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The specific theory of systems a new paradigm

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Abstract. The too general definition established by Bertalanffy L. (1968), has been used as the only system concept from 1968 to date and this led to the publication of many unscientific statements, which have never been verified with reality and which, nevertheless, continue to be accepted and used as a basis for reasoning and explanatory arguments from real situations. Here, a system definition is proposed that effectively replaces that of Bertalanffy and allows to explain in a logical, simple and practical way what systems are and opens the opportunity for new research and the rethinking of many concepts until now accepted in spite of its logical and methodological inconsistencies.

Keywords. System, structure, organization, social systems, living systems

Introduction

All the investigations that have been carried out since 1968 to date, in relation to systems, in all areas of scientific knowledge, have been based on a definition of a system established by (Bertalanffy L., 1968). In the best of cases, the researchers have declared that their work is based on this definition, in other cases, the researchers have only taken the concept of system as something known and understood and have elucubrated about its properties, its behaviors and application, without having mentioned in their writings, what is the concept of system that they are using as the basis of their inferences and affirmations. This has led to a large number of inaccurate statements about systems, in which terms such as: relationship, structure, organization, emergent property and several others are used to try to explain how and why a system is created and behaves as such. Likewise, it has been incorrect to apply the concept of a system in the study of complex fields that are not precise and stable, such as living beings or electromechanical systems, when research has been done on the systems that make up a company or on social systems, the imprecision of the basic concepts used has led to the enunciation of absolutely impractical, inconsistent, irrational and absurd systemic interpretations of how, for example, a company is integrated or how and why social systems behave in general.

In this work, the concept of system is demystified, a complete and coherent definition of systems is proposed and its application is illustrated based on simple examples from nature and human reality.

Traditional view of systems

Capra F. and Luisi P. (2014) consider that at the beginning of the 20th century biology maintained a mechanistic view of life and although much progress was made in understanding cellular structures and functions, they still did not see the coordination activities that integrated operations to achieve functioning as a whole. Organicist biologists, these authors point out, affirmed that the missing key element had yet to be studied: the “organization” or the organizational relationships between the elements that make up a cell.

Capra F. and Luisi P. (2014), also comment that Ross Harrison (1870 - 1959), part of the organistic school, identified the configuration and the relationship as two important aspects of the organization that he later integrated into what he called “organization pattern”. It is important to stop and clarify that these authors use the concept of organization very broadly without adhering to any definition that could clarify what type of concept or property they are describing. For this reason, until now, organization gives the idea of an order or mechanism of action that coherently combines cellular functions to generate results or products of the cells as a whole.

Capra F. and Luisi P. (2014), also refer that Joseph Woodger (1894 - 1981) stated that organisms could be fully described based on their chemical elements and their organizational relationships and that an important property of life is the tendency to form multilevel structures of systems within systems, each of which forms a whole with respect to its parts and at the same time is part of another whole.

In the previous paragraphs, the authors talk about systems and some of the properties or characteristics that suggested their different nature when they are considered as organized wholes that generate results or products, based on the relationships and organization that exist between their constituent elements. But no clear and specific definition of any of these concepts is presented. According to Capra F. and Luisi P. (2014) the essential properties of an organism or living system are properties of the whole that are not present in any of its parts and that arise from the interactions and relationships between those parts. In addition, they comment that these properties of the whole disappear when the system is separated into its parts.

From the above, two very important concepts are established, the first, emergency, which establishes that the system has results and properties that are not observable in any of its parts and the second, perhaps even more important, that a system only exists when there are actions within it, that a dead organism is no longer a system. It is worth noting that, in 2014, the concepts that support the behavior and functioning of systems are still vaguely handled, it seems that scientists say: it is something related to the organization and the relationships between its parts, whatever "organization" or "relationships" could be.

Bertalanffy L (1968), is recognized as the initiator of the modern era of systems, according to the concepts that he proposed in his book and that gave rise to what is known as: "The General Theory of Systems" (TGS). In this book, Bertalanffy includes a definition of a system: "Complex of interacting elements" (Bertalanffy L., 1968, p. 56), is a too general definition that can be applied to anything, artifact, living being, set of beings living, organisms and everything that one can observe that exists in the world around us. This definition defines everything that exists and therefore does not define anything, this is the first problem we encounter when we want to use the Bertalanffy definition to identify a system.

