

ABOUT THE OBJECT AND SUBJECT OF RESEARCH OF THE GENERAL THEORY OF SYSTEMS AS A TRANSDISCIPLINARY SCIENCE

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Abstract

The article examines the problems of creating General System Theory (GST) from the perspective of modern epistemology and methodology of science and suggests methods for solving them. In order for the totality of information about systems to become a science, it must have an explicit, real and intentional definition of the idealized object "system in general", have its own disciplinary system paradigm and disciplinary matrix. And in order for the theory of systems to become general, it is necessary that the system paradigm proposed by it, the ontological concepts of "the system in general", the proposed terminology and research methods have a universal or transdisciplinary character. It is noted that the existing definitions of the term "system" do not allow us to identify a system-forming factor and, consequently, to designate an isomorphism that provides the necessary universality and transdisciplinarity of GST. It is shown how the worldview position based on the synthesis of holism and unicentrism allows systemic dualism. The ontological understanding of the "system in general" as an object that transforms matter and energy according to a single order. It is shown that a single order, which determines the unity and wholeness of the object, is a system-forming factor and provides the required system isomorphism. This allows you to build models of the order of development of the system in time and space, to build a hierarchy of already identified system features: elements, connections, orderliness, emergence, wholeness and unity, etc. Practical examples show how objects of different nature can be studied as a system.

Keywords

paradigm, definitions, transdisciplinarity, an idealized object of theory, orderliness, "systems in general", an essential feature of an object.

Introduction

In the early fifties of the last century, Ludwig von Bertalanffy put forward the idea that "General system theory: a new approach to unity of science" (Bertalanffy L. von. 1951. p.302-12.). It should be emphasized that L. Bertalanffy proposed not a theory, but the idea that such a theory can be created. As he wrote later: "The author of this article thinks of the general theory of systems as a working hypothesis; being a practical scientist, he sees the main function of theoretical models in explaining and predicting phenomena that have not yet been investigated and managing them" (Bertalanffy L. von 1962. p. 1-20). Immediately after this idea became known, attempts began to build such a theory of systems. Already in 1956, Keneth Boulding wrote an article entitled "General systems theory—the skeleton of science" (Boulding, K. 1956), which for many years determined and continues to determine the vector of work in the creation of a general theory of systems (Evidence of this may be the SIG ISSS meeting on general systems theory in May 2024, chaired by D. Russo and G. Mobus).

The interest in GST is due to the fact that the isomorphism declared by it provides a potential opportunity to apply systemic patterns to the study of any real objects. Bertalanffy himself writes about this "..... the fact that systems theory is a broad view which far transcends technological problems and demands, a reorientation that has become necessary in science in general and in the gamut of disciplines from physics

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and biology to the behavioral and social sciences and to philosophy. " (Bertalanffy L. von, 1968. vii.). In other words, the general systems theory (GST) was conceived from the very beginning as a kind of universal theoretical construction, the ontological, epistemological and methodological principles and terminology of which should have a general scientific or transdisciplinary character.

Despite the optimism of the first studies of the 1950s, by the end of the 70s, significant obstacles had emerged that did not allow systemic science to become general. As a result, the focus of systemic research shifted to the practical plane after the 70s of the last century. This is evidenced by the analysis of the topics of scientific research works by authors and organizations dealing with the problems of a systematic approach. But already at the end of the twentieth century, interest in the GST received a new impetus, since the complexity, multifactorial nature of globalism and the problems facing humanity exposed the impotence of disciplinary approaches. Attempts to develop solutions to these problems through so-called interdisciplinary methods could not lead to success because these methods represent nothing more than the consensus opinion of a team of different specialists. In this regard, it is noteworthy that Peter Checkland's statement: "What we do not need interdisciplinary teams, but transdisciplinary concepts that serve to combine knowledge, being applicable in areas beyond traditional academic boundaries" (Checkland, 1976, p. 127).

In the works devoted to the history of the development of systems science, four epochs or four waves of the systemic approach are distinguished (Volkova V.N. 2023), (Cabrera, D., Cabrera, L. and Midgley, G. 2021). Moreover, the fourth period, according to the authors, should be characterized by "universality and diversity" (according to D. and L. Karber) or the discovery of "general scientific" laws (according to V. Volkova). And in almost all works dealing with the GST problem, it is stated that the creation of the theory is at an early stage.

