THE ESSENCE AND MANIFESTATION OF THE SYSTEMATIC APPROACH IN SCIENTIFIC CREATION

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Abstract. This article focuses on the content of new scientific-philosophical categories in the scientific apparatus, which is considered one of the important methodological foundations of scientific research. In particular, the systematic approach, structure, and the essence of the so-called "black box" categories were analyzed.

Keywords: methodology, pozitivism, system, element, structure, inert, bionert, technology, chemical process, physical process.

In modern scientific research, of course, the philosophical-scientific apparatus, laws, and categories, which have general methodological significance, are equally used. In particular, the study discusses some important aspects of the systematic approach.

System analysis method The establishment of the axiomatic method in science in the 20th century is associated with the emergence of Euclid's famous "Principles." However, elements of axiomatics have been encountered before. With the development of science, this method penetrates from mathematics and logic into various sciences and dominates there. Analytical mechanics (in Lagrange, Hamilton, Hertz, and others), Maxwell's electromagnetic field theory, relativity theory, and others are examples of such sciences and theories.

The main requirements for this method are as follows: consistency of axioms, i.e., the system of axioms or principles should not simultaneously contain a certain statement and its negation; completeness, i.e., there should be no consequential axioms, and their number should give us all the consequences or their negations; independence, no exclusion of any axiom from others.

The advantages of the axiomatic method are as follows. Axiomatization requires a precise definition of the applied concepts and rigidity of thinking. It organizes knowledge, removes unnecessary elements from it, eliminates uncertainties and contradictions, and allows a new view of previously acquired knowledge within a certain theoretical system. However, the use of this method is limited. In non-mathematical disciplines, this method plays only an auxiliary role. However, within the framework of mathematics, it also has certain limits. An important role in clarifying this issue was played by the theorem on the fundamental incompleteness of formal knowledge systems, developed by K. Handel. Its essence lies in the fact that within a given system, it is impossible to formulate statements that cannot be proven or denied without expanding this axiomatized system (metatheory).

First of all, thanks to the Austrian theoretical biologist L. von Bertalanffy. His books "The Biological Picture of the World," "Intellect, People, Actions," and "The General Theory of Systems." This led to the rapid development of the theory from the 1950s. Bertalanffy applies system theory to the analysis of human thought and physiology.

At the beginning of our century, these ideas (as well as the ideas of cybernetics) were illuminated by the Russian scientist A. A. Bogdanov (Malinovsky) in his science of universal organizational "tectology." Currently, it is being studied as Bogdanov's second discovery. Previously, the ideas of systematicity were not universal, but developed as separate ideas related to the organization of knowledge, mathematical objects (in the theory of sets, groups), and objects of mechanics. In the 20th century, the works of French structuralists - biologists, ethnographers, and linguists - played a significant role in this field. Nevertheless, the core of systemic ideas was created by the work of biologists and the philosophical concept of organism, which has been a leading tradition since ancient times.

A systematic approach. Ontology of Systems. The existence of systems ontology within positivism was debatable. At the same time, objectively, the world consists of systems, pits, networks, disorders, and plenums (continuous beings), which interpenetrate and interact with each other. But what is a system? A pile of sand, stones, or crowds on the street cannot be called a system. These are more aggregates, the properties of which can be determined as the sum of the properties of the parts.

A typical definition of a system is as follows: a system is a collection of elements that are in contact with or in contact with each other and form a whole or organic unity. Bogdanov indicates in his tectology that there are two ways of forming systems. According to the first, the system arises from the connection of at least two objects through a third-party connection. The second method is the formation of systems due to the negation of previously existing ones. Both of these methods are clearly visible in chemistry, especially in two types of chemical reactions: compound and decomposition.

A real system is not an additive, but an integral. In this case, the concepts of "element," "relations," "system," and others are used in a broad sense. Thus, relationships come in the form of certain constraints, and mergers, and dependencies, and interdependencies, and dependencies and correlations. Elements, that is, some beings that initially appear independent, form the basis of the substrate of any system. Systems do not exist without elements and relations, just as elements do not exist if they are outside the system: an element is called an element if it is part of the whole.

Structure. Structure is often referred to as the structure of relationships and connections within a system, its architecture, form, stable composition, and the structure of the organizational system and the sum of a variable or constant program of actions. Many authors often equate the concepts of structure and organization.

There are many different types of systems:

1) by shape - these are the centering (star);

2) by nature - material and ideal, including information; bioinert and living; natural and artificial (for example, technical and others);

3) by type of movement - material and field, including physical, chemical, biological and social;

4) in relation to the environment - isolated and open;

5) by activity - active and passive;

6) by function - mono- and multifunctional;

7) by structure and quantity - unorganized (like chaos, gases) and organized, as well as small and large, simple and complex;

8) by direction - non-targeted (subject to natural laws or constants, for example, minerals, liquids, planets; having algorithmic and naturally occurring programs, for example, machines, biological organisms, etc.) and targeted (such as man and society);

9) by conditionality - probabilistic (related to randomness) and strictly defined; and others.