Bertalanffy, however, uses interaction as a distinctive element of systems. Everything, according to him, is derived from the interaction between the elements that make up the system. But it is necessary to make the following observations to this statement by Bertalanffy: Interaction means that some elements act on others and these on others and perhaps others on

the first, in complex networks not analyzed, not even outlined in a general way. The interaction does not turn out to be something that describes the systems, as long as what it is cannot be explained.

Bertalanffy also establishes that interaction means that the elements are related in a different way R to another R' , where they behave differently. From the above it follows that interaction is synonymous with relationship. For Bertalanffy, two elements interact just by being related. Again the concepts of relationship and interaction are vague and imprecise and yet they are taken to generate a mathematical model of the systems. Bertalanffy proposes a system of differential equations as a means to study the behavior of systems, which are also based on variables that represent "some magnitude", whatever that may be, of the elements of the system. Given so many imprecise concepts, it is difficult that these mathematical models could have been used to study a specific system and obtain valid results. Likewise, the mathematical isomorphisms that Bertalanffy analyzes study properties of certain specific types of systems that are in no way generalizable to all systems, which would be one of the essential objectives of a General Systems Theory.

The confusing handling of the essential concepts that describe a system and not clarifying the meaning of them with a precise definition, leads us to think that Bertalanffy did not have a clear and deep knowledge of the systems and that many of the statements that he includes in his book are really speculations and not inferences based on actual observations. The only thing that can be rescued from the TGS is the idea that many phenomena should be studied as a result of a coherent whole in which the parts participate and combine to obtain joint results that cannot be obtained in any other way. This gave way to the use of a holistic approach in the study of the phenomena in which interacting parts intervene.

However, despite the defects and inaccuracies of the TGS, the definition of the Bertalanffy system has continued to be used up to the present time, with some additions to make it more representative of the concepts handled in the various specialties or specific fields of study.

Perez G. (2020) carried out a careful review of the publications on systems from 1968 to 2010 in search of a more precise definition of what a system is, which could replace the one established by Bertalanffy in 1968, but could not find any. All the authors consulted either did not include any definition of a system in their articles or proposed one that was basically the same as that proposed by Bertalanffy with some added concepts, which did not modify the original meaning or add greater clarity or detail in the description of what a system is. The most frequent case found was that the authors refer to systems, simply as systems and they analyze, discuss and argue widely, without specifying, never, what is the concept on which they work and of which they affirm many properties, characteristics and behaviors.

As an example of the above, we can mention the case of Boulding K. (1956), who develops a broad argument in favor of the TGS as a theoretical frame of reference that allows communication between different specialties and thus learn from each other. Boulding never establishes what a system is, nor does he describe precisely what part of the TGS he uses as the basis for his claims. Boulding K. (1956), despite his general approach, manages to point out that each specialty studies various "individuals" such as: electrons, atoms, molecules, viruses, cells, animals, plants, families, tribes, corporations, and more. and that they exhibit behavior, action, and change.

Boulding comments that each individual is made up of a structure or complex of individuals of an immediate lower order, molecules are an arrangement of atoms, cells are an arrangement of molecules, and so on until reaching the broadest and most complex. Without

having an exact idea of what a system is, Boulding affirms that the behavior of these systems or individuals, as he calls them, depends on the structure and the arrangements that are generated between the lower-order components. This author confirms that the structure has something to do with it, although he does not specify what he means by structure or arrangement.

Sillitto H. et al. (2017) They reviewed around 100 definitions of what a system is and came to the conclusion that they all have something in common but that there are also great differences in approach. Therefore, these authors propose the TGS as the adequate theoretical framework to accommodate and observe the various variants of the system definition. By making this recommendation, these authors are tacitly accepting that Bertalanffy's definition is adequate and that it remains in force after 50 years, despite being too general and identifying anything as a system.

Sillitto H. et al. (2017) support two system definitions:

1. INCOSE “an integrated set of elements, subsystems and assemblies that achieve a defined goal. These elements include products (hardware, software, firmware), processes, people, information, techniques, facilities, services and other support elements.

