KNOWLEDGE MINING FOR MODELLING IN INNOVATIVE CRISIS MANAGEMENT OF EDUCATION

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Introduction. Innovation management is a key driver of the competitiveness of enterprises in the current economy, which is based on new knowledge and innovative technologies [1, 2]. It transfers the control of processes of creation, promotion and diffusion of innovations in various spheres of activity [3].

Modern management recognizes also significant transformations caused by the development of digital technologies, changes in the needs of households and can lead to professional training of personnel. An innovative approach to educational control leads to the development of digital models, the use of artificial intelligence, adaptive educational platforms and new methods for managing educational components [4, 5].

Anti-crisis management is an important warehouse of complex strategic government and/or corporate management, especially in the minds of currently unstable geopolitical and macroeconomic minds/factors [6]. Therefore, innovative approaches to crisis management allow not only to minimize the legacy of crises, but also to create new opportunities for the development of enterprises/organizations [7, 8]. Moreover, it is relevant to further research the concept of current innovative crisis management (for the time being, and for the public eye), its key strategies and tactics, as well as effective technologies methods that can effectively cope with crises.

The most effective educational management involves the use of current management methods that are based on scientifically based models and the

predicted development of educational systems [9, 10]. Advanced modeling in educational management makes it possible to analyze the interactions between various components of the educational system, evaluate the effectiveness of decisions taken and promote the efficiency of the initial process [11]. In other words, modeling in educational management is an effective tool for analysis, forecasting and optimization of management processes in educational systems. Therefore, scientific and practical approaches to concepts and modeling methods that are established in educational management, in a systematic, mathematical, information and simulation modeling manner, are of particular relevance. Particular respect should also be given to intelligent IT technologies in the modeling of educational processes, including knowledge mining (data mining), symbolic and neural boundary intelligence, great data.
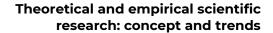
The current world generates large amounts of structured and unstructured, batch and streaming data, which can be used to generate intelligent models for forecasting, optimization and automation of processes [12, 13]. Knowledge mining (Data Mining) itself is the main tool for processing, analyzing and analyzing these data [14, 15], since it allows you to identify new non-trivial knowledge, so that significant patterns, trends and correlations from large sets of data, which are vitally necessary for further effective modeling of complex systems and processes (in the field of educational management).

Doctors have identified the main tasks of intelligent data analysis for modeling: identifying patterns and trends, initiating predictive models, optimizing processes and making decisions, automation analytical processes. This article analyzes the main technologies, knowledge mining tasks (such as clustering, classification, regression analysis, neural measures and association rules), as well as their effective application on-going forecasting, descriptive and optimization models in the educational industry.

Problem statement and relevance of the research. Current crises, such as pandemics, economic recessions, military conflicts and technological transformations, constantly impact the educational system. In such crisis situations, the educational system suffers from a lack of feedback, which requires prompt response and adaptive (often highly targeted) management. Traditional management methods can soon be quickly adapted to such critical minds as to necessitate the urgent introduction of innovative approaches. Current Data Mining is becoming a key tool for identifying emerging patterns, predicting risks and taking optimal solutions to crisis management.

In the medical field, the advancement of Data Mining technologies in the modeling of processes of educational management, technology, design, promotion and adaptation of current technologies knowledge management (data

mining) for forecasting, is becoming increasingly relevant. optimization and adaptation of educational strategies and tactical techniques in educational activities. The authors say that the introduction of knowledge management (data mining) and mathematical modeling in management processes in the sphere of illumination allows not only to minimize the consequences of crises, but also to promote the underlying effectiveness of acceptance operational, tactical and strategic decisions.

The main part and results. As we already know, the current educational system is facing a number of crisis situations, including pandemics, economic shocks, staff shortages, decreased educational capacity and growing digital inequality. In such situations, traditional management methods are not effective enough. *The authors confirm that hybrid knowledge mining (data mining) and mathematical modeling allows:*

- predict crisis situations (for example, a sharp decline in academic performance, mass education of students, financial problems of mortgages);

- develop models for the optimal distribution of resources (budgeting, personnel management, organization of the initial process);

- create adaptive strategies to minimize future crises and adapt quickly to change.

It is the integration of knowledge mining (data mining) technologies and modeling into modern management that promotes its durability/steelness/robustness and total efficiency.

1. Let's take a look at the specifics of effective knowledge mining (data mining) in anti-crisis management.

Knowledge mining (data mining) is the process of analyzing large amounts of data to identify patterns, predict trends and automate solutions.

Detected main Data Mining tasks in coverage:

- forecasting the health care of students - identification of risk groups and development of strategies for their support;

- optimization of educational resources – planning for the acquisition of depositories, division of financing;

- assessment of the effectiveness of distance learning – analysis of student activity on online platforms;

- monitoring of educational intensity - identification of problem areas and automation of brightness.

The most productive and advanced Data Mining methods for educational management have been analyzed:

- Classification, for example – the identification of students who are at risk for health care, based on their academic results;

- Clustering, for example – grouping of educational assets according to efficiency criteria;

- Association Rule Mining [16], for example, identifying interactions between application methods and student success;

- Predictive Modeling, for example – forecasting the results of political reforms.

2. Let us now look at the specifics of the effective implementation of mathematical modeling in anti-crisis management of educational.

Mathematical modeling makes it possible to comprehensively assess crisis officials, generate development scenarios and select optimal management strategies.

