

Modeling of the strategic development of socio-economic systems based on hybrid simulation and ontologies

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Abstract

Purpose

The goal of this research is to demonstrate model designs and approaches based on using modern paradigms and technological solutions in the field of simulation modeling of socio-economic processes and social forecasting that allow us to study complex dynamic occurrences in the development of socio-economic systems.

Strategic management of socio-economic system involves the analysis of structural changes and dynamic aspects of its development. The socio-economic system can be a specific dynamic behavior in terms of development. The search for an effective modeling constructs developing socio-economic systems due to several reasons, among which:

- necessity of choice and analysis of the trajectory of development in the conditions of formation of the strategy;
- structural changes and dynamic complexity of socio-economic systems;
- the need to consider behavioral aspects of individual social behavior and the activity of individual elements of a complex social system;
- the presence of self-organization in social systems where the dynamic behavior can occur spontaneously, depending on the internal structure and the influences from the external environment.

Design/methodology/approach

Observed in society and the socio-economic phenomena, the processes are similar to the processes studied in the area of systemological sciences, as synergetics. The article discusses the methodology and general technological approach to building simulation models describing such phenomena in socio-economic systems. Model design public system should link the micro level, where individuals (organization) decide and act and macro-level, describing the state, the basic structure and development of the system. All model variables are constantly changing for a long time under the influence of external factors and internal, in transforming the system of

structures and properties of the socio-economic system. At the macro level model designs are produced by means of the aggregated system dynamics models describing the main elements and processes of development, the evolution of social systems: population, economy, production and social infrastructure, environment and other factors of social life. Through the description of microprocesses aggregated system dynamics model of socio-economic systems are complemented by agent-based models of individual social and economic behavior of decision makers, as well as describing the interaction of many social groups. The agent-based model allows to investigate the individual behaviour of different groups of agents, the specificity of their adaptation to the changing environment, and how the processes of self-organization influence the evolution and development of socio-economic system as a whole.

Findings

This approach in building a multi-model complexes based composite system dynamics and agent-based simulation models allows to investigate the dynamics and development of socio-economic processes through cyclical relationship of micro- and macro- levels in this socio-economic system.

Originality/value

As an integration base for creating a model set, the paper uses a suite of ontological models, whose framework is based on the conceptual approaches to the model set stratification proposed in the paper.

Research/ Practical/ Social/ Environment implications

A simulation model of the socio-economic system acts as the core of the procedure of strategic decision making in the information-analytical centers, along with the monitoring system, data analysis, methods of generating scenarios, the technology of the scenario studies and analyzing their results. Procedures expert of audit and expertise-cognitive analysis is used for stratification, ontological design simulated socio-economic systems, the formation of possible scenarios, playable on simulation models, and modelling "balance of interests".

Research limitations

Considered model construction by the socio-economic systems are considered and applied by the author of this article in the construction of dynamic models in the social sphere (health, housing, pension system), a regional system, the collaborative supply chain.

Keywords:

sinergetics; socio-economic system; stratification; simulation modeling; system dynamics; agent-based modeling; ontologies