Unsuccessful attempts to create the GST have led to the emergence of different points of view on whether the GST can exist at all, and if so, in what form.

In order to answer these questions, we propose to clarify what "science in general" is from the perspective of modern epistemology and methodology and how this position relates to the problems of creating a GST.

1| GST as a science

Many scientists have speculated about what science are, what is the difference between scientific and non-scientific methods, etc. For example, A. Comte and J. Mill, and P. Duhem, H. Poincaré, and W. Heisenberg, I. Lakatos and M. Polanyi and others. But the range of problems and rhetoric of epistemology, history and methodology of science (as the doctrine of the organization of scientific research) are determined by the philosophical and methodological ideas of logical empiricism of scientists of the so-called "Vienna Circle" with the leader R. Carnap, K. Popper's falsificationism, P. Feyerabend's epistemological anarchism and, of course, T. Kuhn's concept of scientific revolutions.

Despite the well-deserved criticism that unfolded immediately after the publication of T. Kuhn's work (Masterman, M., 1970), his ideas became widely known far beyond the philosophy of science. One cannot disagree with the statement that "never before or since has a book on the philosophy of science had such an impact" (Kuznetsova, N. 2022, p. 73). T. Kuhn characterized the scientific revolution as a paradigm shift. Despite the inconsistency of the original definition of the term "paradigm", which was given by T. Kuhn, from his subsequent works it follows that the essence of *the paradigm is a fundamental idea in a certain branch of knowledge, on the basis of which theoretical positions and methods of solving problems are developed*. "The formation of a paradigm... this is a sign of maturity in the development of any scientific discipline" (Kuhn T., 1970, p. 36). To clarify the term "paradigm" in the 1969 Supplement, Kuhn introduces the concept of a "disciplinary matrix". The paradigm, along with the disciplinary matrix, provides scientific consensus in a particular branch of science. The presence of a paradigm and a disciplinary matrix suggests that the researcher knows a certain standard in the form of an idealized object and the laws of its existence. The researcher *knows* how to select an object, knows the elements that make up the object, their place, role and connections between them, as well as the parameters of the state of the elements and these connections. In other words, on the basis of the existing paradigm, the researcher ontologically interprets facts and

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formulates problems, and the presence of a disciplinary matrix presupposes a methodology for solving problems.

Similarly, when you assemble puzzles, you know how to assemble them, and you know that there is a "picture". If you couldn't assemble the "picture", it's your personal failure, not the "pictures". But you can't put together another picture from the available puzzles.

However, the world is not a puzzle. Unlike puzzles, the "picture" of the World exists in the mind of a scientist. And this "picture" may be inaccurate or erroneous. In this case, there are contradictions between the theory and the practice of its application, that is, an anomaly arises. And if there are many anomalies, the researcher has doubts about the correctness of the "picture". Therefore, it is necessary to change the "picture", that is, to change the paradigm. A paradigm shift leads to a rethinking of facts, a change in the understanding and interpretation of its properties, that is, to a change in the disciplinary matrix. For example, the change of the geocentric paradigm to the heliocentric one made it possible to interpret celestial bodies and their properties in a different way. Before Copernicus, there was the Earth and the wandering stars. Now we know that the Earth is a planet, the Sun is a star, and the Moon is a satellite of the Earth.

But regardless of the paradigm the researcher, first of all, must identify for himself the object that he is going to study.

For example, you want to study a certain creature that flies, has large beautiful wings, a small trunk, a pair of eyes, six legs, etc. It is this set of features that allows you to further identify similar objects in the world around you. From the standpoint of the methodology of science, a mental image of an object is formed in your mind as a set of many of its properties, signs. Such a mental image is called a "representation".

The matter becomes more complicated if you want to involve other people who have never seen such creatures in the research of these objects. Since we cannot transmit mental images yet, you must designate this object with the word (term), for example, "butterfly" and describe it in words.

To do this, you must identify the so-called essential features in your mental image of the object. Essential features are features, losing which the object ceases to be itself and which the object has in any case.

As a result of this mental work, you have to form in your head a certain idealized image of an object as a "notion". And then you have to describe this notion in words. That is, you have to formulate a definition of "butterflies in general". And then the definition becomes a linguistic formula or a short expression of meaning. For example, "A butterfly in general is an insect with two large wings that are much larger than the body. At rest, butterflies fold their wings behind their backs, showing their underside." Now you can be sure that my assistants will be looking for butterflies, not dragonflies or bees.

