprise are influenced by various conditions and factors. Here, first of all, it is necessary to pay attention to business processes that are ineffective or have lost their characteristics.

2. MATERIAL AND RESEARCH METHODS

In order to competently manage and conduct the most effective activities using innovative environmentally-oriented technologies, in conjunction with the innovative infrastructure of forestry enterprises, it is necessary to apply the so-called process approach [5,6].

The methodology of the process approach predetermines the need for a comprehensive study and analysis of the entire chain of business processes [7]. Each forestry industry, both in the field of logging and woodworking, and in the field of pulp and paper and furniture industries, has its own specific characteristics. In the context of conducting a detailed and comprehensive study of the innovative infrastructure of forestry enterprises, a generalized model of the functioning of the chain of business processes of the forestry complex is proposed.

The formed business processes take into account the mechanism for managing and implementing the financial and economic activities of the analyzed

production enterprises. The generalized model is presented in Figure 2.

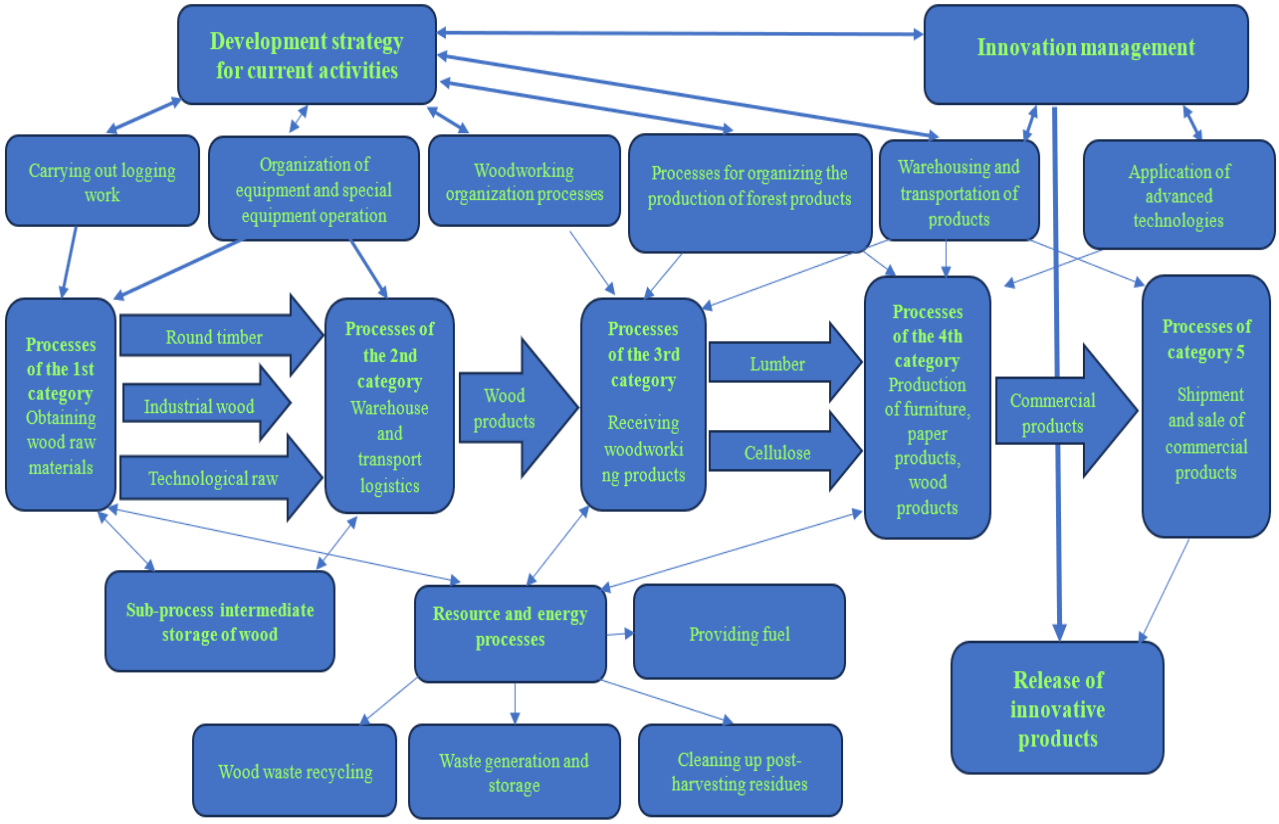

Fig 2: A generalized model of the flow of business processes during the implementation of financial and economic activities of forestry enterprises

3. RESEARCH RESULTS AND DISCUSSION

The proposed model in Figure 2 shows the flow of business processes throughout the entire forestry production chain. The model takes into account the development strategy of current activities in combination with the innovation component. In total, five main categories of processes have been formed that ensure the production of marketable products. Between the processes of the first and second categories, a sub-process of intermediate storage of wood has been formed, since upon receipt of wood raw materials, finished wood products can be stored at the cutting site, and during transfer to wood processing enterprises, in timber warehouses.

Business processes that directly ensure the functioning of the industrial production process are defined in a separate group «Resource and energy processes», where the direct provision of fuel, energy, and the disposal of wood waste and logging residues is carried out.

The application of any model in the activities of an enterprise at the initial stage requires competent assessment and detailed analysis with appropriate evaluation criteria.

