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УДК 330

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SYNERGETICS IN THE MANAGEMENT OF SOCIO-ECONOMIC SYSTEMS

Modern socio-economic systems are evolving in conditions of crises, recessions, declines, and upturns, leading to uneven development. These systems are characterized by stochasticity, uncertainty, turbulence, and intensified regimes. The nonlinear, non-equilibrium, irreversible nature of economic processes has necessitated the development of a new paradigm in economic theory based on the theory of self-organization, rooted in Haken's synergetics.

Synergetic economics is based on the interaction of linearity and nonlinearity, stability and instability, constancy and structural changes in contrast to the properties of linearity, stability, continuity, and constancy [1, p. 216]. Unlike traditional economics, nonlinearity and instability in synergetic economics are regarded as sources of diversity and complexity in economic dynamics, rather than sources of noise and random phenomena.

The methodology of synergetics enables the identification and study of irregular effects in economic reality and the ability to influence the course of economic processes. Synergetics has indeed brought changes to the theory and practice of management, leading to the formulation of new approaches to managing socio-economic systems [1, p. 218]: socio-economic systems are self-organizing systems; it is impossible to impose development paths on complexly organized socio-economic systems; effective management of complex systems is only possible through nonlinear management, taking into account the inherent development trends of these systems. In this approach, a small "correct" action has a greater impact on the system's evolution than a stronger action that is organized in a manner inconsistent with its own tendencies.

the nonlinearity of a complex system lies in the fact that even a minor influence, under conditions of instability, can lead to unpredictable consequences and chain reactions, the development of which follows its own laws; every nonlinear system contains elements of self-organization, regeneration, stability, and developmental goals; for complex systems, it is not possible to use time extrapolation; a complex system has not a single but a multitude of development paths that correspond to its internal tendencies; the diversity of a system provides it with flexibility, the ability to quickly respond to changing external conditions, and adapt to them; closedness of a system impedes its evolution.

Thus, taking into account synergy, the management of social-economic systems' development refers to the process of managing the emergence of synergistic effects. In economics,

the synergistic effect is the result of the coordinated action of the components of an economic system, which leads to a change in the qualitative state of the economy and its development trajectory, as well as maintaining the economy on a sustainable development path despite exogenous influences and endogenous fluctuations [2].

Scientists identify the following methodological principles of synergy in modern management theory [1, p. 219]:

the system's movement should occur in a nonlinear region of the phase space; the system must be open, implying an exchange of energy, matter, and information with the external environment;

there should be cooperation and coherence of behavior among the components of the system; the presence of a nonequilibrium thermodynamic situation where the energy received by the system from the outside is sufficient not only to compensate for the growth of entropy but also to reduce it, contributing to the establishment of order in the system;

the system has multiple paths of evolution in its final stages, which are described by equations regarding the parameters of order.

To apply the ideas of synergy in the management of social-economic systems, conditions must be created in which the system satisfies the requirements of self-organization, with openness and nonlinearity being the key factors. In this context, management should aim to transition from the unpredictable behavior of the system to its development along desired attractors, which determine the goals of the social-economic system's behavior.

When managing complex social-economic systems with consideration for synergy, researchers propose using nonlinear dynamic models, which exhibit the following distinctions [3, p. 195]: violation of the principle of superposition; the possibility of multiple equilibrium positions; the existence of multiple stable and unstable regimes under the same system parameters and external influences; the presence of stable self-oscillations with limited amplitude; interaction of different types of oscillations in nonlinear systems; bifurcation of solutions due to changes in system parameters and/or external influences; the possibility of catastrophes, characterized by discontinuous changes in system behavior due to continuous parameter variations; the existence of solutions in nonlinear models that resemble those of linear models, as well as more complex stable and unstable solutions; the possibility of chaotic solutions in deterministic models; the presence of attractors; and self-organization in dynamic systems.

Therefore, in the context of nonlinearity, it is necessary to study any social-economic processes, consider methods for managing economic efficiency, crisis management techniques, and make management decisions at any level. When making such decisions, it is not sufficient to rely solely on linear comparisons between the previous and subsequent states. It is essential to consider the complexity and nonlinearity of the process, think in terms of holistic information blocks, think in alternatives, understanding the possibility of unexpected (emergent) changes in the direction of process unfolding, and compare the real course of the process after decision-making with the probabilistic course under alternative decisions. Thus, by incorporating the categories and principles of synergy, we can comprehend the laws of development in a complex, nonlinear world, understand the course of socio-economic processes, anticipate potential consequences of actions, and make informed management decisions.

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