

ANNOTATION

of dissertation work of Lilia Borisovna Kurmasheva
on the topic "Development of models and algorithms for intellectual support of
educational sociocenosis management based on the methodology of algorithmic
solution of inventive tasks",
submitted for the degree of Doctor of Philosophy (PhD) in the
specialty 8D06101 – " Informatics, computer engineering and
management"

Modern sociocenoses, including educational, social and organizational systems, are characterized by a high degree of complexity and dynamism. The management of such systems requires the development of effective algorithms that ensure the sustainability, adaptability and effectiveness of processes. This task is especially relevant in the context of the management of educational institutions, where it is necessary to take into account the interests of students, faculty, administration and the state.

The systematization of domestic and foreign studies shows that the relevance of developing new approaches to managing sociocenoses is determined by the following contradictions:

1. between the complexity of sociocenoses and the limitations of formalized methods of their analysis;
2. between the availability of quantitative models and the lack of mechanisms for resolving substantive contradictions that arise in the management process;
3. between the development of AI and its insufficient integration into managerial decision-making circuits.

Thus, the relevance of this research is determined by the urgent practical need for new effective tools for managing complex educational systems and the scientific problem of the lack of formalized approaches that allow purposefully identifying and resolving systemic contradictions that arise in the process of managing educational sociocenoses. In contrast to existing research, which focuses primarily on describing and predicting system conditions, the work focuses on algorithmization of procedures for making managerial decisions.

The development of such tools based on the synthesis of TRIZ methodology, mathematical modeling apparatus and machine learning technologies allows us to consider the management of educational sociocenoses as a process of purposeful resolution of contradictions, provided by formalized methods, models and algorithms combined into a single methodological framework. This ensures a transition to a higher level of validity and reproducibility of management decisions.

The object of the dissertation research is the management processes of educational sociocenoses in conditions of uncertainty and contradictory requirements.

The subject of the research is methods, models and algorithms of intellectual decision support aimed at the formalized identification and resolution of managerial contradictions.

The purpose of the research is to develop and substantiate a TRIZ-oriented approach to intellectual support for the management of educational socioceneses, which ensures the algorithmization of the processes of identifying and resolving managerial contradictions and the integration of heterogeneous models within a single decision-making system.

Research objectives:

1. To carry out a systematic analysis of existing approaches to the modeling and management of socioceneses from the perspective of their applicability to the resolution of managerial contradictions.
2. To develop a conceptual management model for educational sociocenosis based on the TRIZ methodology.
3. To develop predictive models as a tool for quantitative support of the management conflict resolution process.
4. To develop algorithms for analyzing the structural stability and dynamics of sociocenosis based on empirical data.
5. To develop an architecture and algorithmic support for an intelligent decision support agent that integrates the developed methods and models.
6. To conduct an experimental approbation of the proposed models and algorithms in the tasks of educational sociocenosis management.

Thesis provisions submitted for defense:

1. A TRIZ-oriented approach to the management of educational socioceneses based on the formalization of managerial contradictions and ensuring the algorithmization of managerial decision-making processes in conditions of uncertainty.
2. A conceptual model of educational sociocenosis management that implements this approach and allows structuring managerial tasks through a system of contradictions.
3. A model of professional self-determination of applicants as a controlled process of sociocenosis, which makes it possible to identify key factors in choosing an educational trajectory.
4. An algorithm for assessing the structural stability of educational sociocenosis based on rank analysis, which allows quantifying the risks of system destabilization.
5. A method of classifying and ranking management objects in the educational sociocenosis, providing a reasonable definition of priorities of managerial influence.
6. A hybrid predictive model of student movement that provides a predictive assessment of admission and the risk of expulsion based on the integration of statistical and neural network methods.
7. Architecture and algorithmic support of an intelligent decision support agent that implements formalized procedures for resolving TRIZ contradictions in the development of management decisions.

The scientific novelty of the dissertation research lies in the development of a TRIZ-oriented approach to the management of educational sociocenoses, which provides formalization and algorithmization of the processes of identifying and resolving systemic management contradictions, as well as the integration of heterogeneous methods and models into a single system of intellectual decision support. The scientific novelty of the dissertation is represented by the following provisions:

1. A theoretical and methodological framework for the management of educational sociocenoses is proposed, based on the interpretation of management as a process of resolving systemic contradictions, which is confirmed by the monograph and the publication of an article in the journal included in the Scopus database (in the first quartile, Q1).

2. A conceptual model for the management of educational sociocenosis based on the TRIZ methodology is developed, reflected in the monograph.

3. An algorithm for assessing the structural stability of an educational sociocenosis is presented, identifying areas of systemic risk, which is confirmed by a textbook and publication in a collection of scientific papers.

4. A method of classification and prioritization of management objects in the educational sociocenosis is proposed, reflected in the publication in the materials of the international conference.

5. An algorithm for optimizing educational trajectories based on the combined use of Markov chains and TRIZ has been developed, which makes it possible to reduce the likelihood of undesirable conditions due to structural changes in the system, as reflected in an article in a scientific journal.

6. A method of operational forecasting of the contingent of applicants based on the analysis of search queries has been developed, which is confirmed by the publication of an article in a peer-reviewed scientific journal recommended by the National Academy of Sciences of the Republic of Kazakhstan.

7. A predictive neural network model for classifying students' academic success has been developed, which makes it possible to determine the risk groups for expulsion based on a limited set of predictors, as reflected in an article in a scientific journal recommended by the National Academy of Sciences of the Republic of Kazakhstan and a textbook.

8. The architecture of the intelligent decision support agent "TRIZ EduBot" has been developed and programmatically implemented, providing a formalized and reproducible procedure for making managerial decisions, with a confirmed copyright certificate, an implementation certificate and a published article in a journal recommended by the National Research and Development Committee of the Republic of Kazakhstan.

The theoretical significance of the dissertation research lies in the development of the theory of management of educational sociocenoses through the formalization of the TRIZ methodology and its integration with mathematical models and algorithms of

intellectual decision support, which allows us to move from descriptive to constructive-algorithmic management models.

The practical significance is confirmed by the creation of an existing prototype of an intelligent agent and a set of methods and algorithms, the implementation of which in the activities of universities makes it possible to increase the validity, timeliness and effectiveness of management decisions, as well as optimize the resources of the educational institution.

The practical significance lies in the possibility of applying the developed methods and algorithms in the management of educational sociocenoses.:

1. For strategic planning: the sound allocation of resources between stable areas and innovative programs.

2. For admission campaigns: the ability to quickly predict the recruitment of applicants for specific university educational programs before receiving official statistics, which allows you to adjust career guidance measures.

3. For academic management: the ability to identify students at "risk" in order to implement support measures and thereby reduce student expulsions.

4. For the digital transformation of educational sociocenosis policies: providing support for managerial decisions based on the resolution of contradictions to middle and senior managers.

5. In the educational process: the research results are used in the educational process in the preparation of students in IT areas, including on the basis of monographs and textbooks developed by the author on dynamic models, knowledge integration and the basics of artificial intelligence.

The practical value is confirmed by the received copyright certificate and the act of implementation, indicating the readiness to use the developed tools in real conditions.

Approbation of the results. The results of the dissertation research have been comprehensively tested in the form of publications, presentations at scientific events, the implementation of the results in the educational process and management practice of the university, as well as in the registration of intellectual property.