TECHNIUM
SOCIAL SCIENCES JOURNAL

Vol. 8, 2020

A new decade for social changes

www.techniumscience.com

ISSN 2668-7798

9 772668 779000

On the essence of systems in general and social systems

Gustavo de Jesús Pérez Durán

Universidad Autonoma de Guadalajara, Mexico
gustavo.perez.g@gmail.com

Abstract. The concept of system has been the basis for deepening the analysis of many natural, mechanical and social phenomena. However, its applications and developments have been based on a very simple definition: complex of interacting components; on which free and imaginative interpretations of the meaning and nature of the components and interaction have been used. The exaggerated and lax use of the concept of system has not only led to many false conclusions, but it has deteriorated its true value and usefulness. In this paper a stricter definition arises and accurate picture of what is a system, in order to limit its application and constrain its use to those phenomena that contain the elements that make up a system and its application is analyzed in the study of systems created by human beings, social systems and natural systems.

Keywords. system, social system, natural system, organization, connection, action

1. Introduction

All the events that occur in the world we live in, have only two possible origins: either they are generated by a natural phenomenon or they are generated by some living being, whether primitive and simple or evolved and complex. Of all the phenomena or events that occur on earth, those that are of interest to sociology, are the facts caused by the human being and henceforth the term "fact" will be used, as the denomination of the events that occur as result of a human action.

According to the above, all the facts have a human origin and therefore the study of the facts has to be based on human behavior, which is a consequence of the abilities and motivations of the people. Under this consideration the Methodological Individualism constitutes the conceptual base of all effort oriented to observe, to understand and to explain the facts that happen in our world.

The conceptual basis of Methodological Individualism is constituted by the principle that all social phenomena can only be explained as a result of the actions of the individuals that make up a social group. To achieve a greater and better perception of what is truly Methodological Individualism, it is convenient to reflect carefully on the opinions expressed by two specialists on the subject:

Elster (1986) states that "For Methodological Individualism i understand the doctrine that all The social phenomena (their structure and their change) are only in principle explicable in terms of individuals (their properties, their objectives and their beliefs) ". (Elster 1986, page 1)

Noguera (2003): "An Individualistic theory is the one that affirms that the only real and effective entities in social life are individuals, or that all social phenomena can be reduced in

the last instance to phenomena referring to individuals, properties of individuals or relationships between individuals ". (Noguera 2003, page 102)

It should be noted that in these definitions the term social phenomenon is handled as a result or consequence of human performance. In this way, it must be understood that a social phenomenon is some result obtained by the composition of various facts, since nothing will manifest physically as an observable phenomenon until a human being has performed an action. In any case, the thesis that everything that happens in society is a consequence of the decisions and actions of the individuals that compose it, is unobjectionable,

but it can be very complicated to explain how individual actions are transformed into social phenomena. Above all, when studying the social phenomena that are generated by the free interaction of people.

Social phenomena are more easily understood, when they occur in a medium that has some kind of structure that restricts, delimits and determines human actions that are relevant to the expected result. The more precise and defined the structure, the easier it will be to explain, what the social phenomenon is and in what way the individual actions lead to the final result.

For a social phenomenon to occur, it is necessary to involve at least two individuals, but they also manifest themselves within large human groups. Likewise, the result obtained from the aggregation of the acts of the individuals involved in a social group can be very immediate, direct, concrete and simple or very remote, indirect, abstract and complex, which makes it clear that the study of social phenomena are plagued by difficulties and can reach, in some cases, levels that hover over the impossible, unless assumptions are made and a certain level of partiality is accepted in the results.

Another issue that is important to discuss about social phenomena is that they are constituted by the aggregation of facts, that is, of human actions, which are combined in some way to produce general effects or concrete results. However, there is a circumstance that separates individuals from the social phenomenon: once an event occurs, the individual who generated it no longer has any control over what will happen when that fact interacts with others. You can act again with an intention different from that of an earlier event, but what happened with your original action can not be modified, what is done is done.

From the above it follows that at the time an event occurs, it is separated from the individual who produced it and what happens when the event is combined with others, is beyond the reach of the individuals involved. Facts will produce various social phenomena, which can hardly be related to any particular event and less to specific individuals. Social phenomena are collective results generated by the aggregation of facts, which therefore can not be adjudicated or related to any individual, although individuals necessarily participated in some way in their genesis.

