

System thinking ambiguities and confusions and its role in management

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Abstract

In this paper some of cognitive contradictions and complexities of system thinking have been discussed. Organization theory helps changing managers' thoughts, developing their conceptual models and improving their performance. Indeed the effectiveness of system management is found when system's knowledge cognition takes place in an interaction of conceptualization and a concept taking free from contradictions and non-alignments. By pondering on management principles, we concluded that there is a clear and in some cases intangible relationship between them and the system features. So, by digging deep into this theory, some of the vague and conflicting issues were identified. Moreover, in recognizing the problems of systems including organizations and humans, in addition to the ambiguities that each of them are mentioned as one of basic methods for solving systemic problems, there are obstacles against discerning and employing systemic thinking in our society. Finally, to deal with these confusions and obstacles, some effective guidelines and instructions have been proposed.

Keywords: System Thinking, Confusion, Complexity, System Approach to Management, Organization Theory.

1. Introduction

A theory is based on a set of assumptions that forms a basis for a number of related but rational claims. Specific phenomenon that a theory explains is called under study phenomenon [1] and [2]. In organization theory the under studying phenomenon is the organization. An organization can be defined in different ways; for example as a social structure, a technology, a culture, a physical structure or as a part of an environment. It can also be studied in the framework of core controversial issues including governance, conflict, decision making, power and politics and change. Therefore, theorizing is formed depending on how are experts' attitudes to the organization [3]. Due to the diversity and pluralism of organizations, managers must be able to give meaning to the different looks and use them and learn how to apply their knowledge in a wide range of daily decisions. The issue that has been raised is that as a classification and an approach to organization theories systems thinking is expected to enable managers do their duties, roles and missions successfully and effectively. But, are its ambiguities and contradictions considered? How are these contradictions and complexities interpreted? Finally, to what extent managers benefit from this thinking?

A short overview of the classification of organization theories from the perspective of experts shows that system thinking is an important organizational theory. Scott highlights three schools in organization and management theory[2]. Classical school which had dealt with the division of labor, hierarchy, supervision and monitoring scope and logical structure, neo-classical school which is identified with the human relations movement, system school that describes the organization as a system with interrelationships between its internal components and environmental variables and puts it on a higher level than the previous two schools. Scott has divided management and organization theories into four groups or species. His classification criteria include close and open system approach to the organization and rational and social models of human behavior in organizations. In the first group theories organization is considered as a closed system and human behavior is considered reasonable. In the second group theories, namely humanism, the organization is considered as a closed system and human behavior is social. In the third group theories which its inception dates back to the early 1950s, the organization is considered as an open system and organizational behavior has been assumed reasonable. In this type it has been tried to form organizational structure with regard to the environmental needs. In the fourth group theories is formed in an open system approach and giving social nature of organizational behavior. Some scholars' views such as Meyer fall into this

category[3]. Hatch (2012) has outlined the course of historical organizational development through academic pedigree writing style. He notes that since the organization theory has not emerged as a recognized field of study until 1960s, the classical period is a part of the prehistoric period of organization theory. Accordingly, by explaining classical management theory and its role in the organization theory hatch puts his focus on describing symbolic-interpretive modernism, and postmodernism as the constituent elements of the organization theory. Hatch believes that the general system theory has influenced much of modern approach to the organization theory. General system theorists have been able to focus on unifying underlying similarities of all phenomena. Thus, general system theory opened the way for interdisciplinary research as a revolution in science leading method and together with cybernetics became as the emergence sources of system thinking [4]. Following Richard Scott, Tosi (2009) highlights four types of organization theory including rational model of closed system, rational model of open system, natural model of open system and natural model of closed system [3]. The emergence of system thinking is related to the rational model of open system and its development is related to the natural model of open system. In the evolution path of management theories stoner et al. (2006) are listed six categories including school of scientific management, school of behaviorism, management science, system approach, contingency approach and dynamic campaign approach [2]. These experts consider the emergence and development of system thinking affected by the general system theory.