Note that in this case we are not discussing the question of the truth of this notion and definition. At different stages of scientific research and depending on the clarity of understanding of the object, the essential features and their hierarchy may change.

"Butterfly in general" is an idealized image. This is an abstract concept and it is intentionally devoid of details about real butterflies. The definition, as a linguistic formula, should describe a certain hierarchy of essential features of the object. In logic, this is called a "consistent narrowing of the scope of the concept." The hierarchy of features in the definition expresses the essence of the object and reflects the ontology of the object of study formed at the mental level.

Drawing up a notion and formulating a definition is a difficult task. There are many objects for which terms have been coined and there are many ideas about these objects, but which are difficult to define, for example, *being, time, space, love*. In these cases, techniques are used to somehow fix the object of study, for example, *description, characteristic, comparison*. Sometimes there is a notion, but it is impossible to define it. For example, if you are asked: "What is a dot", you will not be able to define it. This is a geometric image. You can only point to it. This is the so-called ostensive [from Latin. *ostensivus* - visual] definition. There is a special section in logic devoted to definitions, where, depending on the degree of maturity of the understanding of the object, definitions can be intensional and extensional, real and nominal, predicative and non-predicative, indirect, etc. (Pope, p. 1976). But since a theory is a set of statements that give a holistic view of the features, properties and patterns of existence and development, in order to create a theory, the definition of an object must be explicit, real and meaningful (connotative). In other words, such a definition should not only reveal the essence of the object, but also indicate the necessary and sufficient

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signs and conditions for the appearance and existence of the object. But the theory describes only an idealized object, the features, properties and patterns of which can be extrapolated to real objects.

Such idealized objects and their definitions exist in many branches of science that position themselves as general. For example, in astronomy, the objects of study are celestial bodies (a non-man-made object located in space), in cytology - a cell (the main structural and functional unit of all living organisms), in mechanics - machine parts (a part of the mechanism that is manufactured without assembly operation), etc. From the standpoint of philosophy and methodology of science, in order for the totality of information about systems to become a science:

- on the one hand, it must have an explicit, real and intensive definition of the idealized object "*system in general*", have its own disciplinary system paradigm and disciplinary matrix with ontological representations of the system, its own language and its own research methods;
- on the other hand, in order for the theory of systems to become general, it is necessary that the paradigm proposed by it, ontological concepts of the "*system in general*", terminology and methods have a universal or transdisciplinary character.

2| Problems of building GST

The principles of the existence of science "in general" discussed above make it possible to more accurately identify the problems in creating GST.

The first problem is related to a lot of definitions of the term "system". Soviet scientist V. Sadovsky, in his work "Fundamentals of the general theory of systems", published in 1974, cited 20 definitions known to him. About 100 definitions have been analyzed in the works of D. Day, H. Sellitto and their colleagues (Dori, D., & Sillitto, H. 2017. pp. 207-219). *The problem is that we're all talking about systems, but we haven't decided what exactly.* (this is a paraphrased statement by L.Robbins on Economics (Robbins, L. 1935, p.1).

The variety of definitions led to the fact that in 1979, the president of the Society for General Systems Research, Bryon Gaines, said: "A system is what we will define as a system" (Gaines, B.R. 1979, pp.1-9.). But this is an ostensive definition in the style of "anything goes" epistemological the anarchism of P. Feyerabend and it is not suitable for building the GST. Such a statement by B.Gaines and some other scientists is due to the opinion that the concept of "system" has a character of categories and it is impossible to give it a strict definition, such as "being" or "time" and can only describe the properties of the system. For example, J. Mobius suggests talking not about the system, but about "systemness".

In our opinion, the abundance of definitions is because the authors of the definitions are scientists-disciplines, that is, biologists, engineers, energy engineers, politicians, economists, etc. They studied objects that have already been called "systems", for example, the nervous system, the transport system, the management system, the financial system, etc. And when trying to solve the ontological problem, the mixed real objects called systems with an idealized "system in general". As a result, an extensive field of system-disciplinary approaches has been formed (Mokiy V.S., Lukyanova T.A., Mokiy M.S., 2016).

