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The Methodology of Modernization Processes Management in Innovation Networks

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Abstract. An approach to managing modernization in the framework of an innovation networks was developed, based on the fact that the formation of priority directions for modernization was proposed to be implemented taking into account the potential for modernization of the enterprise and its subdivisions. An algorithm is developed for analyzing the sufficiency of the potential for modernizing production systems. The rating of the enterprises included in the business group was carried out to determine the most investment-attractive objects among them on the basis of the calculation of the complex index of the modernization potential, taking into account the organizational and managerial and personnel components of the modernization potential.

1. Introduction

The problem of the modernization processes management is universally recognized [1-6]. The necessity for a system and complex modernization of the Russian economy has been identified at the state level within the priority areas of development by the Council for the Modernization and Innovative Development.

2. Relevance

One of the priority directions is the development of the machine-building industry, which at present stage is experiencing a number of interrelated problems, as evidenced by the state statistics data [7-11]. It is evident that these problems need a phased solution through the cascading accumulation of necessary resources and potential. This, in its turn, determines the relevance of supplementing and adjusting the methodological base and applied management tools on this issue.

3. Statement of the problem

The work is based on the assumption of the existence of a relationship between the modernization efficiency of enterprises and their readiness for its implementation, which is described by a certain set of criteria that reflect some compromise state of economic, technical and social subsystems [12, 13].

The problem area considered in the article describes the following aspects:

- economic uncertainty;
- high intensity of technological changes;
- limited financial resources;
- lack of effective modernization management tools;



- the existence of choosing alternatives problem when financing modernization projects.

4. Theoretical part

Analysis of existing approaches has shown that the theoretical basis for solving the presented problems should include the provisions of the theory of investment analysis, decision theory, the theory of operations research, the theory of econometric modeling.

The characteristic features of modernization at macro, meso- and micro levels, which should be taken into account in the development of the toolkit are the necessity, priority, continuity, consistency, purposefulness, systemic, integrity, benchmark. It is expedient to consider modernization processes on base of integrated business groups and innovation networks, as they have the possibility of accumulating excess resource, which can be directed to modernization [14].

It is developed the approach to the enterprises modernization management and resources distribution (within the integrated business group or innovation network), based on consideration of two possible invariants of readiness or unavailability of structural subsystems to modernization projects realization. In order to formalize this readiness, the term "enterprise modernization potential" is introduced in the work, which is described by a specific set of criteria within a certain range of values.

In the author's interpretation, "the enterprise modernization potential" is understood as a set of factors characterizing the level of enterprise readiness for the implementation of certain types of modernization projects.

The systemology of this approach is based on the following elements:

- presence of purpose (modernization);
- allocation of local enterprises in the structure of innovation networks;
- allocation of homogeneous groups of modernization projects;
- identification of significant modernization factors;
- selection of indicators describing the identified factors;
- setting priorities (allocation of financial resources);
- non-additivity and emergence of the system.

The successive stages of the proposed approach are the following. At the initial stage, enterprises that are members of the business group or innovation network are developing plans for modernization projects, based on the initial data on external factors, objects and business processes that require improvement or a major upgrade, the reasons for modernization. Further, the analytical services, on which the consideration of the feasibility and appropriateness of financing each of the submitted projects depends, analyzes their properties, relationships, and structures on groups of homogeneous projects. As a result, a database is being created that contains all the information about potential modernization projects, among which priority must be set. It is proposed to analyze and evaluate the modernization potential of each object claiming to receive financial resources within the groups of homogeneous projects in order to identify the object which is the most ready for modernization and thus the most investment-attractive.

The Figure 1 shows the enlarged algorithm of the enterprises rating in the innovation networks based on the calculation of the complex indicator of the potential in order to identify the most promising object from the point of view of modernization. Its essence consists in the study of a certain set of indicators reflecting the state of key modernization factors by comparison with the baseline values, analysis of the dynamics of indicators and calculation of the complex indicator, on the basis of which a decision is made on sufficiency or inadequate potential[15-17].

However, the list of indicators is not constant, but varies depending on the goals and direction of the modernization project. When establishing baselines, similar indicators of the most advanced companies can be used according to benchmarking data, generally accepted normative values, the method of expert assessments, which is important for machine building enterprises [18, 19].

