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CONTENTS

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EVOLUTION OF SYSTEMS CONCEPT IN MANAGEMENT THEORY

By Takehiko FURIHATA*

I Foreword

The author, in his previous article titled "Reflections on Management Theory" (*Keizai Ronso*, Vol. 106, No. 1·2·3) discussed the importance of the definition of business organization in order to develop a management theory, as well as the need to redifine business organization from a viewpoint of the systems concept with a view to achieve the theoretical and practical tasks of today's management theory: the unification of interdiciplinary approach. The author also suggested that the understanding of the difference in the systems concept between that of the traditional theory and that of the current theory (closed system versus open system) would provide a consistent basis as well as meaningful clues for the understanding of the evolution of the present management theory.

The previous article nevertheless had made some general reference on the evolution of systems concept because the matter was discussed in relation to some concepts expressed in various management theories in the past. As much as the importance of the evolution of systems concept has been emphasized in our approach in the management theory, it is felt necessary to advance our study in this respect a little further.

* Professor of Economics, Kyoto University.

In this article, the author intends to analyze the evolution of the systems concept in relation to the various studies. On one hand there are L. J. Henderson, *Pareto's General Sociology*, 1935; B. Barber, *L. J. Henderson on the Social System*, 1970. On the other hand, there are the studies by von Bertalanffy, "An Outline of General System Theory" (*British Journal of the Philosophy of Science*, 1. 1950) and (ditto) "General System Theory, a New Approach to Unity of Science" (*Human Biology*, Vol. 23, 1951). L. J. Henderson's work is the best introduction[1] to the theory[2] of Pareto who was the first man ever to introduce the systems concept into the study of human and social phenomena.

The concept of social system which Henderson discussed in his work still retains the characteristics of closed system. For this reason, he may be said to have laid the ground for the work of Human Relationists (or New Classicists) and of C. I. Barnard, the father of modern organization and management theory. On the other hand, Bertalanffy advocates his General System Theory on the basis of 'open' system which he maintained would provide a new scientific approach for analyzing theory various phenomena effectively and serving as a means to achieve the synthesis of scientific disciplines, a pressing need of the modern times. Bertalanffy exercises a penetrating influence over the management theory and there are increasing numbers of scholars who support his theory. Basing on the above discussion, these theories are going to be reviewed in the present article.

II Evolution of Systems Concept

1) Pareto's systems concept

The systems concept is one of the key characteristics of our natural science, for instance, the solar system. The famous physico-chemical system proposed by W. Gibbs is a good example of system in the natural science. According to Gibbs, it is an isolated aggregate of materials made up by a given number of constituents, such as a mixture of ice, soda water and whisky in a tightly closed thermos flask. In this instance, the aggregate represents a condition made up by three different phases (solid, liquid and gas) existing at the same time, although the condition is never constant but changes incessantly depending on the concentration of constituents, pressure applied to them and temperature variances. A change in one constituent necessarily produces some other changes on the other, so that the constituents are really depending upon each other. In such a system, then, the simple cause and effect analysis is no longer valid. Analysis must be made for the simultaneous changes that take place in the inter-depending

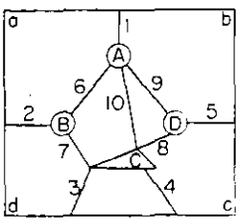
1) L. J. Henderson, *Pareto's General Sociology*, 1935, p. 17, p. 20, p. 28, p. 96; B. Barber, *L. J. Henderson on the Social System*, 1970, pp. 32–33, p. 84.

2) Pareto's *Trattato di sociologia generale*, 1916, has been translated into English by Andrew Bongiorno and Arthur Livingston as *The Mind and Society*, 1935. The book is partly translated and published in Japan; ref. Takeo Toda, *Rekishi to Shakai Kinko*, Mikasa Shobo, 1939, and Tsutomu Himeoka, *Ippan Shakaigaku Teiyo*, Toko Shoin, 1941.

constituents[3]. Obviously, such an isolated system cannot be found everywhere. It is a concept of system fictions rather than real, since analysis has been directed only to the interaction of a specific set of factors by omitting others. This omitting of the other factors is a necessary step to simplify the study of complicated phenomena in a consistent manner, and to bring forth a remarkable progress of chemistry and other disciplines in the natural science.

This is the systems concept in the natural science that Gibbs has explained so well. Pareto, on the other hand, has considered a social system as a conceptual scheme which characterizes his General Sociology and which is very close to Gibbs' model. According to Pareto, a social system is an aggregate of heterogeneous individuals of varying characters whose behavior are motivated by emotions. The aggregate is conditioned by the inter-action of the heterogeneous individuals (constituents) and in this sense it is a system isolated from the rest. Obviously Pareto's system is remarkably similar to that of Gibbs: the ice, soda and whisky in the latter's system are replaced by individuals while the different 'phases' (solid, liquid and gas) correspond to the heterogeneousness of individuals and such other factors as density, pressure and temperature can be substituted by the behavior of individuals motivated by their emotions[4]. However, since Pareto's subject of research is sociological phenomenon in which human emotions play a predominant role, he spends a great deal of efforts to analyze the emotions. In fact, most part of his work was directed to this aspect.