Another problem with the building of GST is the lack of an indication in the existing definitions of what exactly the constancy of forms or isomorphism should manifest itself in. Soviet academician P.K. Anokhin in the 70s of the last century wrote: "... the absence of a system-forming factor makes it impossible to establish isomorphism between phenomena of different classes, and, therefore, cannot make the theory general" (Anokhin P.K. 1973. p. 9). The absence of a system-forming feature causes another problem that the Soviet scientist V.N. Sadovsky identified it as a paradox of systemic research. Sadovsky's paradox sounds like this: "in order to correctly identify a self-organizing system, we must know the conditions and causes of self-organization; in order to understand these conditions and causes, we must identify a self-organizing system as a necessary moment for their theoretical study" (Sadovsky, V.N. 1974.p.194).

Therefore, systems science is at a pre-paradigm stage of development and, consequently, as J. Korn rightly notes, systems thinking is in an existential crisis. (Korn, J. 2018). But a crisis is a transition from one state to another and quantity must turn into quality. After all, systems science is still very young.

Realizing the temporary setbacks in this direction, a group of scientists from the Bertalanfi Center for the Study of Systems Sciences, led by David Rousseau, published a series of articles in a special issue of the

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journal *Systema: General Systemic Transdisciplinarity*. In these works, in accordance with T. Kuhn's views on science, David Russo and his colleagues proposed steps to create a general theory of systems as a system-wide transdiscipline, which includes;

- a General Systems Worldview (GSW)
- a General Systems Theory (GST*) that includes:
 - an ontology of systems that can be used to describe systems and classify them in an unambiguous way
 - models that characterize the kinds of processes that support the evolution, expression or degradation of systemic behaviours;
 - models of the mechanisms that underpin systemic evolution or systemic behaviour; (D., Wilby, J., Billingham, J., & Blachfellner, S (2016). pp 76-99).

Fully supporting the ideas of Manifesto for General Systems Transdisciplinarity and the call for "extend and refine GST*", we propose the following approaches for such expansion and improvement.

3|The GST System paradigm and Disciplinary matrix

The analysis of definitions from the standpoint of the theory of definitions, their classification and criticism deserves a separate work. We must to note the fact that the vast majority of researchers explicitly or latently use the understanding of the system, which was formulated by A. Bogdanov in 1913. "A system is a set of interrelated elements having a common (systemic) property that is not limited to the properties of these elements" (Bogdanov, A. A.. 1989. p.48). And also, the fact that the efforts of system scientists have revealed signs that can be attributed to the *system in general*. These are *elements, connections (direct and inverse), emergence, orderliness, wholeness, unity*. In works on system dynamics, actions and processes are indicated as an essential feature of systems, for example, in the works of Friendshuh, L. and L. Troncale 2012 (Friendshuh, L. & L. Troncale 2012). And as correctly noted "... systems do not consist of interacting components, but of actions that collectively generate a result. Before that, everyone was talking about the components of the system, not what they do" (Duran G.J.P. 2020.p. 17).

But what is the hierarchy of the highlighted features? And what is the system-forming feature and what is the system isomorphism? What makes a system "a set of interrelated elements having a common property that is not limited to the properties of these elements"?

For example, you took apart a watch and dumped the parts on the table. This is certainly a set of interrelated elements, if only because they lie on top of each other. But no one would think of calling this bunch of details a system. However, no one doubts that the clock is a system.

What makes a set of elements a system?

A collection of parts becomes a clock when they are connected in a certain order. This order allows the object to carry out processes or actions. The order in the form of a certain standard determines the meaning of each detail, their place and role in this system, determines the necessary number and properties of parts and connections between them. It is the order that ensures the unity and wholeness of the object called the "clock".

By the way, the term "system" is often used in the sense of order. In this sense, when we want to "systematize" something, we want to organize it. If something happens "systematically" we understand that it happens in a certain order.

Then order, as strict certainty in the arrangement, placement of something, is certainly a common essential and a system-forming feature *system in general* and presupposes elements, connections (direct and inverse), emergence, *orderliness, wholeness, unity*.

However, stating the order as a system-forming feature is not enough for the generality of the theory. For the general systems theory, it is necessary that the order be universal and transdisciplinary. Only in this case will we be able to study any object as a system, including the World itself. But this is already a philosophical worldview problem.