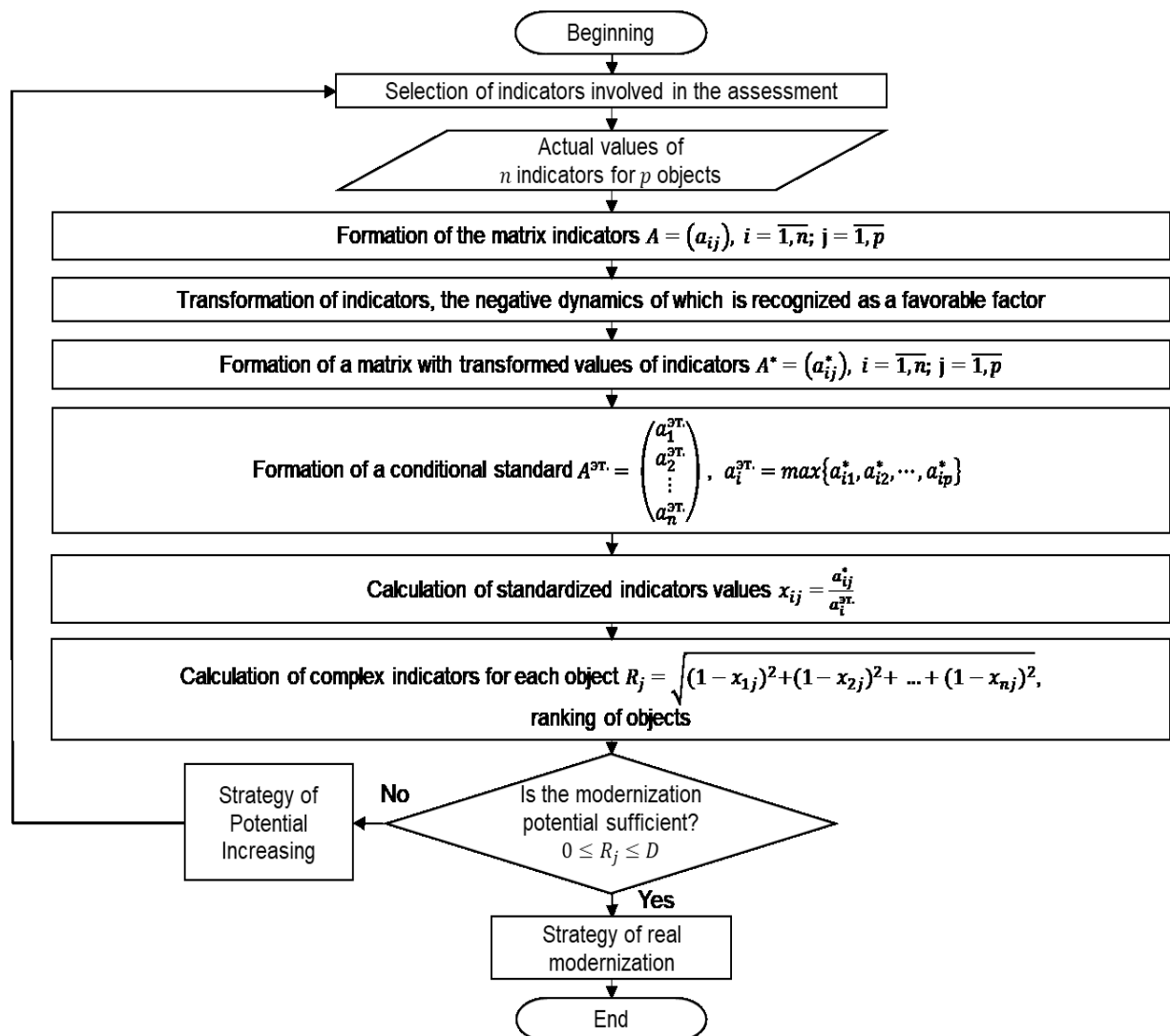


Figure 1. Algorithm of enterprises rating.

Based on the results of the calculation of the integrated indicator, the choice of strategy for the enterprise is determined: if the potential is recognized as sufficient, then a strategy for real modernization is chosen.

As a base model, one of the methods of the Expert Choice group was used in the format "Model of distance from the reference" according to which the criterion for making a decision is the minimum distance between the investigated and the reference variants in the factor space.

5. Practical significance and results

In the work, the theoretical results obtained are tested on a group of typical machine building enterprises that are part of Transmashholding, which is the leading representative of railway engineering [20]. It should be noted that the prospects for modernization of the business group under consideration are determined by such a specific factor as the presence of the main consumer of JSC Russian Railways and its high investment activity associated with the need to update the rolling stock both in terms of quality and quantity.

The article reflects a enterprises rating on a set of indicators of organizational and and human resources components. The following enterprises participated in the assessment:

- Bryansk Engineering Plant;
- Tver Railway Car Building Plant;
- Demikhovsky Machine Building Plant;
- Kolomensky Zavod;
- Novocherkassk Electric Locomotive Plant.

According to the results of the assessment, Tver Railway Car Building Plant possesses the greatest potential for the set of indicators under consideration, which makes it possible to consider it as a priority object for carrying out measures for technical and technological modernization within the framework of a business group. The results of the evaluation were used to substantiate management decisions related to the development strategy.

6. Conclusion

If it is necessary to compare the enterprises potentials within an integrated group or innovation network, it is advisable to apply a rating evaluation procedure, the purpose of which is to assign a rank to each of the participating enterprises that is established on the basis of a certain indicators set. The rating evaluation can be considered as an additional step to the procedure of element-wise analysis.

The toolkit proposed in the work allows us to consider the modernization processes from the point of view of the complex analysis of numerous and various aspects, which allows us to interpret the obtained results as a basis for the subsequent development of modernization ontology.

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