System thinking is one form that interdisciplinary has adopted and is a catchall term for different postwar developments in variety of fields, such as cybernetics, information theory, game and decision theory, automaton theory, systems engineering and operations research. These developments concur, however, in as much as in one way or another, they relate to a basic reorientation in scientific thinking attempting to overcome ever-increasing specialization, and trying to make a shift from reductionist to holistic thinking, while acknowledging the unity of reality and the interconnections between its different parts and aspects.

With the increasing expansion of system thinking, von Bertalanffy felt the need to distinguish different domains. Following his distinctions, the wide range of studies in the systems field- general system theory in a broader sense- can be divided into three realms or basic types. The first is systems science, which can be defined as the scientific exploration and theory of 'systems' in the various sciences, such as biology, sociology, economics, etc., while general system theory concerns the principles that apply to all. The second realm is system approach in technology and management that concerns problem arising in modern technology and society. While philosophy is present in the areas of systems science and systems technology, systems philosophy can be distinguished in the systems field of as a third domain in its own right. In the view of leading systems thinkers such as Bertalanffy the introduction of 'system' as a key concept entails not only a total reorientation in science and technology, but also in philosophical thought [5].

Theoretically speaking, the existence of commonalities among these theories is very reasonable. They are about the organization and are often rooted in the attitude of positivism. The main difference between them is that each of these theorists takes a different set of principles to identify and optimize organization. This paper examines the concept and nature of system thinking and focuses on it rather than comparing it with other theories. As mentioned earlier a theory is a man-made or artifact, an abstract way to express reality, by presenting a definition of a set of concepts and theorems that regularly interact with each other[6]. These relationships feature a reality. Whether in system thinking perspectives of experts and scholars are consistent with each other? Whether the set of concepts, definitions and theorems of system thinking overlap with each other on a regular basis? To understand system thinking and its application i.e. Management based on system approach in the organization, first we should be familiar with the system definitions and its underlying concepts such as system classification features. Then, understand the three phases of system thinking and finally to apply them. In the following system definitions and features, three phases of system thinking, its rules, contradictions, complexities and ambiguities are respectively examined.

In reviewing the relationship between organizational structure and system approach with market orientation in selected hospitals of Isfahan city in Iran, Yaghoubi et al. (2014) concluded that Dimensions of market orientation and its significant relationship with organizational structure and systematic approach can lead managers' view to the analysis and recognizing elements of success and achievement of goals. With increasing competition in market, presence in international markets and more attention to patients' satisfaction, it is required for hospitals to understand and to use market orientation in order to promote quality and services in the health system [7].

2. Material and methods

2.1. System definitions

Like management many definitions have been done for system. Examples of existing definitions we will be investigated [6,8,9,10,11]. System is an entity that its existence is possible through the interrelationships among the components (Bertalanffy). The system consists of a set of concepts or factors which are used to satisfy a need (Miller). System implies on clear planning and arrangement (Johnson). The system includes a mental or physical entity that is made up of interdependent components (Beckett). System is a set of different processes that there is a cause and effect relationship in this collection (Watt). System is a set of related factors which receive data from the environment, transmit them and deliver output back to the environment (Daft). System has interaction with the outside world as a whole (Feller). A system is whatever that gets its integrity and form through interaction of its components progressively. The components have a common purpose and a common way of acting and these components are linked together [6]. System is as an intertwined whole that its function depends on its components and interactions between these components [11].

If we ponder these definitions, despite the experts' emphasis on internal relations some words and concepts can be achieved that have not mentioned in other definitions. Whether different components have clearly defined in these definitions? Whether interactive processes are the same interactive components and elements? As a component whether human is the same process? In most definitions there is no mention of system communication with the environment. However with his definition Ackoff has attempted to give a clear understanding of the system. But there are two points worth mentioning here; firstly, the fact is that in any science and knowledge in the definitions whatever concepts are less common, their interpretability is going to be more diverse and their understanding and application will be with confusion and this includes system. Secondly, the concept of component in the system definitions is still questionable. Does components means human beings or processes or subsystems and resource or even issue components including knowledge and quality?

