

# Cognitive modeling of labor activity processes in R&D

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## Abstract

In this paper, a comprehensive study of the processes of intellectual activity in the field of R & D and the development of proposals to improve the effectiveness of scientific activity.

The study was performed using the system analysis methodology and cognitive modeling using the electronic decision support system (DSS) of the NEEDLE.

The main subsystems of the labor system of R&D – specialists, affecting the efficiency of its activities, are identified. An iterative method using surveys of an expert group formed a system of the most important and quantitatively evaluated concepts.

Identified the problematic factors in this area that are most important to increase for Russia: wages, the demand for scientific research, financing and provision of resources, the R&D support system.

The cognitive matrix of this weakly structured system is constructed. With the help of DSS, it is shown that the matrix has a high total level of consonance (confidence) of 72%. The system has little effect on the group of mental factors. For coordinated work of the system, such key concepts as the demand for scientific research, the R & D support system in the company, innovative business culture, teamwork training, and self-control are of high importance.

Dynamic modeling of the system behavior under the influence of the controlling factor “Retraining of Scientific Personnel” showed that with its increase by 14%, the increase in the effectiveness of scientific work is 14%, and the salary by 11%, the growth of education level by 21%. At a low rate (~ 6%), organizational concepts and the slowest concepts of group work are growing.

The developed model can be used in the management of research activities to improve labor efficiency. The work can be used for conceptual modeling in the field of economics of scientific labor.

**Keywords:** R&D, science, system approach, labor efficiency, cognitive modeling, fuzzy cognitive matrix.