If what happens after a fact, is no longer within the domain of individuals, nor is it possible for them to influence what happened, then the facts to conjugate behave under their own principles that are different from those of individual behavior. Therefore, it would seem sensible to consider that Methodological Individualism provides a valuable theoretical basis for analyzing social phenomena, up to the point where actions still remain within the domain of the individual and are the result of his will. That point, without a doubt, is the decision: the moment that the individual, based on his motivations and in full use of his free will, opts for an action. From the decision, what happens immediately is an action, that is, a fact.

Social phenomena result from the conjugation of diverse facts that when interacting generate a result, which can be, as already said previously simple and concrete or complex and abstract. Social phenomena can then be interpreted as the result of the interaction of various interrelated elements. The elements that interrelate are the facts and not the people.

2. System

If there is a word that has been used without rigor and applied to a number of situations and concepts that bear no relation to its real meaning and the corresponding ontological definition, it is the word system. In many publications, both scientific and popular, systems are often talked about and concepts such as: the writing system, the game system, the teaching system, when the above and many other examples that could be mentioned, really correspond to methods or strategies. In general, the word system tends to be used to refer to any set of components, whether physical or conceptual and as will be explained later, systems are not just that.

Maybe the problem started with the system definition that Bertalanffy originally used (1989): "Complex of interacting components" (Bertalanffy L., 1989, page 94), this definition establishes as the only requirement to accept that something is a system, that it is a set of elements, components or things that interact with each other, that is, the actions of some have an impact on the others and vice versa. This definition is precarious in excess, since it only specifies a requirement: that the components interact and, moreover, this property is not what systems normally show.

Interaction is not the way in which systems work, systems combine the actions of their components to generate a result, which is not comparable with any of these components and has characteristics and properties that are not observable in any of them. For example, in the human brain, the neurons conjugate their actions to generate ideas, but an idea can not be found in any neuron, nor can any of the characteristics of an idea be identified in a neuron.

All the theoretical developments and subsequent applications took Bertalanffy's approach as a starting point and were based on the broad concept given by him to determine or identify a system. Thus, many sets of elements that were not systems, were studied as systems and the term, system, was soon used to synthesize the properties of complex conceptualizations or simply to abbreviate language in the description of phenomena that are not known in depth.

On the other hand, when reviewing the literature written in relation to the systems you can find a large number of definitions of the concept, all different and in which various properties or characteristics are included, therefore it is necessary, and convenient, to establish a definition clear and coherent of what a system is, in order to describe its ontological nature and establish a solid basis to support the concepts that will be developed in this analysis.

First, it is necessary to establish that a system is not an abstraction, the systems must have observable components, whether tangible or identifiable in some direct or indirect way, which allows absolute security of their existence. Systems are part of the real world and their existence must be clear. Hence, it is not possible to speak of systems created with imagination, conceived with thought or drawn on paper. A diagram will never be a system, it will be just that : a diagram.

In addition, systems must possess certain characteristics that fully describe them as such, properties that are privately owned by them and that can not be found as a whole in any other real entity. Ross D. and J. Wade (2015) propose in their work that systems must have three testable characteristics: components, interconexiones and function or purpose. According to what we have been arguing, all these elements that constitute the system must be tangible or identifiable.

Of the three characteristics of the systems, the most valuable is the one that Ross D. and Wade J. (2015) has called function or purpose, which is what contains the true usefulness of the systems, since this characteristic refers to the fact that systems must achieve something or said otherwise, they must generate a result. It is therefore more objective and clearly state that systems must have three characteristics: components, interconnects and results, and so we will handle it from here on.

So far it would seem that the ambiguity and the lack of precision found in the definitions of systems have been resolved, but there is still something to be clarified. The systems must generate a result and the results can only be obtained through actions, an entity that does not act, can not contribute to any result. A passive component can not contribute to any result or purpose.

Also, they are not the components that participate in a system those that are conjugated to obtain a result, because if it were thus, the systems would be ephemeral because when conjugate and form a result these elements would cease to exist. This condition may exist in some systems such as those formed by chemical elements that react, but they form a special category of systems that will not be addressed in this work.

Then the results of a system are achieved through the conjugation of the actions generated by the components that participate in the system. The elements of a system are, then, the actions generated by certain components that participate but can not be considered part of the system. This necessarily has as a consequence that the description of the characteristics that a system established by Ross and Wade must have must be modified. A system must then have three characteristics: Actions, interconnections and results.