2. ISO / IEC / IEEE 15288. Combination of interactive elements organized to achieve one or more stated purposes.

The first maintains the basic idea of the Bertalanffy definition, since it considers that the system is an integrated set of elements, but adds subsystems and assemblies, which are only part of the world of systems engineering, which is the specialty that groups together INCOSE members. The big problem arises when they describe the elements that are, from computer programs, to computers, people and everything in a company. This definition encompasses so many concepts that it almost seems to be defining what a company is and not what a system is. In that vast set of things there are a lot of systems and other conglomerates of elements that are not. Frankly, it is a postulate that cannot be taken as a definition of a system, neither in the specific field of systems engineering nor in a general way.

The second is again Bertalanffy's definition, but it is added that the elements are organized and although it does not define the meaning of organization, we can take the popular meaning of the word and accept that they function in a pre-established and coherent way.

The most important of these two definitions is that they state that the system has one or more pre-established results and that everything is organized and works to achieve those results or purposes. This element is new and was not considered by Bertalanffy L. (1968) in the original definition of it and as it will be seen later it is a very important part of any system.

However, in these definitions there is still a high degree of imprecision, in the ISO definition, it speaks of interactive elements, which suggests that the elements act on each other and vice versa, but it is obvious that there is no clear idea of how that interaction is and it is left to the imagination how it can be. They are vague and tentative definitions of something that is unknown, so that they can be applied in any circumstance. The functioning of the system is left at the level of interaction since almost all things that exist in nature interact in some way and thus it is achieved that the definition adapts to any situation raised by the researcher in turn.

Dori D. and Sillitto H. (2017 b), recognize that in previous decades an acceptable definition of a system has not been proposed. They analyzed about a hundred system definitions and found important ontological differences. The foregoing confirms that, at least until 2017, there was no clear, coherent and general definition of what a system is. This, they claim, prevents communication between different communities that use the concept of system as the basis of their theoretical framework. The above confirms that the TGS is not a clear and solid theoretical framework for the study of systems and that there is not yet a correctly ontological

definition of what a system is and everyone works with systems in a very general way, thus much of what is discovered in the different fields of expertise, is derived from the concrete observation of facts and behaviors of particular phenomena and the concept of system only serves as a reference to keep in mind the importance of the holistic approach and the interaction of the parts.

Dori D. et al. (2020), conducted surveys that revealed at least seven different views about what a system is. Based on their research, these authors propose a "complete" definition of the system, which, according to them, can be accepted by those who have different worldviews in this regard. The definition they propose is: "Arrangement of parts or elements that together exhibit a behavior or meaning that the individual components do not have." Again they use the basic definition of Bertalanffy L. (1968), since it establishes that a system is made up of parts or elements, although they add the emergent property as a characteristic of the systems. However emergent ownership remains a vague and imprecise concept. Forming a set is already an emergent property that individual parts do not have, group behavior cannot be found in isolated elements either, but what is called behavior, the interaction between the parts? to the end result? This definition is still as imprecise as the many that are used in the systems literature.

All the theoretical and practical research that has been carried out with something that is considered a system as an object of study, has been carried out using, as a frame of reference, some general and imprecise definition of this concept. Researchers have analyzed the implications of fuzzy and imprecise attributes such as: interaction, interrelation, organization, behavior, structure, emergence, process and results and this has led to the explanation of causes, consequences, effects and properties, with arguments that may not be clear or invalid and give rise to imperfect or incorrect theoretical statements.

Maturana H. Varela F. and Benhnchke R. (1984) mention that the organization are those relationships that have to exist or have to occur for systems to exist. They describe as an example that, to judge an object such as a chair, it is necessary to recognize certain relationships that exist between parts called legs, backrest and seat, in such a way that it is possible to sit on it. The example is not clear enough, but like Bertalanffy (1968) these authors affirm that the organization is given by the relationships between the components, which we will see later is not the correct thing to do. The organization is defined based on the actions or functions to be performed and the relationships are the basis for communication and other transfers between components. Which, we will see, constitutes the structure.

Also (Miller J., 1978) considers structure as an important characteristic of systems and defines it as the arrangement of its components and subsystems in a three-dimensional space at a moment in time. He cautions that this arrangement continually changes over time, although sometimes if the situation calls for it, it can remain relatively fixed for a long period. He adds that the structure is observable when it is stable but that the spatial organization of its parts is the structure of the system, although it changed quickly. Miller states that his definition recognizes that information and structure are connected and the latter is a complete set of relationships. This is all a bit tangled.