Based on the proposed generalized model of the flow of business processes during the implementation of financial and economic activities of forestry enterprises, criteria for assessing the effectiveness of production business processes are proposed. The system of evaluation criteria for ongoing business processes includes five main groups of indicators. These groups are «Operational characteristics», «Organization», «Management leveling», «Versatility», «Variability». The calculation formulas for each group of indicators, the optimal values of the coefficients, with the determination of the optimal values for each industry group are presented in Table 1.

Table 1. System of evaluation criteria for ongoing business processes at forestry enterprises

Criteria for assessing the effectiveness of production business processes	Calculation procedure	Optimal coefficient values	Optimal values for industries
Operational characteristics	$E_h = \Sigma Rpbp / \Sigma Chsp - 1$, (1) Where: E_h – operational characteristics of business processes [8]; *Rpbp* – number of rows of business processes; *Chsp* – numerical composition of ongoing business processes.	$E_h > 0,53$	Logging (PAP): 0.53-0.65; Woodworking (DP): 0.56-0.67; PPM: 0.8-1.3; Furniture's (MP): 0.64-0.8.
Organization	$O_{org} = \Sigma Ch_{ne} / \Sigma Ch_{st} - 1$, (2) Where: O_{org} – organizational component of business processes; Ch_{ne} – the number of business processes that are ineffective and require radical changes; Ch_{st} – number of stages of business processes.	O_{org} = from 0.2 to 1	Logging (PAP): 0.4-0.6; Woodworking (DP): 0.7-0.9; PPM: 0.8-1.2; Furniture's (MP): 0.7-1.0.
Management leveling	$UP_N = K_{зн} * n / \Sigma Ч_{cm} - 1$, (3) Where: UP_N – controllability of the business process by responsible persons and the ability to synchronize with current conditions; K_{zn} – the number of areas of responsibility through which business processes pass [9]; n – the number of critical sections of business processes.	UP_N = 2,0<3,5	Logging (PAP): 1.5-1.7; Woodworking (DP): 1.63-1.85; PPM: 2.1-2.5; Furniture's (MP): 1.9-2.15.
Versatility	$UN_p = \Sigma K_{out} - \Sigma K_{in} / B$, (4) Where: UN_p – the possibility of business processes occurring when the production program plan changes; B – the number of used production resources passing through a specific business process (general flow and through a specific business process); K_{out} и K_{in} – the number of business processes at the output and input, respectively.	UN_p = *0,5-1,0*	Logging (PAP): 0.5-0.67; Woodworking (DP): 0.58-0.74; PPM: 0.79-1.0; Furniture's (MP): 0,71-0,83.
Variability	$I_{ism} = \Sigma K_{n\ external} * K_{n\ inner.} / \Sigma Ch_{st} - 1$, (5) Where: I_{ism} – the ability to change business processes without improving the entire system [10]; K_n – the number of obstacles caused by regulatory documentation (external and internal documentation) [11].	$I_{ism} > 1 < 2$	Logging (PAP): 1.0-1.25; Woodworking (DP): 1.1-1.47; PPM: 1.63-1.0; Furniture's (MP): 1.5-1.87.