The value of the three essential characteristics that a system must have is that, on the one hand, they constitute a set of requirements that can be used to check if some set of components is a system or it is not and, on the other hand, they allow define, in general, a system based on its essential elements : A system is a set of interconnected actions, which combine to generate a tangible or observable result.

Systems exist to the extent that the actions that constitute them exist and manifest themselves in the real world. Without actions a set of interconnected components is only an inert physical entity constituted by physical entities capable of acting. For example an internal combustion engine out of action is a set of metal components, plastic and other materials, which are interconnected, designed and organized to generate a result, but not a system. The engine becomes a system when it is started and its parts perform actions coherent with the previously determined result and then generate it.

In the previous paragraph, two additional concepts have been added that complement in greater detail the characteristics that a system must have. First of all we talked about organized components to generate a result and this gives rise to address and clarify what is the organization and how it is integrated into a system. Organize is the determination of what actions a component must perform in order for its operation to be coherent with that of other components and, thus, obtain through the conjugation of its actions, an integral result. The human being is the most capable organizer on earth and with his intelligence he has designed the organization of a large number of systems that work under his influence, which can range from very simple to extremely complex.

All components of a system must be part of an organization so that their actions are consistent with the result generated by the system. When a component is part of a system, we say that it has organization or that it is organized, so that based on this characteristic, it is possible to establish a more precise definition of a system: **A system is a set of coherent and interrelated actions, which combine to generate a tangible or observable result.**

In summary, systems are the result of the activity of a set of organized components that are capable of generating coherent actions, but the elements that constitute the system are the actions and not the components. The different parts of an internal combustion engine components are organized in a system, but the internal combustion system is constituted by the actions performed by said components. This issue is of the utmost importance and it is necessary to insist on clarifying the relationship that exists between components and systems.

Systems are constituted by actions, but there is no spontaneous generation of actions, something or someone must generate them. To generalize, it must be established that any system is generated by a set of organized components, capable of performing consistent actions and a set of relationships or connections that allow you to conjugate them to generate an established result. Both the components and the relationships are the basis on which the system is developed, but they are only the infrastructure for the system to operate, they are not part of the system.

Components and connections are not part of a system, but they are indispensable requirements for the system to exist, therefore to be able to affirm that something is a system, it must be verified that a series of requirements are met. In order to have an accurate procedure to know if we are dealing with a system, we must verify that the following factors exist:

- a. Components capable of performing actions.
- b. An organization that ensures that the actions of the components are coherent.
- c. That the components work and generate the actions.
- d. Relationships or connections that allow conjugate actions.
- e. A tangible or verifiable result.

The lack of any of these factors, it would be a sufficient reason to decide that the entity being studied is not a system or that it is necessary to conduct a deeper investigation to find the missing factor. This checklist and the last definition of the system that was described on the page 5, are the tools that can be used to determine if an entity that is studied is a system or is not. With this, it is expected that the use of the word will be transformed into something more specific and that when talking about systems, one can assure that it is done with accuracy and property.

However, given the wide use that is currently given to the word system, surely will continue to appear frequently in many types of texts, both popular and scientific, and people will continue talking about conceptual systems, systems of equations, numerical systems and many other concepts that are comfortable to describe in that way, but that do not have the necessary characteristics to be true systems. Therefore, to a set of actions that meet the definition of the page 5 and with the characteristics of the previous list, we will call it, in this work: real system. This concept is similar to that used by Ackoff R. (1971), when he calls concrete systems those that have at least two components that are objects.

The practical value that something is a real system is that you can immediately use for your study a set of generalizable concepts and properties that are reliably and securely applicable to any real system. Among the properties of a system they emphasize the three that are enunciated next :

1. Recursion. That alludes to the fact that systems can be combined with other systems to form systems networks.
2. Synergy. According to Johansen O. (1993), it refers to a well-known property of the systems, which consists in that the study of some or all of its parts in an isolated way, does not allow understanding the behavior of the whole, in which they come into play the effects of interactions. It is also understood that, as a result of the synergy, the effect of the system is always greater than the sum of the effects of its component parts.
3. Autopoiesis. That according to Rodríguez D. and Torres J. (2003), it means determination of the next state of the system from the previous structuring to which the operation arrived or the capacity to produce and reproduce the elements of which they are constituted..