It is relevant that all the authors who are considered to have been relevant in systems research have agreed to handle two basic concepts as an explanation of holistic or systemic behaviors, these concepts are: Structure and Organization. In the previous paragraphs we have seen that they are mentioned by some important researchers in their arguments, although they use them imprecisely, possibly because they infer their existence as part of the systems they

study, but they cannot discern either their essence or the participation that have in achieving the end results of such systems.

As a conclusion to all the above, the following can be expressed: The concept of the system that has prevailed since its study began has been that of a conglomerate of components that act in a coordinated manner and that generate some common result derived from joint participation. . The definition of a system has remained vague and imprecise, however, the concept of considering all the components of a phenomenon and studying them together, opened the doors to a holistic interpretation and thus led to a more complete understanding of behavior of all those entities or events that seems to have the accepted characteristics of a system.

Knowledge about systems advanced thanks to the fact that various scientists carried out research on specific systems or on specific types of systems and in this way they managed to observe their behavior in detail, discover what components they were made of and what were some of the interrelationships that supported their operation. . On the results of these particular observations, some inductive inference attempts were made to try to establish general principles applicable to all systems.

These attempts faced two limiting conditions that prevented their generalization, their adoption in other specialties and their application as laws or general principles of the systems. The first was that the systems studied initially were the existing systems in the specialties related to biology. Living beings are made up of exactly designed, strictly organized and complete systems that work perfectly, effectively and efficiently. In our world, on the other hand, there is a great variety of systems ranging from those that are similar to biological systems, to those with a precarious or variable organization, minimal and flexible designs, and heterogeneous results, all on a gradual scale. with infinite variations. For this reason, observed and documented behaviors for biological systems can hardly be extrapolated to other systems that do not have the functional perfection of the former.

The second limiting condition was that what was attempted to be established as general principles or laws of the systems, were behaviors observed or inferred by inductive reasoning, but that manifested themselves in specific systems belonging to some technical or scientific specialty, in which they participate, normally natural systems. Because they are behaviors and not essential aspects of systems, these behaviors almost always turn out to be specific to the specialties studied and there is no way to generalize them to all specialties and all systems.

As an example the case of MacG. A et al (2014) can be cited. These authors compiled 30 propositions that are behaviors or characteristics of the systems and considered them absolutely general, that is, they can be observed in the operation of any system. Grouping them artificially, they determined seven groups which they defined as axioms that, according to them, constitute a fundamental body on which a Systems Theory can be built. The problem is that the propositions collected by these authors are clear, specific and characteristic only in some systems. Certain systems show some of these characteristics and other systems allow us to clearly observe some others of them, but it is almost impossible to find a system that manifests them all clearly and unequivocally. Therefore, if they are not generalizable in a simple and obvious way, such propositions cannot be the basis of a general and universal Systems Theory.

Systems ontology

Definitely, the essential principles of systems cannot be found in concepts that derive from their observable behavior, since each system according to its purpose will have a different configuration and operation. It will also relate differently to its environment and therefore it will manifest behaviors and characteristics different from other systems.

What is possible, and this is something that all existing entities in our world have, is to determine the ontological essence of any being that exists physically. Systems are exactly that: entities that have a physical existence and can be observed and therefore must have an essence that distinguishes them from other types of entities.

Researchers who have dedicated themselves to the study of systems have managed to get closer to the essence of systems and have managed, in isolation, to identify some of the constitutive elements of the systems that are found in all of them and, therefore, are general and they are part of its essence. However, these findings, being isolated, have not, to date, been correlated and integrated as part of the ontological nature of systems.

In the literature on systems there are references to the fact that the systems show organization, as a synonym for the fact that the different parts that the systems seem to have work individually, but coherently and this keeps the systems working and achieving their inherent purpose, since the systems exist for something and everything in them is oriented to achieve it. From this, three conclusions are drawn: systems have components, organization and purpose and these characteristics are general and therefore essential and attributable to any system.