Pareto divides emotions into 'residues' or the fundamental part of emotions subject to little change and to be called instincts, and 'derivation' or the various forms of expression of 'residues' are subject to changes[5]. He then reintegrates these emotions into the concept of social system after a great deal of intellectual efforts and tries to verify the concept within the framework of crucial phases in the European history. Here again, his concept of social system closely ressembles the physical or chemical system. This is because Pareto considers that even if it is impossible to give a quantitative expression for the conditions in a social system, unlike those in the system of natural science, any change in the social system will generate a counteraction within the system (even though it may be modified or conditioned somewhat by human experience) and this tends to



3) Henderson uses the following diagram in order to explain the interdependence within a system (L. J. Henderson, *op. cit.*, p. 14; Barber, *op. cit.*, pp. 163–164). Four rigid bodies (A, B, C and D) are connected by means of rubber bands (1, 2, 3, 4 and 5) to the outer square and these four bodies are interconnected by similar rubber bands 6, 7, 8, 9 and 10. When one of the solid bodies is pulled, there will appear interactions between each of the bodies which swing for a given period of time. However, they will eventually return to their original positions.

4) Henderson, *op. cit.*, p. 16; Barber, *op. cit.*, pp. 183–184.

5) Pareto distinguished six residues (instinct to combine, maintenance of group, need to give expressions for emotion, residue concerning sociability, safeguard of individual character and sexual residue), and four derivations (affirmation, authority, consistency to emotions and principles, demonstration by language). (Henderson, *op. cit.*, Chapt. V, Chapt. VI; Barber, *op. cit.*, pp. 115). As for the residues and derivations, refer to Himeoka (*op. cit.*, Chapt. 6–8 and Toda, *op. cit.*, pp. 25–82).

restore the system back to the original state, because conditions of a social system depends on those of its constituents. For example, short-duration war, or a moderate epidemic or a natural calamity it produces confusions only for a limited period of time[6]. We may say again, therefore, that Pareto's concept of social system is quite similar to the natural scientific system regardless of the difference in their subjects. It would naturally be a mistake to conclude from this ressemblance that Pareto owes his concept to Gibbs and that he simply applied Gibbs' concept of natural science to sociology. Actually, there was no link between Pareto and Gibbs. The similarity is due to the fact that the stage of scientific development at that time provided this type of systems concept as the most effective logic to explain the complicated phenomena characterized by interaction among its constituent elements[7]. Consequently, just like Gibbs' systems concept of physics or chemistry which have had a lasting influence over a wide range of scientific disciplines including metallurgy, geology, zoology and biology, Pareto's concept has left a far-reaching impact on social science, although the latter may be suffering from some inherent problems[8].

2) L. von Bertalanffy's systems concept

The classical school, be it natural science or social science, treated a phenomenon as a whole (i.e., macrometric approach)—the work of Newton in physics, Adam Smith in political economy, Auguste Comte in sociology, Mooney and Reiley in the organization theory are good examples—whereas the modern science is characterized by micrometric approach. Laplace, for instance, reduces the world into aimless play of atoms governed by the natural laws, while biology studies a life in terms of molecules and organs whose physico-chemical process is considered to represent the behavior of an organ. In the domain of social science, the early schools of modern political economy considered the economic society as the total of pure economic behaviors of all units or constituents. Industrial sociology and the so-called "theory of human relationship" apply the same approach to the study of smaller social units and groups[9]. In other words, viewing from Gibbs' physico-chemical system, the prevailing attitude was that any phenomenon could be clarified first by isolating it from the others and by dividing it into a given number of constituent factors, and finally, by finding the interaction or inter-dependence (or equilibrium) among these factors. In this sense, the modern science finds its exact model

6) Henderson, *op. cit.*, p. 46; Barber, *op. cit.*, pp. 88–89. As for equilibrium, refer to Himeoka, *op. cit.*, pp. 500–508, and Toda, *op. cit.*, p. 49.

7) Henderson, *op. cit.*, pp. 16–17, pp. 81–86, pp. 91–93; Barber, *op. cit.*, pp. 183–184.

8) Henderson, *op. cit.*, pp. 93–94. The difficulties aflout Pareto's concept are as follows:

(1) Among various objects of the study of social science, there are a number of cases where the concept of social system cannot be applied.

(2) Difficulty to distinguish a concrete social system from the others.

(3) Difficulty to establish an experimental social system.

(4) Difficulty to give clear definition of economic interests, emotion, etc.

(5) Impossibility to give quantitative expression for the object of study. (*ibid.* pp. 94–95)

9) L. von Bertalanffy, "An Outline of General System Theory", *British Journal of Philosophy of Science*, 1, 1950, p. 134; W. G. Scott, *Human Relations in Management*, 1962, pp. 152–154.

in natural science[10].