Of The three properties above the first, called recursion, deserves clarification. Traditionally, under the inaccurate definitions of what a system is, there was talk of systems integrated by

systems, and this quality was called recursion. Many times the concept was refined and it was said that recursion consisted in the fact that the components of a system were systems similar to it.

Based on the above-mentioned idea of recursion, we spoke in different methodologies of approach of processes of: Systems, subsystems, megaprocesses and other terms, which alluded to the existence of systems within systems, on a scale descending from the broadest, to the specific ones identified with complete tasks. In addition, it was considered that this model, stratified by levels of generality or size, coincided with the existing reality in companies and responded to a natural law. All based on the imprecise conception of the ontology of a system. From the system definition enunciated on the page 5, it is concluded that for the components of a system to be systems, it must be fulfilled that these, the component systems, have as a result an action and not another type of object, since the systems are constituted by actions. But the fact that the components of a system are systems does not mean that a system is constituted by systems, because the only possible elements of a system are actions.

Systems networks can be integrated by systems whose results are actions and in that case we will call them Integrated Systems Network (ISN), because they are systems whose components are systems in turn. The best example that can be used to understand the concept is a robot. A robot is constituted, mainly, by motors and other systems that generate actions. The robot is a system because the elements that constitute it when it is active are only actions. Other ISN's very clearly identifiable s, are computers.

In other cases, the systemic networks are integrated by systems whose results are not actions but objects and what happens is that a system is coupled with another that takes the object and transforms it by means of actions to generate a different object. In this case the set consists of two systems but none can be considered a component of a system, because they generate objects and not actions and the components of a system must necessarily generate actions. These sets of systems will be called: Coupled Systems Networks (CSN)

The clearest example of a Coupled Systems Network is an assembly line, for example, that used to make a shoe. The assembly line is a system that consists exclusively of actions that are performed on various inputs, from other systems whose results are objects that are incorporated into the assembly line and are transformed by actions. The CSN is not a system, because its components, although they are systems, do not generate actions but objects, which are conjugated and assembled by the final system or assembly. Figure 1 shows a model describing quite accurately both CSN as a to ISN. The difference would be on the nature of the green ellipses, or results in an CSN would be objects and in a ISN would be actions.

Figure 1. Generic model of an CSN or an ISN

In an CSN the central system is a system of sequential actions that take the results of the key systems and make changes on them and assemble them with the results of the other key systems, until the final result is obtained. In a ISN the central system is the conjugation of the actions resulting from the key systems.

The key systems also have feeder systems that generate the actions or objects, whether they are ISN's or CSN's and their models are similar to that of Figure 1 and each of the key systems of those RSI's or CSN's, they constitute ISN's or CSN's and this deployment by components of the components can be followed, up to the level that is desired. In the second level of deployment, the model that describes the relationship between CSN's or ISN's, is shown in Figure 2 :

Figure 2. Second level deployment

The property of recursion has, then, two meanings:

1. If it is a Integrated Systems Network, recursion property states that if components of a system are systems whose results are actions, they are then integrated to constitute a ISN and the components of a ISN are also ISN's.
2. If this is CSN's, the property of recursion notes that if the Network is integrated by systems whose results are objects, then the system and its coupled systems are integrated to form an CSN and that the components of an CSN are also CSN's

3. Social systems

Social systems strictly comply with the system definition reported on page 5 and by checking the factors described on page 6, it is feasible to confirm its systemic character. However, they have a characteristic that distinguishes them fundamentally from other types of systems, they are integrated by human actions. The definition of a social system is: **A social system is a set of coherent and interrelated human actions, which combine to generate a tangible or observable result.**

In order to verify that we are facing a social system, it is necessary to verify that the five factors described on page 6 are present and clearly identifiable. For a social system these factors have specific characteristics that it is convenient to analyze:

- a. The components, that is, the objects that perform the actions, are always human beings and the actions can be, then of any nature that a human being is capable of performing. Nowadays, more than in past times, actions have to consider all those that a human being can generate through the use of a machine. The actions are executed by the machine, but are selected by a human being, who knows the effect he wants to cause and the way in which the actions participate in the system.
- b. In a social system there must be an organization that gives coherence to the actions and allows them to be combined to achieve the expected result. In social systems, the organization can present itself in all the possibilities existing between a precise and detailed definition and a general description with very few rules or obligatory behaviors. The organization is always a human creation, only that in social systems, it can be established in a previous way and known by all the members of the system or it can be generated at the moment through the judgment of the participants. It can also happen that the organization has a hybrid character: A part of the actions are previously established and are known by the people and others are determined by them according to the development of the system.