The system and its real environment are opposite to each other and interact with each other; there are no completely isolated systems. Therefore, any system is limited externally, including in terms of resources. Moreover, it is always localized in space and time, having clear or unclear boundaries of life activity. There are no infinitely large and eternal systems: all real systems have upper limits in terms of the number of components, the number of levels, complexity, and variety of properties, i.e., they are always internally limited.

Simple and complex systems. The simplest system consists of at least two elements, or components in general, which are united into one whole through some relationship, bond, like a proton and electron in a hydrogen atom. But the properties of the resulting whole differ sharply from the properties of the elements. A system is a new, different quality, not equal to the sum of the properties of its elements (emergence). Formally, networks (for example, the cellular structure of the Galaxy, colonies of organisms, communication networks, human settlement, production location in regions, control schemes, etc.), honeycombs (crystals, clusters of cells in the tissues of organisms, specific designs, rhythms, and regular processes in technology and technological schemes, etc.), agglomerations (for example, sand dunes, stone dunes, crowds, etc.), as well as disorder and plenums (vacuum, liquids, gases, etc.) can be considered "degenerate" states of real systems, conditioned by the nature of the components and, most importantly, their interrelationships.

These include all living organisms, their communities and the biosphere as a whole, humans and their various groups and associations (peoples, states, etc.), as well as hybrid (mixed) systems such as biogeosystems, human-machines, economic, and ecological systems. All of them are open systems with their own behavior, based on the exchange of material, energy, and information with the environment. These are hierarchical according to the structure of education. They are characterized by direct and feedback, control, functionality, self-organization, reflection, memory, adaptability, selectivity, orientation, algorithmicity, aggressiveness towards the environment and exchange with the environment, and other properties.

Knowledge of systems, their simplicity and complexity, starting from other characteristics, is directly related to the ability to perceive, store, and process received signals, which are assessed in the human nervous system and summarized in meaningful information. This is connected with the capabilities of its tools, as well as with the goals and objectives of cognition, design, planning, and action. In this regard, such characteristics of systems as size and scale, number of components, simplicity and complexity, qualities, properties and degree of intensity of processes, difficulty or convenience of movements, speed and slowness are evaluated by humans. In this case, the subjectivity of the perception of the received information is undoubted. However, the heuristic power of comparison, analogy, analysis, probability methods, and statistics, hypotheses, and other methods is also undeniable.

The ***"Black Box"*** method, which was first developed ***in behaviorism*** and subsequently used in cybernetics, may be of great importance for knowing the unknown.

Such "***Black Boxes***" can be complex systems of any type and their models - matter-field, energy, data, for example, physical processes of complex nature and high intensity (extreme), chemical reactions, organisms, populations, ecosystems, technical systems corresponding to the model, as well as economic, financial, production, social, as well as human activity systems, such as the person himself and various groups, communities, states and their associations, all of humanity. Mastering the "black box" methodology is very relevant in connection with the current state of relations of human communities with each other, and most importantly, with nature. Of course, in this case, it is often necessary to collect very large amounts of data in various ways and effectively process it, for example, using statistical data and a probabilistic approach, as well as building computer technologies and cybernetic information models.

The essence of system methods can be expressed as follows:

1) The main role of the systemic method lies in the fact that, based on it, the unity of science and all of human knowledge, a holistic worldview, is achieved, and the possibility arises.

2) The source of modification of the system or its functions usually lies within itself. This is related to its internal contradictions and directed behavior (for example, dependent on natural laws and regulated by them, algorithmic, goal-oriented, etc.). At the same time, a characteristic feature of behavioral systems is their self-organization and self-regulation.

3) In system research and heliocentric studies, the principle of the universality of system laws is of great importance, which does not exclude the specificity of different types of systems simultaneously. This refers to the ability to construct analogies in organic nature rather than simple analogies (such as organisms with governing and managed structures, populations of organisms in the form of human peoples and states).

4) At the same time, it has different properties, parameters, functions, and principles of structure and development. This is manifested in the hierarchy of complex systems and the specific features of management in such systems.

5) A systematic approach is impossible without an analysis of the conditions of existence and related environmental factors.

6) From a systematic point of view, it is possible to correctly approach the solution of such an important issue for science as reducing the explanation of certain levels of the structure of matter and the mechanisms of its change based on the previous level.

7) The main principles of system analysis are as follows: when solving management problems in systems, it is necessary to try to take into account all the input and output characteristics of the object as fully as possible; the use of an interdisciplinary approach; research, development, projects, and actions require building not only a functional approach, but also a problem-oriented and "task" orientation. System analysis is concretized in the form of its applied link - system engineering.

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