However, it is necessary to specify the meaning of the three words that seem to correspond to three essential characteristics of the systems. Let's start with the components, it is the classic concept that describes the main ontological characteristic of the systems, it is the only element considered in the definition of Bertalanffy (1968), although this author mentions it only as something that is part of a conglomerate and that interacts with other components. From this it is possible to deduce that the components generate actions of some kind because they act, according to Bertalanffy's definition. So the components of a system are entities that generate actions, they are not inert, these actions are what give life and existence to the system. They are those that somehow intervene to achieve the purpose that characterizes the system.

All purpose seeks to achieve something, purpose is similar to finality, what is sought in the end. Therefore, the purpose of a system will necessarily be obtained as a result of the actions of the components, since these are the only elements of the system that produce changes and are capable of generating something different that is not found in any of the components. By combining the actions, a concrete and identifiable result of the system is generated, something new resulting from the changes generated by the actions. This is the concept of emergence that many authors use as a distinctive feature of systems. The result is something that did not exist before in the system, the actions create it.

If there is an expected result, then the actions carried out by each component have to be exactly those that said result requires and not others, therefore, the actions are not random or isolated, they obey a previously established purpose. The actions respond to an organization, also pre-established, which determines what actions each component has to carry out and this fully coincides with the traditional definition of organization: the prior determination of what each of the participating entities must carry out in order to achieve a expected result. This is the third essential characteristic of a system: having an organization that establishes what actions each component has to perform.

The analysis carried out so far has made it possible to extract three essential characteristics of the systems: result, organization and components, but it is necessary to explore other concepts detected by the researchers, for example, several of them point out that the systems have a structure and link it with the interrelationships that exist between the components. Miller J. (1978) establishes that the structure is the spatial distribution that the components of a system have at a certain moment and points out that it is constituted by the

interrelationships between them. The systems studied by Miller were living systems and are very complex so that their organization and structure can change rapidly over time, but despite this the concept of structure is very clearly established by this author. Miller also determined that the structure is used as a medium for the exchange between the components of: energy, matter or information. The structure can have all imaginable configurations according to the needs of the system, it is always composed of different interconnections for each of the objects that are transmitted through it and all three, two, or one can be present.

All action requires energy to be generated by some component, these, transform the energy into actions. Therefore, every system needs to have as an essential part of its nature some type of energy that feeds the components. Energy is then an indispensable element of all systems and must be considered in its ontological description. Energy is also transmitted between components and when this happens it can also have the purpose of coordinating actions in cases where they are required to obey an automatic sequence or consecutiveness. The energy is transmitted from one component to others, the structure is used for this, which is, as already said before, the network of connections that allow the flow of energy, matter or information.

Something that should be clear is that the components only generate actions, of many types: physical, electrical, electromechanical, chemical, physicochemical, biological, electrochemical and of any other type that may exist in nature and so that there may be a specific result of said actions, they must be conjugated in some way congruent with the expected result. The sequence of actions based on a specific combination of them is called a process, then every system must have a pre-designed process that allows the actions to be combined in such a way that they produce a pre-established result. The process can consist only of the combined actions and in that case, the result or product of the system are new joint actions that will manifest as an action produced by the system as an integrated whole. This means that there are systems that produce only joint actions or system actions. The set of actions of the components is conjugated and a system action emerges. The example that can be used to illustrate this type of behavior of a system is the shoals of herring: each fish is a component of the system and performs congruent actions so that the system moves as a whole, that is, it performs actions as a system.

In other cases, the actions of the components are applied to a matter or material that comes from the external environment of the system and that are transformed, in some way that turns them into an expected product. There are systems with very simple processes and others with extremely complex processes such as those that can be found in those that are part of living beings. So the process that generates the result is an essential element that is part of all systems.

Finally, the result or product of the system, both words should be considered as synonyms that refer to the same object, it is also an element that characterizes the system and is part of its essence. A system cannot exist if its product does not exist and this can be a material object or an action. Ontologically it can be established that the product is an essential part of a system, without it the system cannot exist.

Finally, by putting together the elements that were described in the previous paragraphs, it can be established that a system is an entity composed of the following essential elements:

a. Components. Systems are made up of a set of components that perform consistent and predetermined actions.

b. Structure. The systems have a structure made up of interconnections between the components that allow the flow of matter, energy or information.

c. Organization. The systems have an organization that establishes the actions to be carried out by each component.

d. Process. The systems work based on a process that establishes the way to combine the actions of the components in order to obtain the final expected result of the system, which can be actions or material objects. The processes can receive inputs that are transformed into material products of the system and if they do not receive them, then the results of the system are actions.

e. Products. They are the results obtained from the process, which can be actions or material objects.

f. Energy. The systems use energy to generate the actions carried out by the components, which can be received from the external environment or generated by the system based on materials also obtained from the external environment.