The generation of the organization individually and at the time of executing the actions, is a characteristic exclusive of social systems and this is possible, only because human beings participate that have intelligence, which is the human quality necessary to create an organization.

- c. For people who participate in a system to work, it is necessary First, that they know perfectly well what is the expected result of the system and what are the actions that must be carried out. They must be able to perform the required actions, and according to their complexity, people must be trained beforehand.

Obviously, the system will exist only if the members act, because it must not be forgotten that the elements that constitute and give reality to the system are the actions.

- d. Human beings are able to interconnect only by using their five senses, these are what allow them to know what happens in the environment that surrounds them. Then the five senses are the connections that will allow human beings to conjugate the actions that the system requires.

The connections between two human beings have as limitation the maximum distance their actions can reach, but using technology, that distance can be extended to an extreme degree.

- e. Like all systems, social systems must have a tangible or observable result. However, when the system is one in which the organization is created at the moment by the participants, the knowledge of said result becomes indispensable because without that information it would be impossible to individually conceive which are the personal actions required by the organization.

When it is a system in which the organization is designed in advance, the actions are determined precisely and people can learn and execute without having a clear idea of what the final result is, although there are other matters related to efficiency and productivity that establish the need for all participants in a social system to know the purposes and final results of the systems in which they are involved.

In order to study social systems, it is convenient to focus attention on two of the fundamental characteristics of a system. On the one hand, it is necessary to observe that the result of a social system can cover all possible degrees of accuracy in a continuum that goes from the greatest generality and the least precision, to the most complete specificity and maximum precision. On the other hand, the organization of the actions may also be previously designed to the smallest detail or may be left to the free will of the participants in the system.

There are systems in which the organization has been previously designed by a human being and the components of the social system, ie the human beings that participate in it, must execute with precision the actions established in said organization ; This would be the case, for example, in a battalion of soldiers marching to move from one point to another, the actions they perform are previously established and must be executed to the letter. In this case, the social system has a precise and simple result, from one initial point to the other established as an objective.

In other cases, for example, in a soccer game the result of the system is established, which is to score a goal, but it is a general result of little precision, it is not established how, at what moment and who should do it. The organization, that is, the actions to be carried out, is designed by the participants when determining individually, what action they must take.

In this way, social systems can be studied through their location in four quadrants that combine in a binary way the accuracy of the results with the precision of the organization, as described in Figure 3.

Figure 3. Quadrant of the location of social systems

Quadrant of the Figure 3 reveals that there is a wide range of social systems that cover the possible combinations that can be generated in the quadrant and that any classification systems in certain groups, it is artificial and very little practical use. For this reason, the classification made by Luhmann N. (1998) in which he establishes that there are three types of systems: Interactions, Organizations and Societies, is not considered viable. Such is the range of varieties of social systems, that it would be impossible to concentrate them all in three or more types. Luhmann's proposal is further complicated when it is said that: "Society is the comprehensive system in which organizations and interactions are contained" (Rodríguez D., 2004, page 45), which raises the possibility that society is a suprasystem that contains two different systems in nature, something that is very difficult to prove or observe.

Notably Luhmann (1998), suggests that social systems are constituted by actions: "Social systems are based, therefore, on a kind of action or in some aspect of the action" (Luhmann N., 1998, page 140), however, this phrase is ambiguous, when it adds: "or in some aspect of the action", without mentioning that aspect of the action that could be the constituent element of social systems. Furthermore, Luhmann also asks: "In the end, does a social system consist of communications or actions?" (Luhmann N., 1998, page 141), and with this he ends by confirming that it is not possible to find in his approaches, a clear position about what are the elements that constitute a social system.

The situation is complicated if you consider some statements by Darío Rodríguez.

- "Luhmann's theory considers interaction as a communication system" (Rodríguez D., 2004, page 44).
- The above is not surprising if it is understood that the organization is an autopoietic system of decisions (Rodríguez D., 2004, page 47).
- It is for this reason that society is the social system formed by all possible communications (Rodríguez D., 2004, page 12).

When interpreting the previous statements it is concluded that the social systems are not constituted by actions, two of the types of social systems proposed by Luhmann N. (1998), the one of interactions and the one of society, are constituted by communications and the third, the one of Organization is constituted by decisions.