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About the system worldview

One should agree with Richard Mattessich's conclusions that starting with the works of A. Bogdanov and von Bertalanfi "... the systematic approach had a pronounced philosophical flavor, not so much because of its programmatic nature, but because it embodied many aspects of the holistic paradigms expressed in the philosophies of Lao Tzu, Heraclitus, Leibniz, Vico, Hegel, Marx, Whitehead, Drish and others" (Mattessich, R. 1982. p.29). The "flavor" of the holistic paradigm is present in almost all works that relate to the philosophical justification of the systemic approach and GST, starting with the works of Erwin Laszlo (Laszlo, E. 1972) and Blauberger (Blauberger, I. V.; Sadovsky, V. N.; Yudin, E. G. 1977) and ending with recent works, for example, (Hammond, D. 2017).

The concept of holism, holon and holarchy has certainly had a strong influence on the worldview of many scientists, including system scientists. However, holism is not suitable as the philosophical and methodological bases of transdisciplinarity, since it ontologically allows for different orders. The picture of the World from the perspective of holism looks like this. The whole world consists of elements-parts or holons. Each part or holon (in principle) can have its own interests, its own laws and order of existence and development. And if we want to preserve the wholeness of the object, we must look for a compromise. For example, I used to often quarrel with my wife about the order in my office. From her point of view, I have a complete mess, from my point of view, I have a working order. That is, we have different ideas about the order. Why did we keep the family? Therefore, we want to live together and make mutual concessions, that is, we are looking for a compromise. The construction of any mechanism is a search for a compromise between the desire of the designer and the physical properties of materials, if we want to preserve humanity, we must look for a compromise between countries, etc.

In the 2000s, Russian scientist V.Mokiy put forward the philosophical principle of *unicentrism* (Mokiy, V.S. 2009). The picture of the World from the point of view of unicentrism looks like this.

- The world is One Orderly Medium. That is, there is one world and there are no other worlds.
- All fundamentally possible objects are natural elements-fragments of a single world and a single order is manifested in all its fragments. Otherwise, communication between fragments will be impossible.

A fragment of the one, unlike a part of the whole, has no independent meaning outside of the one.

As, for example, one puzzle has no meaning and no independent meaning in the overall picture. That is, unicentrism does not allow compromise in principle. Agree that it's silly to talk about a compromise between the roots and leaves of a tree. The unity of the tree (as well as the unity of the world) is ensured as a result of the joint directed development of all fragments or their *co-evolutionary development*. (Moiseev, N.N. 1997).

In this presentation, these two worldviews contradict each other. But I should point out that philosophers have been thinking for a long time about the relationship between the One and the Whole. The idea of combining the one and the whole can be found in ancient Indian philosophy as the idea of the Absolute, which has the ability to reproduce itself in everything (The Basic Upanishads, 1954), the same ideas are present in the ancient Chinese philosophy of Taoism. According to Plato, the world is a collection of noumena and phenomena. Noumena are entities, ideas, or archetypes of real things. They cannot be seen or felt. Noumena are comprehended by the mind. Phenomena are the embodiment of the noumenon in reality. These ideas were developed by Neoplatonists, especially Plotinus (1956), and later by many other philosophers, for example I. Kant and G. Hegel.

These ideas do not oppose holism and unicentrism, but try to unite them. The synthesis of holism and unicentrism allows us to treat the World simultaneously as a One-Whole.

The paradigm and ontology of *the system in general*

Such a worldview position allows us to ontologically interpret the idealized object "*system in general*" as follows.

A "system in general" is an object in which the process of transformation of matter and energy, the emergence and existence of elements and connections between them occurs according to a single order and through which the wholeness of this object is ensured.

In this sense

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A single order embodies a systemic isomorphism and is a system-forming factor for any object studied as a system.

The main function of the *system in general* is the transformation of matter and energy in time and space. (By the function of the system, we mean its ability to perform the necessary actions for the transformation of matter and energy).

The statement of the simultaneous existence of the World as a single and whole determines the *systemic dualism*, according to which the *system in general* exists in two guises at once – as a kind of standard of the object (the one) and as its real embodiment (the whole).