The conjunction of each and every one of these elements is a necessary and sufficient condition for the entity that contains them to be a system. In other words, an entity is a system if and only if it contains all the elements mentioned above. This way of defining a system is clear, specific and consistent, so that it allows distinguishing a system from a simple conglomerate of components, which may contain some of the elements, but not all.

The first conclusion that can be obtained from this last definition, which we will call from now on the Specific Definition of Systems (SDS), is that the definition established by Bertalanffy L. (1968) is incomplete, as are others that have been derived from it and all those that have been published in the bibliography that was reviewed to carry out this work and that now here, a general but discriminating definition is proposed, which allows a better study of the systems and opens the possibility of reviewing many of the claims made by published researchers on the subject of systems. We will call the theory that is developed from this definition, called Specific Theory of Systems (STS), to differentiate it from what specialists in the field call the General Theory of Systems, which is clearly inadequate and obsolete to the light of the new concepts contributed by the STS.

Theoretical analysis

The above does not mean that all the discoveries made about the systems, their behavior and their theoretical supports are incorrect, since they have been obtained from the scientific study of the behavior of certain specific systems, what can be affirmed is that the STS at Being truly general, as well as being clear, complete and specifically applicable to systems, will make it possible to locate all these results and conclusions within a coherent and logical theoretical framework, solidly supported. On the other hand, it is certain that many concepts will have to be rethought as they were established with theoretical bases with little consistency and rigor.

Bertalanffy's definition so broad and not very rigorous, allowed a great amount of speculation and led to consider as systems, concepts, objects and entities that are not and on them many pages were written that did not contribute to scientific knowledge and that contain all kinds of affirmations impossible to be contrasted with reality.

The first concept that needs to be discarded and that was initially proposed by Bertalanffy (1968) and confirmed by Miller J. (1978), is the existence of abstract systems and conceptual systems. It is impossible for abstract or conceptual systems to exist, since the abstract is not part of the physical reality of the universe and only exists as an idea in thought and conceptual is something similar. There cannot be a system whose components are concepts, because in concepts there is no action. In these so-called "systems", there is no energy, no result, no structure and much less process, in short, they do not meet any of the requirements that a true system should have.

As mentioned before, many authors speculated and wrote many pages without having established what they were talking about and what they discerned. They never included any definition of a system in their writings, and yet they argued extensively on properties of systems and on various possible applications of the concept. It is entirely possible that in all these writings there are wrong and invalid statements and conclusions that have surely diverted other subsequent investigations from their course. For this reason, it is necessary to carefully review all the accumulated knowledge about the systems and rethink everything that cannot be supported theoretically or contrasted with reality.

One of the cases that draws attention is that of Niklas Luhmann and his theory of social systems, since he never clearly established what a system is for him and less what a social system is, and yet he spoke extensively about them and elaborated a large number of statements in often obscure and unintelligible language. Luhmann (1998) establishes: "a social system is not made up of people, but of actions (Luhmann N., 1998, p. 140)" but he also affirms that action is constituted by means of communication and that actions are the elements that the system produces and we must understand, then, that actions are not constitutive elements of the system but its consequences. For this reason, the question arises, what are the components or elements that make up a social system? Luhmann (1986) states: "Social systems use communication as their particular way of autopoietic reproduction." Its elements are communications that are recursively produced and reproduced by a communications network and which cannot exist outside of this network (Luhmann N., 1986, p. 172) "with this, it is possible to confirm that Luhmann considered social systems integrated by communication as fundamental elements, but in various publications, he points out that social systems are made up of communications and the actions that derive from them, since they are inseparable. Luhmann does not really pronounce in a definitive, clear and forceful way about the ontological nature of social systems, in some publications he affirms that human beings do not belong to them and in another he integrates them because they are the producers of actions.

The main problem with Luhmann's theoretical concepts is that he based his entire analysis of social systems on communication and if properly interpreted, communication constitutes only the structure of social systems, therefore, it ignores all the other elements that are part of a system, according to the SDS definition that was postulated above. For this reason, possibly a large part of the conclusions that Luhmann establishes about social systems are untenable, since they start from false premises.