Luhmann wrote a lot about social systems but very little about their essence, in Luhmann N. (1998), you can find some statements about it:

- A central concept in Luhmann's theory is communication. This author states that: "the basic process of social systems that produce the elements of these systems, can not be under these circumstances more than communication" (Luhmann N., 1998, page 141).

- b. It also establishes that: "action is constituted through communication" (Luhmann N., 1998, page 140).
- c. "We answer, then, the question about what social systems consist of, with a double response: of communication and its ascription as an action. Neither of the two moments would have been able to evolve without the other " (Luhmann N., 1998, page 170).

Luhmann's constant mention of communication as a constituent element of social systems has led many of his followers to attribute that role to communication. Thus Rodríguez D. affirms " According to Niklas Luhmann, as we have said, society is an autopoietic communications system" (Rodríguez D., 2004, page 12). It is evident that if it is not clearly specified what the constituent elements of a system are, it is very difficult to do affirmations about him. Neither can Luhmann's works be further clarified on the organization, connections and results, so that his concept of social system could be clearly established. Communication does have a very important and crucial role in the functioning of social systems, mainly in the generation of the organization. All social systems work based on a preconceived organization and designed by human intelligence, some social systems are based almost 100% in a predesigned organization and others in a minimum percentage, but in general social systems work with a part of their predesigned organization and another part generated, at the moment, by the participating individuals.

The predesigned part of a system must be made known to the participants of the system, so that they can act in accordance with it and the way they receive it is through communication. The communication allows that, through some of the senses, mainly the hearing and the sight, the people obtain information on which are the actions that they have to carry out as components of a social system.

The organization designed by the participants concomitantly is not based on the communication, but on the observation that they make of the actions carried out by other participants, from where they determine what the pertinent actions should be so that the expected result is achieved. In this case there is no premeditated act of communication that allows participants to learn what are the required actions, each observe and select the items on which decides its consequent actions.

For example, the circulation of vehicles in a city is a social system that results in all participants being able to mobilize in the streets. This system has a part of preconceived rules that determine what are the allowed actions and what are the actions that must be performed when certain preconceived facts happen, such as the activation of a light at the traffic light, but during the circulation each driver observes the behavior of the others and determines, based on it, what actions must be executed so that the circulation continues. The organization, in this case, is not induced by a deliberate act of communication. It is the people who independently observe the environment and select the events they will take into account to design their next coherent action and thus the organization of the system is created through individual acts decided in a personal way.

As the analysis of social systems has been developed, it must have been clear that for a system to exist there must first be an organization that congrues the actions that will integrate it and make it a reality. The organization is composed, then, of comprehension and reasoning actions, which generate, through neural actions, the knowledge of the actions to be carried out and the conviction of the pertinence of its realization. This leads us to the conclusion that the organization is constituted by human actions carried out in the brain of the people and if the organization is a set of actions then it has the basic attribute to be a system, which should be confirmed by checking the five factors on page 6 :

- a. The components of the "organization" system are human beings.

- b. The preconceived organization establishes the coherence of the actions.
- c. The human beings that make up the system have functional brains.
- d. Communication is the nexus that combines actions.
- e. The result sought is that all the participants in the system have clear what to do and remember it.

The organization has to be something real composed of actions; it is not a document where the necessary actions are recorded for a system to work. The organization, as a system that is, can not be an abstraction, it can not be a diagram that shows a model of the actions and their description. The organization must be an active and real system whose components are human beings that carry out actions of understanding, reasoning and memorization of the actions that correspond to them as part of a social system. The organization is a social system composed of permanent brain actions that conserve knowledge of the actions that a person must perform as a component of a system.

Social systems are complex, simply because human beings are complex, human beings do not function in an accurate and predictable way like a machine; They have needs, desires, personality, preferences, values and many other peculiarities that determine their behavior. But over all the peculiarities, the human being has one that defines whether it carries out a decision and turns it into action, or refrains from acting, this definitive peculiarity is the will, it is what makes the human being unpredictable.

The will is the quality that distinguishes the human being from all the animals on the planet. The will can prevent an action that is driven by an instinct, that is craved by a desire, that is fueled by an emotion or that is justified by a reasoning. The will has the final say in the performance of an action by a human being. Therefore, social systems will work only if the will of the human beings that compose it allows the required actions to be executed.

