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## MODELING COMPLEX SOCIAL SYSTEMS: METHODOLOGICAL ASPECTS

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**ABSTRACT:** The modern social world is becoming complex and non-linear. There is a need for a new methodology in modeling such processes.

The synergetic approach is an adequate methodology for modeling complex, non-linear social processes

**KEYWORDS:** complex self-organizing systems (G. Haken), “complex-systems thinking”, “science of complexity” (K. Mainzer ), “Paradigm of complexity” (E. Moren).

### INTRODUCTION

In these conditions, it is required to find new rational methods of researching reality. It should be noted that in modern epistemology and methodology of science there are attempts to develop such paradigms as complex dissipative systems (I. Prigogine), complex self-organizing systems (G. Haken), “complex-systems thinking”, “science of complexity” (K. Mainzer ), “Paradigm of complexity” (E. Moren) [1].

At the same time, in the study of the phenomenon of complexity, “Theory of Complexity”, “Theory of Nonlinear Dynamical Systems”, “Theory of Catastrophes”, “Theory of Bifurcation”, “Theory of Chaos”, “Theory of Fractals”, etc.

The integration of sciences in the cognition of complexity should not be carried out only in the form of expanding links between the sciences, that is, be their mechanical totality. In this case, it will have no methodological significance. The integration process between the sciences should demonstrate the integrity of the structure of science, the emergence property should appear, a new qualitative state of the system should appear.

The advantages of an interdisciplinary approach are that if a separate science (scientific discipline) investigates an object by the method of mono-theoretical thinking, using a unified theoretical scheme, then interdisciplinary science is based on a poly-theoretical, systemic style of thinking, examines the studied subject and phenomenon in a dialogical / polyological way. As a result of the study, it was concluded that the modern picture of the world takes on a very complex form, a very complex methodology is required to display it.

When modeling objects of cognition as a methodological approach, the linear paradigm is based on the classical picture of the world that has dominated science and philosophy since the 18th century, Laplace's determinism. The core of the linear paradigm is Laplace determinism.

In this paradigm, an object is viewed as a strict mechanical structure. According to this, any state

of an object can be determined unambiguously.

Linear methodology in most cases does not work for the knowledge of complex social processes.

For example, V.V. Vasilkova argues that classical science is based on the following way of thinking:

- chance is removed from scientific theory, it is considered secondary, has no fundamental significance;
- the properties of the whole are explained by the properties of its parts;
- science is knowledge about stability and balance, disequilibrium and instability are understood as negative and destructive forces;
- the processes occurring in the world are reversible in time, therefore their further fate and future are predictable for a long period of time [2, p. 25-26].

The study made the following conclusions on the methodological standards of the linear modeling paradigm:

- the influence of any process is directly proportional to its result, that is, “the cause is proportional to the effect”;
- the idea of the complete determinism of objects and phenomena of the world (Laplace determinism). According to this, the next state of any system can be uniquely determined, predicted;
- strong factors affecting the system are taken into account, but minor, random factors are removed. The consequences of minor impacts are negligible. The linear modeling paradigm is based on linear thinking.

Non-classical (post-non-classical) science is based on a new way of thinking in the knowledge of the world. According to this:

- the subject of science is not only general, repetitive, but also random, individual and unique processes;
  - ... matter is not inert, it itself is a source of self-movement and has internal activity;
  - in the display of the world, determinism does not deny randomness - they come into mutual agreement and complement each other. If at the point of bifurcation randomness and uncertainty dominate, after choosing the path of development, thanks to the power of determinism, the system will be at the stage of highly stable existence;
  - development is multivariate and alternative;
  - development occurs through (due to) disorder, therefore, one should not be afraid, and also one should not deny the role of fluctuation, chaos in development, chaos is not only destructive, it is at the same time constructive;
  - the development of the world occurs according to the laws of nonlinearity, that is, it does not happen cumulatively in stages, the pace and direction of development are not set
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unambiguously [3, p.30].

The paradigm of nonlinearity is broader than the paradigm of linearity and is adequate to objective reality.

Consequently, the paradigm of nonlinearity opens up wide opportunities for holistic, systemic, poly-paradigmatic study, knowledge of the object of research.

Based on the above, we can give the following definition of nonlinear modeling:

Non-linear modeling is a type of modeling that takes into account non-linearity, non-determinism, random connections of the system, as well as the multi variance of the evolution of the system, and through this is based on knowledge.

In short, it is necessary to rely on the methodology of synergetics in the modeling of complex nonlinear social processes.

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