2.2. System characteristics

Based on general system theory, previous researchers [9,12,13,14,15], enumerated the following characteristics for systems: purpose, components, relationships, environment, resources, status, hierarchy and complexity. The nature of some of these features is in place to further explore. Regarding mentioned ambiguities some matters were discussed. In understanding the environment which have been identified in two parts i.e. Indoor and outdoor, the need for boundaries in the system arises. It is not possible to define and detect the boundary and scholars have emphasized on it. Accordingly, determining the internal and external factors by system experts can be disputed. The consequence of such withdrawal is incorrect determination of factors affecting the system performance and behavior when both internal and external environment conditions should be studied. In the hierarchy, system and sub-systems are discussed. Sub-systems that includes sub sub-systems and such condition continues. Since each system consists of inputs, processes, outputs, feedback and environment, is it possible to imagine such combination of the main system and its subsystem in the hierarchy, maintaining their scope and differentiation of the five system components and sub-systems? Inevitably, it brings a complex situation that makes analyzing and solving system problems sometimes with difficulty and perhaps impossible. It is prudent that the following sentence be investigated further [2]. "The difference between systems and subsystems is quite subjective, since it depends on system position. In other words, to distinguish between system and subsystem is subject to how to define the desired system and what aspect of it is desired". Thus, each supervisor, consultant or system thinking approach based management can perform different from others about system barriers identification, analysis and removing. This is due to the different perspectives and behavior of analysts.

2.3. System thinking and three steps of problem solving

Many references related to system thinking theory [1,2,12] have followed these three steps to examine issues and to evaluate problems that are faced:

- First the overall system which includes the above issue should be specified. In other words, a whole needs to be recognized that above issue is part of it.
- Then the behavior and characteristics of the overall known system should be investigated.
- Finally, the behavior or characteristics of the studied issue according to the roles or functions in the overall system must be examined.

2.4. Consider the following examples

- Investigating lack of motivation of human resources in an organization
- Investigating success of a company in the field of creativity and innovation
- Investigating students dropout in different academic levels in one of the provinces
- Analyzing processes of presidential elections in one country

In order solve these problems using a three-step system thinking approach , depending on the perspective of system analyst, management consultant and managers in all four cases, determining the overall system can be done with their preferences and with clear differences. To study the behavior and characteristics of the overall system, if the overall system is identified how much information can be achieved. Since in system definitions we talked about relationships and interacting components if data gathering is possible for all people equally, whether the under study system which is undoubtedly a sub-system issue would not be influenced by other components i.e. The other sub-systems? These sub-systems are certainly affecting each other and this matter is not mentioned in the above three steps. By adopting these three steps it is emphasized that each issue and problem which is expected to use this method is regarded to be a sub- system. Finally, another vague and unclear thing is that based on system definitions sub-system these are components including the sub- systems that interacting with each other gives integrity to the whole original system. As it was mentioned above by adopting any problem and issue that is regarded as a given sub-system regardless of other sub-systems identification and the resulting interaction between them determines the totality. According to the first step in what way can we identify a whole or a totality? If we further ponder the third paragraph of these three steps the relationship between the main system and sub-system has been discussed. In other words, there is no mention of the ongoing interaction between sub-systems. Another vague point that somehow been discussed.

To this part of the discussion it is clear that each system can also be regarded as a sub-system. This mentality leads to ambiguity and lack of clarity of issues including system border, interacting sub-system, system hierarchy and three steps of problem solving and this ambiguity leads to create much different tastes and attitudes in who are interested in using this approach in understanding phenomena and solving problems.

2.5. Rules and principles of system thinking

System thinking has its foundation in the field of system dynamics, founded in 1956 by MIT professor Jay Forrester. Forrester recognized the need for a better way of testing new ideas about social systems, in the same way ideas can be tested in the engineering. System thinking allows people to make their understanding of social systems explicit and improve them in the same way that people can use engineering principles to make explicit and improve their understanding of mechanical systems.

The approach of system thinking is fundamentally different from that of traditional forms of analysis. Traditional analysis focuses on the separating the individual pieces of what is being studied; in fact, the word “analysis” actually comes from the root meaning “to make into constituent parts.” System thinking, in contrast, focuses on how the thing being studied interact with the other constituents of the system- a set of elements that interact to produce behavior- of which it is a part. This means that instead of isolating smaller and smaller parts of the system being studied, systems thinking works by expanding its view to take into account larger and larger numbers of interactions as an issue is being studied. This results in sometimes strikingly different conclusions than those generated by traditional forms of analysis; especially what is being studied is dynamically complex or has a great deal of feedback from other sources, internal or external[16].