Main types of mathematical modeling in educational industry:

- predictive modeling – identification of possible scenarios for the development of the crisis;

- optimization models – search for the best solutions for the distribution of educational resources;

- system dynamics - modeling the interaction of various educational factors;

- agent modeling - analysis of the behavior of students and depositors in crisis minds.

Application of complex mathematical models in educational industry:

- model for assessing the risk of health care among students (various logistic regression and tree solution for predicting the availability of health care; identification of risk factors (low grades, low productivity, financial difficulties));

- optimization model of budget planning (establishment of linear programming for optimal distribution of funds between initial investments; number of parameters: number of students, availability of educational programs, personnel costs);

- scenario modeling of the transition at a distance (development of Markov models to analyze the reliability of successful adaptation of students and depositors; development of strategies for digital transformation of educational institutions).

3. Let's take a look at the features of synergetic integration of data mining and mathematical modeling in anti-crisis management of educational.

The combination of intelligent data analysis and mathematical modeling in educational industry allows:

- automatically collect and analyze large amounts of information;

- develop more accurate forecast models for crisis management;

- promote objectivity and consistency of management decisions.

Let's look at the example of such synergistic hybridization in educational industry:

Objective: The ability to provide education to students and develop teaching strategies is important.

Stage 1 (Data Mining) – analysis of initial data (success, growth, activity in the LMS).

Stage 2 (Mathematical modeling) – the development of the transferred model (logistic regression).

Stage 3 (Optimization of solutions) – development of personalized strategies for supporting students.

Result: decreased level of health care, increased academic success, decreased educational outcomes.

4. Finally, it is considered appropriate to critically analyze the synergistic integration of data mining and mathematical modeling technologies in anti-crisis education management, in particular regarding challenges, difficulties and prospects.

Main challenges *for educational industry*:

- data quality – the need for completeness and relevance of educational data;

- high computational costs – processing large amounts of information requires powerful resources;

- ethical issues – ensuring the confidentiality of student and teacher data;

- resistance to change – low digital literacy of employees of educational institutions.

Promising development directions *for educational industry*:

- development of artificial intelligence (AI) for automatic analysis of educational data;

- implementation of cloud technologies for scalable computing;

- development of Explainable AI to increase the transparency of management models;

- integration of blockchain technologies for secure storage of educational data.

Therefore, knowledge mining (Data Mining) and mathematical modeling play a key role in anti-crisis management of education. Their application allows to predict crisis situations, develop adaptive strategies, optimize resource allocation and increase the efficiency of educational processes. Despite the existing challenges, the development of digital technologies opens up new prospects for sustainable and innovative management of educational institutions.

Conclusions and perspectives of further research. Innovative management plays a critical role in modern business, providing companies with competitive advantages and sustainable development. The use of digital technologies, open innovation and flexible management methods allows you to quickly adapt to

market changes and create breakthrough solutions. Further research and implementation of innovative strategies will help increase the efficiency of management and the sustainability of organizations in the long term.

Modern innovative educational management is a key tool for increasing the efficiency of the education system and its compliance with the challenges of modern society. The use of digital technologies, adaptive learning platforms, a competency-based approach and inclusive methods contributes to the creation of a flexible and effective educational ecosystem. Further research and implementation of innovations in educational management will ensure high-quality training of a new generation of specialists.

Innovative anti-crisis management is becoming a key factor in the survival and development of business in modern conditions. The use of predictive analysis, digital technologies, agile management methodologies and strategic leadership allows companies/organizations not only to successfully overcome crises, but also to gain competitive advantages. Further development of innovations in crisis management will contribute to the creation of more sustainable and adaptive business models in the future.

Modeling is an important tool in modern education management, which allows to increase the efficiency of management decisions, optimize educational processes and predict the development of educational systems. The use of digital technologies, artificial intelligence and big data opens up new opportunities for improving educational management and improving the quality of education in general.

Knowledge Mining is a powerful tool for analyzing big data, which is used in various fields of science, business and education. Thanks to the combination of artificial intelligence, natural language processing and knowledge graphs, this technology allows to obtain valuable insights that improve the decision-making process. Further development of knowledge Mining will contribute to the creation of new methods of analysis and knowledge management, which will have a significant impact on the digital transformation of society.

Knowledge mining is a key tool for creating effective models for forecasting, optimizing and automating processes in various fields. The use of modern methods of machine learning, deep learning and big data significantly expands the capabilities of modeling and improves the quality of decision-making. Thus, ONLY by integrating data mining into modeling, organizations and researchers can improve the decision-making process, efficiency and accuracy of forecasting (including in educational management), which becomes even more relevant in crisis situations/states/periods.

Discussion. Nowadays, the education system is increasingly faced with numerous crisis challenges, including pandemics, economic crises, armed conflicts

and rapid digital transformation. Traditional management methods often do not allow for a prompt response to crisis situations [17]. That is why the authors put forward the following discussion thesis: not just knowledge mining, but the synergy of Big Data Analysis & Analytics and AI-based modeling helps to predict risks, adapt educational processes and improve the quality of management decisions. In other words, Big Data Analysis & Analytics in combination with innovative (in particular deep) artificial intelligence models will be a key technology for effective anti-crisis management in the field of education at all levels [18]. Such hybridization allows for a synergistic improvement in the forecasting of crisis situations [19], personalization of the educational process and optimization of resources of educational institutions. Despite certain challenges, the development of hybrid AI technologies in education will contribute to a more sustainable and effective functioning of educational systems in crisis conditions [20]. Taking into account the above, the results of this new direction of the author's research are planned in future publications.

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