Then the will of the components is one more ingredient in the functioning of social systems, there will be systems in which 100% of the human beings that compose them are willing to execute the actions established in the organization and others in which only a low percentage is. In other words, there will be systems where 100% of the participants have the unrestricted will to participate and others where only a small percentage of them have the will to participate. Under the previous considerations, Figure 3 must be modified because the will of the participants is another ingredient that characterizes the systems. There will be systems in the entire possible range of percentages of people willing to participate in the actions, from 0% to 100%. The will of a person is influenced by a set of factors that determine their desire to act in accordance with the established organization. These factors have been integrated under a concept called motivation, which according Chiavenato I. (2007), comes from the word motive, that is everything that drives the person to act in a certain way. Motivation is then an internal response of the individual that strongly influences his will and leads him to act in the direction that his motives define.

Instead of speaking of will, it is preferable to talk about motivation, since this concept has been widely studied and has knowledge, methodologies and tools that allow us to know how it manifests in people. Given that people will act in accordance with their personal motivations, it is possible to establish that their will is inclined or not to action according to their motivation. Therefore, a person without motivation will not have the will to participate with their actions in a system and the one that has a complete motivation will have the will to act immediately and in agreement with the organization.

Based on the motivation, it is possible to identify systems in which there are different percentages of motivation and could be located, also, in a continuum ranging from 0% of motivation to 100% of motivation. Based on this variable and those used in Figure 3, social

systems can be placed in a three-dimensional space formed by three axes representing three characteristics, according to as shown in the Figure 4 :

Figure 4. Characterization space of social systems

In reality you can find social systems that have characteristics that place them in any point of the space described in Figure 4, this suggests that attempts to classify them in a finite number of groups, may be only an intellectual exercise that will not bring any benefit methodological or conceptual and will not provide any advantage for studies or research carried out on social systems.

4. Systems in companies

Companies are important because they are the mechanism that provides the goods and services that a society requires to function and satisfy, therefore all the needs of people. Given this determining role in the success of society as such, it should be expected that companies always operate with high levels of efficiency and effectiveness, which is not entirely true in general terms.

The company is a conglomerate of people who act with the purpose of achieving certain pre-established results and in that sense they have, at first sight, the characteristics of a social system, however, seen as a whole, they would be networks of very complex systems, ISN's or CSN's. The important thing is that it is feasible to apply to the study of companies the concepts and properties that derive from the theory of systems.

Like all social systems, the systems that integrate a company, are human creations and for a human being to create a system, it requires, as a *conditio sine qua non*, to have perfectly clear which is the result that he wants to obtain, because the design of the organization, fundamental element of the system, is the creation of the actions that must be combined to obtain the expected result. You can not design a system to observe what will be the result obtained.

The organization is an act of creation and human intelligence is what makes this creation feasible. How can intelligence be applied to design an action that must be combined with others to achieve what is not known? This comment may seem naive, but it is not far from the reality that characterizes many companies. Many companies design their organization based on very general notions about their results and in large companies, that design, defective base, only reaches the first hierarchical levels, the others are organized informally.

Every company has certain products that are commercialized to generate the income that maintains it and those products, which can be goods or services, are the most important, because without them the company does not exist. These products are the result of a social system that generates them; that social system is called the central system, similar to how it was done in Figure 1 and this is the fundamental system of every company. In some companies the central

systems are a combination of people and machines, but they are still social systems, because machines perform actions that would otherwise be done by a person and are also actions designed by a human being, even if they are made by a machine.

In the same way that the central system is integrated by actions, so that a material object is generated in it, it must be fed by objects from other similar systems and this reflection is repeated for these systems and for the systems that feed them and so you can continue to the level considered convenient. A company has as its first essential components a set of CSN's that are directly related to its final products. If the products were services, then the central systems generate only actions and it could be said that instead of CSN's, these first components are ISN's. The real situation is more complex, and it is most likely that the company is composed of a combination of CSN's and ISN's.

The companies are divided into a set of areas, departments, subdirections, etc. And each of them should have specific results to obtain, to contribute consistently to the achievement of the final products, otherwise, they would have no reason to exist, and each of these subdivisions of the company can be analyzed with the same systemic approach and determine how it is integrated with systems networks. Once what is known as an organization is integrated and how it works, then it is possible to direct, operate and manage it, without this knowledge what deprives is inspiration and improvisation, which are artistic disciplines too used in companies.