Generality and validity of the STS

The definition of the system that constitutes the theoretical and conceptual basis of the STS allows us to describe and study all the existing systems in our reality. Natural systems, that is, those that were created by nature have been, perhaps, the most studied. Among them are those that support life and are found in atoms, cells, organs and organisms in the animal kingdom and similarly those that support the existence of life in the plant kingdom.

As an example from the animal kingdom, the human being will be used. Human beings are a system whose components are organs, its structure is composed of two types of interconnection, the circulatory structure constituted by veins and arteries that allow the transmission of matter and the nervous structure that allows the transmission of energy in the form of electrical impulses, also called nerve impulses. The components of the human body, the organs, function based on an organization that establishes the actions that each of them must carry out. The energy that the human body requires to function is generated by its own cells based on matter obtained from the outside that is transformed by metabolism. The human

organism lives thanks to a process that combines all the actions of the components to achieve a result that is to keep us alive. This is the fundamental system of a human being and here we have described it very succinctly, all the components perform very varied and complex actions and as in all living beings, the structure and organization are changing, although the result is maintained. The human being has many other systems that allow him to perform physical and intellectual actions and that require an interpretation that is best made by specialists in biology or medicine.

Another natural system is the solar system, its components are the sun and the planets, its structure, that is, the connection that allows the flow of energy, is formed by gravitational attraction or the deformation of space caused by it. The organization determines the actions generated by the components, they are attractive forces, some stronger than others, but mutually affecting all of them, they also exert a centripetal force caused by the curved movement of their orbits in constant balance with the force. attraction of the sun. It would seem that the structure, the gravitational attraction is confused with the action, the attractive force, but it is not like that, the structure is universal, it is a property that mass has and the attractive force is particular and its size depends on the mass. . Energy is the kinetic energy that the planets have and that which generates gravitational attraction. The process is the way in which actions are combined to keep the planets orbiting around the sun and the result is to keep the solar system running.

Other surprising natural systems are those in which living beings that act together intervene, in a sense they are social systems, since the result is obtained as a consequence of the congruent actions carried out by a large number of individuals. The first case that is worth analyzing is of the ants that eat leaves, it is known that some of them go out and find food and return and communicate it to others through pheromones and all continue to do the same as they return to the colony, they inform of the purpose and the route to which are leaving the colony or are on the road.

The animal social system, which we will call it that way to distinguish it from those made up of human beings which we will only call social systems, has components that are ants, it has an organization that is already integrated into its brain that determines what actions each should carry out, has a structure formed by the connections that they establish with their antennas and with which they exchange matter (pheromones) and information. Energy is generated by ants based on the matter they use for food. The process is also predefined in their brains and establishes how they must combine their actions to achieve the result of supplying the colony of leaves and they do it on the way to and from the colony. The result is to keep the mushroom hatchery they feed on, stocked. Ants have other social systems to achieve other results, but I will leave their analysis to the specialists.

Natural systems are of a different nature, some are the sustenance of life and their components carry out very complex actions of a chemical, biochemical, electrochemical type and others that my lack of knowledge does not allow me to describe correctly, but in general they are very complex actions. Other natural systems function based on physical actions, such as the solar system. There are those that work based on physical actions combined with chemical and electrical actions. There are also animal social systems of many kinds, some more controlled than others. And many other types of natural systems.

Systems in general and therefore also natural systems can be classified in various ways, by the type of actions carried out by their components, by their processes, by their structures, by their results, by their essence and other forms. It should also be noted that in order to identify in the systems the elements that are established in the Specific Definition of Systems (SDS), it is necessary to use their meanings or basic behaviors that are really generalizable. For example,

when we think of actions in common situations of our existence, we always think of physical actions, which we perform directly with our body or through the use of tools, however we have seen that there are components of systems that perform other types of actions. The concept of action that is handled in the STS is: any use of energy that produces changes. Something similar happens with the concept of structure, every day we think of structure as something rigid and strong that holds heavier objects in balance, its real meaning is: something that connects any two or more elements. Most often it is a network of connections and a connection is a medium that allows the flow of matter, energy or information. These clarifications were necessary to facilitate the systems analysis.