That is why, for example, a telemaster can fix a TV. He knows the standard (as it should be) and looks for a malfunction and selects the necessary parts in order for the TV to work. In cases where there are no original spare parts, he is looking for parts that are more or less suitable in terms of technical characteristics. Note that the basis for finding this compromise is the presence of a standard. I cannot say now where to look for the standard of the World and what it is, but it must “be” from the point of view of the described system ontology. The establishment of such a standard is a matter of further research.

This understanding of the system generally makes the following necessary. As we noted above, a paradigm shift leads to a rethinking of the facts. In this regard, the use of the term “open system” cannot relate to a General Theory, because if the World is considered as a system, then what is the World open to as an open system? Other Worlds? This contradicts the paradigm according to which the World is one. The use of the terms “suprasystem” and “subsystem” is incorrect, since ontologically it implies different orders, which is impossible within the framework of the transdisciplinarity of the paradigm. It is necessary to talk about holarchy, where each holon can be considered as a system.

4| Symbolic generalizations and patterns of the *system in general*

The system paradigm outlined above as the basic idea and ontology of the *system in general* allows us to formulate symbolic generalizations and patterns of this object:

- The implementation of the *system in general* main function is possible when performing two functions – the function of system development and the function of self-preservation. In other words, *in order to carry out the transformation process and develop, the system must “be”*;
- The parameters of the main function specified in the standard set the parameters of the functions of the existence and development of the system;
- At each stage of this process, the following eight functions must be performed:
 - the function of constant analysis of the parameters of the external and internal environment;
 - the function of evaluating and predicting the consequences of changing parameters;
 - decision-making function;
 - the function of evaluating options for action;
 - action function;
 - the function of evaluating the result of an action;
 - comparison function with parameters;
 - the function of neutralizing dysfunctions.

Without these functions, no transformation process can be successful, not even the process of cooking scrambled eggs. The designated set of functions is a manifestation of systemic isomorphism. (The presented set of functions is an expanded classification of P.K. Anokhin's system functions modified in accordance with the information model of the unit of order of V.S. Mokiya (Mokiya, V.S. 2021. p.40-48).

But the functions themselves are not executed. This requires *a mechanism for implementing functions as a set of interrelated elements or a structure of system*. All the elements of the structure are formed from the so-called *basic elements*. The concept of a basic element is the key to this concept. *The transformation of matter and energy is carried out precisely by the basic elements of the system*. Therefore, *a change of the system's state is a change in the state of the basic elements, their number and the relationships between them*.

For example, if we consider the car engine as a system, then obviously the engine performs the transformation of matter and energy. But in fact, the transformation process is allowed to take place by the

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elements of the engine structure, consisting of parts as basic elements. A change in the state of the engine is a change in the state of the parts. If we consider humanity as a system, then the basic elements of this system are people and a change in the state of humanity is a change in the state of people, etc.

Ontologically, the *system in general* (both in the standard and in reality) represents a unity of functions and structure.

The development of the *system generally* takes place in accordance with the standard in time and space. At the same time:

- the implementation of the self-preservation function is expressed in the desire of the system to maintain qualitative certainty. Therefore, at each stage of the development of the system in accordance with the standard, the quantity and quality of the basic elements in the structure of the system and the connections between them are constant. In physics, this pattern is called the Le Chatelier-Brown principle, in biology, homeostasis, etc.;
- according to the standard, the parameters of the main function change at each stage of the system development. In accordance with this, the structure is optimized (complicated). The number and condition of the basic elements and the connections between them are changing, new elements of the structure appear. New elements of the structure appear by combining the basic elements. In physics, this principle is called the Hamilton principle. According to it, combining elements provides the least expensive way to perform functions;
- coevolution of development requires a strictly defined number of basic elements and the quantity and quality of matter and energy that they consume. These parameters are determined by the parameters of the target function of the system and provide the ability to control the state of the system at every moment of its existence;
- the transition to the next stage of system development occurs only when, in accordance with the standard, the number of modified basic elements and connections between them reaches a "critical mass". As a result, the parameters of the main function change and, in accordance with them, the structure of the system changes;
- deviations from the reference parameters are possible at each stage of the system development. In this case, the mechanism of neutralization of dysfunctions should ensure the return of the system state to the reference values. This happens by changing the state of the basic elements and the connections between them or by replacing them.

But the stated features and patterns of the object "*system in general*" will be speculative and hypothetical in nature, until their practical application is demonstrated.