This assessment system can be applied at enterprises of various forms of ownership and in different countries, adjusted for current conditions in a particular region.

Based on the developed model and criteria-based assessment system, a methodology for analyzing business processes is proposed, which takes into account the key conditions of structural and logical analysis with the possibility of designing and radically rethinking ongoing business processes. The study analyzed the business processes of enterprises included in the Russian timber industry complex. The results are presented in Table 2.

Table 2. Indicators included in the methodology for analyzing business processes of forestry enterprises

Indicator No.	Name of indicator	Value	Optimal values for the forestry complex (LC)	Optimal values for industries
1	R_{pbp} – number of rows of business processes	7	5	PAP: 3 DP: 5 PPM: 7 MP: 2
2	Ch_{sp} – numerical composition of ongoing business processes	16	10	ЛЗП: 7 DP: 15 PPM: 12 MP: 9
3	Ch_{ne} – the number of business processes that are ineffective and require radical changes	6	3	PAP: 1 DP: 2 PPM: 3 MP: 1
4	Ch_{st} – number of stages of business processes	12	10	PAP: 3 DP: 5 PPM: 10 MP: 8
5	K_{zn} - the number of areas of responsibility through which business processes pass	8	7	PAP: 3 DP: 5 PPM: 9 MP: 3
6	n – number of responsible areas of business processes	7	4	PAP: 2 DP: 4 PPM: 4 MP: 5
7	B – number of used production resources passing through a specific business process (total flow and through a specific business process)	13	11	PAP: 7 DP: 9 PPM: 11 MP: 11
8	K_{out} и K_{in} – the number of business processes at the output and input, respectively.	9 и 16	8 и 15	PAP: 2 и 4 DP: 5 и 12 PPM: 8 и 15 MP: 7 и 15
9	K_n – the number of obstacles caused by regulatory documentation (external and internal documentation).	4 (external), 7 (internal)	3 и 4	PAP: 0 DP: 1 PPM: 1 MP: 1

According to the data presented in Table 2, it can be noted that today business processes go through seven rows, the first row of business processes has a starting point from the development strategy of current activities with parallel management of innovation activities, the second row involves obtaining the necessary raw materials and materials for production of products, the next row directly involves the production of timber products, the fourth and fifth rows are associated with warehousing, movement and delivery of finished products to consumers, the next row of business processes is separate and focused on the production of innovative products, the final seventh row is resource and energy processes, related to the generation and disposal of waste. For timber industry enterprises, it would be most optimal to operate in five rows. Thus, the release of innovative products should be carried out directly with the release of main products. At the same time, it is also recommended to combine transport and logistics rows (fourth and fifth) to minimize costs and eliminate bottlenecks.

4. CONCLUSION

As with any production, there are ineffective ones in the chain of business processes; in total, six processes have been identified in the general structure of forestry production that directly or indirectly affect the quality of innovative products. In the production of forest products, in our opinion, it is possible to reduce ineffective business processes with reengineering or their improvement to three units.

At the same time, up to thirteen production resources pass through one production business process, in some places they are duplicated, and some resources repeatedly pass through one business process. Thus, it is recommended that forestry enterprises rethink the entire production chain to improve production efficiency, interaction between forest industry participants and increase production innovation.

5. ACKNOWLEDGMENTS

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