There are other systems that we will not call natural, because they are created by man. The best known of these and those that are closest to our daily experience are the mechanical systems in which mainly physical forces participate and the electromechanical ones that combine physical actions with electrical ones.

However, the human being is capable of building much more complicated systems in which chemical, electrochemical or nuclear actions intervene and perhaps also other types of actions that escape my immediate perception, but that have never reached the complexity and variety of the actions that participate in natural systems. Either way, human-created systems exist in a wide variety, ranging from simple to complex. Some human systems, such as computers, show characteristics that are normal in natural systems and exceptional in human systems, such as the variable structure and the existence of components that generate different types of action according to the needs of the system.

When the human being builds a system, always part of the result or product that he wants to obtain, then he designs the process that is needed to obtain that result, then he designs the components that can perform the actions that the process demands and the structure that will allow the operation of said components or the exercise of control, concomitantly with all of the above determines the energy and inputs that will be required. All this is done by the human being based on a fundamental characteristic: intelligence, only intelligence is capable of defining the organization, the structure, the energy required, the inputs and the process necessary to obtain a predetermined result or product. Components, structure and process are never designed and put into operation to see what is obtained, human systems are preconceived. On the other hand, the origin of natural systems and the procedure followed in their creation is still uncertain and the subject of many controversies. As interesting as the subject is, it is beyond the scope and intent of this work.

Among all human systems, the human social systems stand out, which we will simply call social systems, whose main characteristic is that their components are human beings. Their organization can be previously determined and the participants are required to carry out exactly the actions that the organization has established for them, in which case they will be rigid systems in which each individual is a simple executor. The process can also be completely designed and the participants in the system will stick their interventions to the times and sequences that it establishes.

Human beings, as already mentioned, have intelligence as part of their basic capabilities and with it they can create suitable organizations and processes according to changing circumstances or unexpected events. The human being analyzes the situations that arise in the system, makes decisions, determines the appropriate actions and performs them in a coordinated and congruent way with those carried out by the other participants and jointly the appropriate process is generated to achieve the pre-established result.

From absolutely rigid social systems and based on the degree of autonomy that human beings are allowed to participate in the design of the organization and the process, a wide range of social systems is generated that ends in fully flexible systems. , in which human beings have total control of the organization and the process, in them, each individual has the freedom to use their intelligence to analyze the situation, decide the actions to take and how they should participate in the process that will lead to get the expected result.

In a social system, the components are human beings who carry out physical or intellectual actions that they generate by decisions based on the analysis they carry out of their environment, the information they receive, their knowledge and their will. The structure of the system is constituted by the link that the human being establishes with his environment through his senses. This link establishes the communication of the human being with his environment and allows information to flow, almost always supported by energy.

So it is communication that really allows the flow of energy to our senses and also the connection that constitutes the structure of social systems. The communication we have through our senses allows us to receive intentional information from other human beings or obtain it on our own, voluntarily determining what we want to perceive. For this reason, in social systems the structure is variable. Communication is not to be confused with information, communication is the link that allows human beings to obtain information.

The energy of social systems is generated by human beings based on their diet. The process can be, as already mentioned, rigidly established or freely designed by the human beings participating in the system, and between these extremes there can be many combinations of restriction and freedom in the influence of human beings on creation. of the process in a social system. Obviously the result has to be clearly specified or the information and actions will not make sense.

Conclusions

The analysis of studies and research carried out throughout the history of the General Theory of Systems reveals that many statements have been made about systems, their anthology and their properties, with little theoretical support, which has generated a very large of false conclusions, vague or of very little practical use.

Much research has inadvertently drifted toward claims that, although they seem logical, are based on assumptions that are not solidly grounded in rigorous theoretical concepts. Despite this, the study of specific real systems has allowed us to discover some laws, properties and characteristics of the systems that have managed to be exported to different areas than the one in which they were initially observed and this has increased the knowledge of the systems and their nature. However, there are many concepts and results that must be analyzed in the light of the Specific Theory of Systems that supports a congruent and totally generalizable definition of a system, and describes them in a rigorous way. With the new elements provided by the STS, it is clearer to observe them, identify the phenomena that occur, the different elements that make them up, and obtain clearer principles that help reason, explain their behaviors, predict their results. and above all to the design of new systems.

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