In the most relevant references of system thinking [3,6,12], its rules and principles have been grouped under these themes:

We should not focus solely on what happened and to find causes, but we should feel and understand patterns of change.

System problems must mostly troubleshoot from inside rather than outside. The environmental conditions should not be blamed.

What is the right for system’s individual members and components cannot be right for the whole system.

The best way to know things is that we find the relationships of its connected components.

The effect of system structure on the performance of components is greater than the effect of performance of components on system structure.

Delay of any degree is a kind of waste and an origin of entropy and must be resolved.

Identifying cause and effect relationship between variables and phenomena is more important than recognizing the correlation between them.

Determining the correct boundary of the system leads to high quality decision making.

Dynamic thinking opens the way for problem solving better than static thinking.

Adopting wrong policies leads to the intangible behavior of social systems[3,6,12].

By pondering on these principles, there is a clear and in some cases intangible relationship exists between them and the mentioned system features. Considering the relationship between the components and processes of the system and assuming that they are properly identified cause to understand the pattern of gradual changes and would prevent to deal with accidental events. If we understand interconnections, bring synergism and lead to a negative entropy then we have been able to seek the cause of problems within the system and by better understanding the causes when examining the problems and phenomena we can conclude to employ which strategies to reduce the entropy and take optimal use of opportunities. If we have comprehensive and inclusive measures in decision making then we less face with intangible behavior of individuals and their resistance. In contrast of this principles and effective points again there are some inconsistencies and ambiguities. Whether the causes of problems mainly need to be found from inside or outside? Is personal development done in the organization? Do working groups act successfully in the organization? Is the organization exposing to bankruptcy and crisis or not? What discussed in system composition and most system scholars believe is the continuous relation between system with its environment and the interaction between them. Learning environment can play a role in the individuals' failure to progress, incorrect assessment of group performance causes their inefficiency; play an effective role in the organizations' bankruptcy, outbreak of war, economic sanctions and the existence of various and interpretable rules. The geographical situation of the area could be affected by natural disasters. Each of these systems can be affected by environmental incidents. Accordingly, it certainly cannot be said that the system's problems must mainly troubleshoot from within. There are some ambiguities about the higher effect of the system structure on component performance compared with the effect of component performance on system structure. System definitions indicate that the interacting components will cause a special feature in the system which is generally called the whole. Therefore, with specific totality each system can be recognized by its own id. Thus, each system with its own specific wholeness as its identity can be recognized. Now the question that can be put is: in the case the structure of system carries the title of overall state of a system how can the effect of a system structure on behavior and performance of a part take on significance? In other words, the sum of interactions among the parts of system brings about wholeness. However, the effect of structure as a whole on its parts is more considerable than the inverse form of this relationship. Furthermore, if structure of a system has something to do with organization and its relations, unquestionably affect individuals' performance, but this phenomenon in the reversed direction rarely occurs. It has been seen that a worker, a manager, or an employer could have been able to respectively produce dramatic change in the process of quality and production, plan fundamentally, and tackle crisis. Besides, the influence of an author and politician in shaping political and social evolutions in countries is a remarkable phenomenon. The failure and stop of a machine in a manufacturing company most often than not can be crisis provoking. Henceforth, the effect of a part on whole shouldn't be considered insignificant. The holographic principle in systemic resources (Tosi, 2009) and (Murthy, 2001) is in contrast with the principle of continuous interaction of parts and formation of wholeness principle. If a mirror is broken into pieces, each piece like the initial unbroken mirror can reflect the image; this presented example can explain the principle [3] and [17].

Accordingly, this state of the system can be adapted to the structures, or units that can act like the basic unit or structure. Definitions and descriptions of the system show that all the scholars have consensus upon: first, constant communication of parts causes the whole. Secondly, if an organization is divided into sub-systems, will the microsystems represent the entire organization?

Believing in designing interactional patterns [3] and [18] doesn't always show the transparency and clarity of action. An observer in stating her/his major insights and perceptions considers the unceasing relationship and ignores the algorithmic, process, initial and final form. For example, in the systemic learning organization of Marquardt, the weighting of the components has not been carried out, and it seems that the components are of equal weight and significance [3], [18] and [19].