5| Examples of practical application of the GST disciplinary matrix

Let's show how systems thinking looks from the perspective of this paradigm and ontology when studying objects of various natures.

1. Consider the human body as a system. In accordance with the GST paradigm, a single order manifests itself inside each of us, and as the philosopher Chilo from Sparta, who lived in the VI century BC, said: "Know yourself and you will know the gods and the universe." So...

- The human body is engaged in the transformation of planetary matter and energy continuously and throughout life. We can't give it up because we have to breathe, drink and eat.
- The existence of the human body from conception to death is a manifestation of a certain standard in time and space (now we are not discussing the question of exactly where this standard is located, but it exists).
- The basic elements of the human body as a system are the cells of the body. It is the cells that carry out the transformation of matter and energy. In this sense, a change in an organism is a change in the number, condition of cells and the connections between them.
- Various organs (brain, bones, skin and heart, etc.) are formed from cells at each stage of the body's development. as elements of the structure and the connections between them are established. As a result, the entire set of system functions is provided.
- The performance of systemic functions is possible only with the evolutionary development of all cells of the body.

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- The transition to the next stage of human body development occurs only when, according to the standard, the number of modified base cells and the connections between them reaches a "critical mass". As a result, a person from an embryo passes into the period of infancy, childhood, adolescence, adulthood and old age.
- The parameters of cells and the connections between them at each stage of development are determined by the organism's standard. These parameters determine the quantity and quality of cells in the organs, as well as the quantity and quality of the substance and energy consumed by them.
- Deviation from the standard is assessed by the body as dysfunction and, therefore, it requires the inclusion of a mechanism for the elimination of dysfunction. So, a single overeating will cause a gag reflex. Prolonged overeating or malnutrition, as a violation of the principle of determinism, leads first to a change in the state of individual cells, then organs and the entire body. Diseases or death of the body occur.

2. Consider the company as a system. It is an object that transforms matter and energy. The basic elements of this system are the employees of the company. The structure of the company is formed from the employees of the company, which performs the entire range of functions. Cybernetics and management specialists will see a complete correlation of system functions with management functions. It is easy to see that the parameters of the main, objective function of the company determine the behavior of each employee. If an employee does not meet the parameters, his behavior is unconventionally and a mechanism for neutralizing dysfunction is activated in the form of a fine or dismissal.

3. If we consider the country as a system, then the basic elements of this system are the citizens of the country. All the country's governing bodies and other organizations are formed from the citizens of the country, which carry out the entire set of functions of converting matter and energy from the formulation of the main function and its parameters to the elimination of dysfunctions. The development of a country is the development of its citizens. The country's transition to a new level occurs when the number of citizens with an altered state reaches a critical mass..

Conclusions

Thus, the proposed worldview position allows us to formulate the definition of "*the system in general*" as an object of GST study, form a systemic paradigm and designate the disciplinary matrix of GST as a branch of science. The postulation of a single order as a property without which systems cannot exist and as a system-forming property provides the required universality and transdisciplinarity of GST. This makes it possible to identify and explore self-organizing objects as systems from the atom to the universe. and, therefore, they cancel the Sadovsky paradox. For objects created by people, these patterns are a guideline for finding a compromise.

The isomorphism of order and its transdisciplinarity make it possible to use models of information, temporal and spatial units of order created within the framework of the methodology of transdisciplinarity-4 (Moki V.S., 2011) for research.

With the help of these models, it becomes possible to study systemic patterns in objects for which search and verification experiments are possible, and then extrapolate these patterns to objects and processes where conducting such experiments is impossible or very costly.

When solving multifactorial tasks, it becomes possible to interpret knowledge obtained using disciplinary methods from a single point of view and identify the relationship between objects and phenomena that cannot be identified using disciplinary research methods.

All of the above is a transdisciplinary concept of a systems approach (TCSA), that is, a theoretical scheme that sets a vector for creating a full-fledged theory of GST. There are many aspects (subjects of GST study), which need further research. But even in this form, the proposed concept will make it possible to significantly advance towards the goal outlined by L.F. Bertalanfi, namely "... he sees the main function of theoretical models in explaining and predicting phenomena that have not yet been investigated, and managing them." (see introduction) and give a new impetus to research in the field of system analysis, system design, system dynamics, pathology, etc.

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