A company is then a complex of social systems and it is essential to know as best as possible that systemic complex, in order to correctly measure the achievement of results, identify problems, design solutions and achieve the greatest possible efficiency and effectiveness. Without this knowledge, any decision and action taken to alter it will have uncertain consequences and effects that can never be known.

5. The natural systems

There are two types of systems that allow a clear classification of the systems. There are systems created by man, which are characterized because the organization that gives coherence to the actions of its components is created by means of human intelligence. These systems can get to be very complex and contain large quantities of components, such as mechanical and electronic systems in particular.

The other systems that complete this classification are the natural systems, those that nature created and are the basis on which life develops. Natural systems fully satisfy the definition of system that was established on page 5 and in its structure it is possible to identify the five factors that determine that something is a system and that were described on page 6.

To illustrate how a natural system is, the neural system on which the brain works can be used. In this system the components are the neurons that generate electrical impulses and produce chemical substances called neurotransmitters, they have a complex organization that determines the basic coherent actions they must perform, they are an active system, they have dendrites and axons that work as connections and generate results tangible and verifiable which are the ideas.

However, the brain is a complex of Integrated Systems Networks and Coupled Systems Networks of great complexity. In these networks each component can be part of a large number of ISN's and CSN's and can generate various types of actions and products, which makes them much more complex than any system created by humans.

There are also natural systems whose components are living beings and which are similar to the social systems that were previously discussed, a representative example are the colonies of ants, these colonies work based on diverse systems which can be based on predetermined organizations such as the system that they use to produce new members of the colony or systems

whose organization is created by the components based on communication, as is the case of the systems they create to store food.

In any case, it is clear that natural systems are much more complex than any system created by humans and have very complex pre-established organizations as well, but they are governed by the same basic principles found in any other system and therefore respond to the same essence. Human beings can study with enough detail and precision the functioning of natural systems and discover what are the components that make them up, what are the actions they perform, what are the connections and what are the results they produce. What the human being has not been able to know is what is the origin of the preset organizations of natural systems. All we can assume with a high risk of error, is that according to our experience, the organization is created by the intelligence, because that happens in social systems, and that something similar can happen in natural systems: some kind of intelligence beyond the reach of our perception and understanding, has the ability to create such perfect and complex organizations. What is difficult to imagine is that these organizations come from nothing or are generated spontaneously.

6. Conclusions

Without a doubt, the system is the most important concept that the human being has learned from nature. The system concept describes and interprets a general structure of operation that, by itself, determines various properties that are recognizable and characteristic of it. According to the available historical data, the concept was inferred when studying the functioning, behavior and conformation of structures in the biological field, so it is not surprising that it was a Biologist, Ludwig Von Bertalanffy, who was the first to describe the system as part of their investigations.

The definition used by Bertalanffy (1989) was concise: "Systems are a complex of interacting components" (Bertalanffy L., 1989, page 94), in this definition Bertalanffy, clearly states that there must be action in every system and that therefore the systems are active entities, not passive structures. However, the concept was adopted by changing interacting ones by interrelated, which is not the same, and applied laxity to many sets of related or interrelated components. In this way the systems proliferated in all the disciplines of human knowledge and the term lost its conceptual and scientific value, from being a learned concept of nature it became an abstracción, applied with laxity in phenomena or conceptualizations of all kinds.

Given the analytical value of the system concept, it was considered convenient to rewrite the definition and clarify the requirements that characterize the true systems, which made it necessary to radically modify the original statement put forward by Bertalanffy (1989), preserving the sense of acting. The system definition proposed by him establishes that the system is a complex of components but in reality it is a complex of actions, since the inactive components remain a complex of components, but they do not constitute a system. It is fundamental to consider that actions are those that explain the ontology of a system. The system exists to the extent that the actions exist the complex of components may exist, even if the system does not exist.

The fundamental change introduced in this work consists in establishing that if the systems are active entities, then the elements that integrate them must be actions and that the components that generate those actions are not part of the system, but are only the infrastructure over the that systems work.

The change in the definition of the system allows for a clearer and more rigorous generalization and easily explains the essence of systems in the natural environment and in the field under the domain of human creation and social behavior. However, this definition, due to its specificity

and conceptual rigor, immediately invalidates many conceptual and philosophical developments and methodological proposals that were conceived based on lax interpretations of the original definition of Bertalanffy (1989).

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