Finally, the scholars' perception and at times the incompatibility of such perceptions are of the issues which require contemplation in systemic thinking. Murthy (2001) introduces systemic thinking [20] and come up with noteworthy common points. Such differences results in mental, behavioral, and functional dispersion, utilizing it.

3. Conclusions

Long- System thinking has Emphasizing development and growth in every aspect. The necessity of considering/creating a reasonable prospect. Forming unification/union and unity. Developing systematic emotions/feelings with sense of peaceful coexisting with nature. Feeling respect and holiness, avoiding self-concerns The compulsion/ exigency of leadership in organizations [17]. Mar-ashi et al. [9] also refer to advantages of systemichinking as follows: More influential method about thinking system, goals, environment, and its parts. Framework and method for ginning insight into complexities of life, (because every live being is considered as a system). A method for learning of new ways in an easy way and unifying basic rules of systems. Creating a framework for identifying, analyzing, and solving problem and making decision in the system (which entails the easy understanding of complex issues, such as the interaction of parts in the multiple cause and effect cycles). A method for complexity management in the era of systems through accentuating each part and their internal relations. A method for observation of whole system along with observation of its constituents. A prospect for discerning short and term consequences [9].

Making a comparison among different perceptions of systemic thinking with mentioned rules obtained from beliefs of some of system theorists, one can hardly ever been proposed as one of the organization theories and management approaches, and implemented by exploiters. This thinking approach has broken/ignored some traditional paradigms and opened up a new window of perspective to users. Of the main effects of this thinking are the evolutions in the mental models and developing problem-solving methods at a micro or macro level in the human societies. System dynamics and causal loop diagram, expanding the concept of feedback, complexity management, chaos theory and environmental issues can be ascribed to development of systemic thinking. From one perspective, conflicting interpretations and perceptions, and from realistic point of view, contradiction in some concepts of this approach, gives priority to reviewing and correcting/modifying such ideas. Managers and leaders can utilize systemic thinking in the case that they take the part of an effective theory in the organization's life and its accomplishments and conceptualize terms and expressions and make attempt to understand the cohesion, and internal consistency, i.e., its validity.

Digging deep into this theory, the following vague and conflicting issues were identified:

- Disparate definitions with little commonalities
- Obscurity of the parts borders and sources as features of systems
- Changing systems into microsystems and vagueness of inputs, outputs, and internal or external of microsystems.
- Making use of three stages of problem solving adopting systemic method although noticeably unclear systems' change into microsystems beside vagueness in systems boundaries
- Placing emphasis on recognition of systems' (organizations) problems more internally andless externally (environmental effects)
- Taking the effect of system's constituents on its structure as no apparent
- The contradiction of holographic concept and entity
- The insistence of systemic models on adopting interactional view about their parts, and not proceeding in a phased/step by step and algorithmic way

In recognizing problems of systems including organizations and humans, in addition to these ambiguities that each of them are mentioned as one of basic methods for solving systemic problems, there are obstacles against discerning and employing systemic thinking in our society such as:

Humans are mesmerized by their own mental models and frameworks which are part of themselves, such a basis, unconsciously, turns into a hindrance against admitting systemic thinking; because it is a difficult task to avoid such frameworks and models in examining topics and events, without prejudice and relying on old patterns.

The second barrier stems from the prior one. Since human beings live and perform in the reality, every person carries extensive experience representing life based on practice. These experiences, in turn, change the attitude toward subjects and phenomena. Accordingly, humans instead of considering themselves as creator of phenomena, tend to respond to them.

The essence of systemic thinking requires attending to relations not subjects and objects, while individuals are accustomed to heeding objects and tangible matters. In fact, only once it becomes possible to observe and analyze relations that a lot of effort is made on the part of the individuals.

The fourth barrier in opting systemic thinking emanates from the humans biology and their survival instinct. This instinct can overcome intuition, thought and contemplation which are the requirements of systemic thinking. Therefore, such thinking can remain at the level of mere yearning and curiosity, and choosing and implementing it becomes a tough task.

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