# Possibility of simulation modeling to identify the impact of a pandemic on the education

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***Abstract*—The article discusses the issues of the possibility of simulation modeling to identify the impact of a pandemic on the education system in a particular region. It is proposed to apply cognitive modeling of complex systems for these purposes. Such modeling allows to display the structure of a complex system in the form of a cognitive model, to investigate with its help various properties of the system, to anticipate the options for the development of situations and, on the basis of this, to propose reasonable management decisions. An example of a cognitive map reflecting the problems of the education system and some results of modeling the processes of developing situations are given.**

***Keywords*—Cognitive modeling, education system, structure, foresight, behavior, pandemic.**

## INTRODUCTION

The education system in any society plays a decisive role in the development of human potential, the quality of the nation, and the quality of the population life. In conditions of stability (economic, social, political, etc.) the existing education system can to a certain extent support the structural stability of society, can ensure its sustainable development. But with sharp changes in the external environment with the emergence and strengthening of risks of a different nature, societies can lose their stability. And in anticipation of the possibility of such situations, it is necessary to have the means to overcome them. To find the means of such changes in a complex system that could overcome the negative consequences of risks maintain sustainable development, it is advisable to first simulate the possible consequences of the risks that disturb the studied complex system, and those control actions that can be recommended to improve situations. The world is currently fighting the coronavirus pandemic. Statement of the task paper is to study the necessity and possibility of improving the education system in such a way as to level out the consequences of the pandemic to a certain extent. The question arose, is it possible with the help of transformations (spontaneous and purposeful) of the education system in the future to resist various risk - situations? At the "intuitive" level, the answer seems to be yes - you can. But to what extent, due to what actions, with what consequences - the question remains open. Therefore, it is proposed to use cognitive simulation of complex systems [1-3,7] to analyze the problem under consideration.

## COGNITIVE MODELING

Fig. 1 shows a cognitive map of the relationship between education and social and economic factors identified on the basis of expert conclusions and theoretical assumptions [1,8]. The cognitive map was developed and depicted using the author's software system CMLS [7].

Analysis of its structural properties, stability properties, topological analysis was carried out [4, 5].

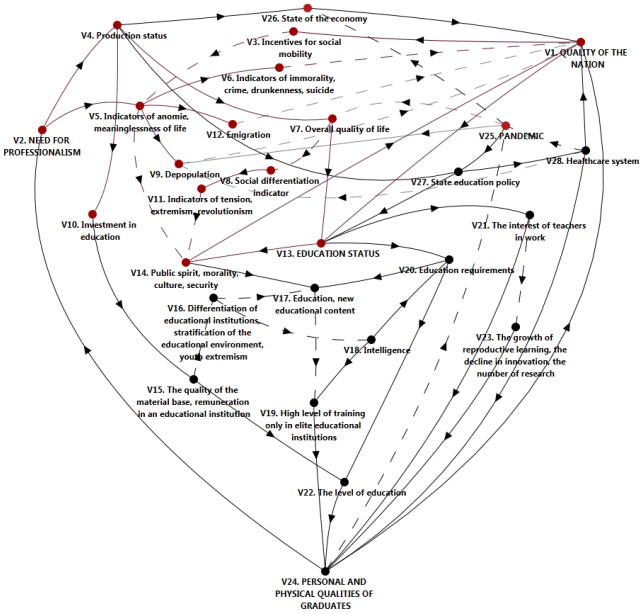


Fig. 1. Cognitive map "Education system and society"

The analysis made it possible to establish that the model does not contradict the real system, to determine the conditions for its stability and to proceed to modeling various scenarios for the development of situations [6]. Some graphs of the situations development system under the assumption of a pandemic and possible counteraction to its consequences by improving the education system and appropriate government support measures are presented in Fig. 2. The simulation of the impulse processes was carried out by introducing signals into 4 vertices: PANDEMIC. (V25), State of the economy (V26), State education policy (V27), Healthcare system (V28). The results of a model implementation of one of the many scenarios obtained with CMLS are shown in Fig. 2. As can be seen an

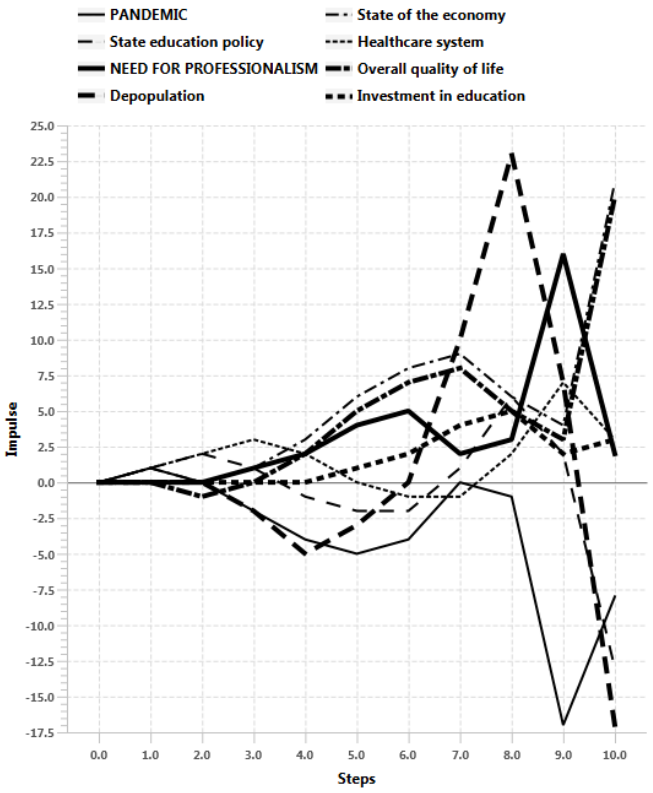


Fig. 2. Modeling of impulse processes

outbreak of a pandemic (1st step of modeling, thin solid line) can be neutralized in a developing economy (dash-dotted line), timely implementation of the state policy to support the education system, the healthcare system, which also depends on the education system and high professionalism of personnel, through investment in education; all this leads to an increase in the general standard of living. But if the pandemic starts to repeat (8th cycle of modeling), the indicators may start to deteriorate, then it will require new efforts to correct situations, maybe even change the structure of the system shown in Fig. 1.

To study such a problem (changing the structure), it is proposed to carry out a simplicial analysis (q-analysis of connectivity) of the system. Fig. 3 illustrates the results of such a cognitive map analysis.

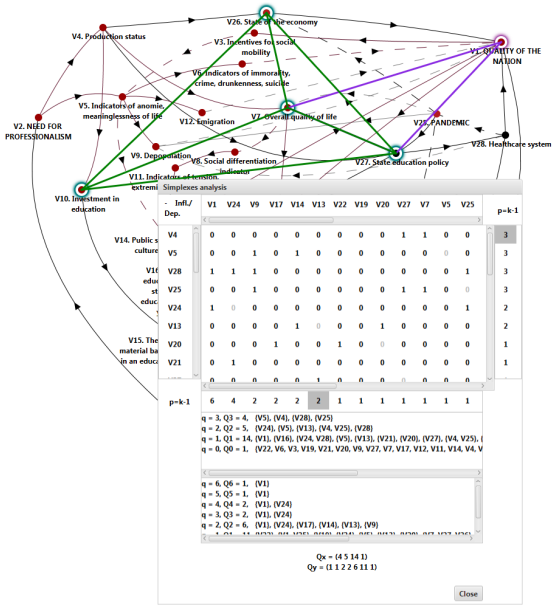


Fig. 3. Illustration of q-analysis results

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