Consequently, many sectors of science attained an unprecedented degree of accuracy and subtlety in their analysis (the age of analysis[11]), although at the same time, scientific and social progress made it increasingly apparent that such analytic approach alone is insufficient to elucidate the universe and the phenomena it contains. Those highly specialized sciences serve to clarify fragmented aspects of things, while a phenomenon is a unity far more complex and organic. Moreover, conditions and factors constituting such a phenomenon are subject to constant changes. In other words, a phenomena is a process in which such changes or interactions take place. The analytical approach of modern science has therefore but limited power in tackling the complex phenomena. What becomes necessary is not the traditional elementaristic type of thinking, but the attitude to question the wholeness of a phenomenon. It tends to move a researcher's interest towards a non-elementaristic thinking or to a synholistic thinking relating to organization as a whole rather than the aggregate of parts, and also toward a dynamic interaction among the constituents[12]. This is the advent of parallelism and the "age of synthesis" (Culliton, *op. cit.*). If we accept this, then we are not far from isomorphic thinking which is applied to approach two or more objects which are different but are remarkably similar in their governing principles[13]—a good example of which is the law of index. Of particular importance is the recognition that phenomenon and objects are some kind of systems leading to emergence of General System Theory (i.e. to emphasize the logical homology of a system in order to build up an effective theory encompassing all systems in general).

The General System Theory completely denies the traditional attitude of science as described previously, i.e. analyzing a phenomenon by breaking it down into parts and components and then to use their mechanistic combination (i.e. the whole is the aggregate total of parts) for final explanation. It would be possible to take up, for instance, a part of a living organism (such as an eye or a heart) and establish physico-chemical principles applicable to it. However, when such organism is to be considered as the vital feature, it then becomes necessary to treat it as an organization, orderliness and regulation basing upon dynamic interactions of highly complex nature constitute a living organism. Therefore, even the most elementary phenomenon taking place in a cell cannot be explained by the traditional science based on physico-chemical approach. A new approach completely different is therefore needed (that the whole is not aggregate total of parts, that although it is possible to treat all phenomena alike as systems, the whole may contain elucidation of phenomena which cannot be resolved by the old approach)[14].

However, inasmuch as the General System Theory is based upon the recognition

10) Bertalanffy, *op. cit.*, p. 139.
11) Culliton, "Age of Synthesis", *H. B. R.*, Sept. 1962,
12) *Ibid.*, pp. 134–136; Bertalanffy, "General System Theory: A New Approach to Unity of Science", *Human Biology*, Vol. 23, 1951, p. 302.
13) Bertalanffy, "Outline", pp. 143–144.
14) Bertalanffy, "Outline", pp. 146–154.

of isomorphy, the problem would be to determine the proper model. In this respect, traditional science, in considering a system, tended to regard it as a closed or isolated one as we have already seen from Gibbs' physico-chemical system or Pareto's social system. The General System Theory, as an antithesis, no longer holds such a view and seeks its model in an open system which is not isolated. It maintains that like an organic being, it keeps incessant exchange of materials and energy between itself and the outside world, which means that the constituent elements inside the system is subject to constant change in order to survive and grow—an open and organic system. To establish a theory which can hold ground on the basis of such a model is the task for the new science[15]. For instance, be it a short process of growth like sea-urchin or a much longer process such as the systematic evolution of a species, organic being tends to develop to a higher order of organization and evolution (so-called anamorphosis, including heterogenesis and complication). It is impossible to tell from the initial conditions what the final state would be, yet the final state presents a coherent picture of a specific living organism (or 'equifinal' phenomenon). The closed system theory will be totally inadequate to account for such a phenomenon, because its guiding logic is that the final state depends upon the initial conditions—such as position of a planet at point t_n is determined by its position at point t_0, or the chemical equibrium in which final concentration is dependent on the initial conditions[16].

Thus, we have seen that the open system, or a new model offered by the General System Theory, is quite adequate to give suitable explanation for such phenomena which remained unaccountable under the conventional theories, and that such a theory opens up a number of new possibilities to science in general. Bertalanffy summarizes the approach as follows: (1) the central point of systems theory is in contrast to Cartesian mechanic theory (which aims to elucidate an orderly phenomenon under those conditions of foreseeable structure) in that it constitutes a dynamic view to clarify a phenomenon in terms of interactions or process, (2) if we set aside the 'machine' whose origin remains to be unclear (which Descartes called 'creator' and which is today called 'natural selection'), the general models of mechanistic concept were found among random phenomena, while according to the new concept, such a model should be found in the organic world, and (3) we have moved from "self-actional" viewpoint (in considering isolated chain of cause and effect, process and self) to an "interactional" point of view (interaction between these units) and finally to 'transactional" point of view in which clear boundary between the knower and the known disappears and which, in consequence, recognizes that no system in existence is isolated from the others[17].

15) Bertalanffy, "Outline", pp. 155–157; ditto, "GST", p. 308.

16) Bertalanffy, "Outline", pp. 157–159, pp. 161–163, ditto, "GST", pp. 308–310.

17) Bertalanffy, "GST", 5, Conclusion, pp. 343–344. If the concept of open system is to become the center of general system theory, we should question the relationship between the closed system and open system, but it would be possible to regard it as a special form of open system which does not have any exchange relationship with the outside world (Bertalanffy, "Outline", p. 156). Even if such a relationship has any known value, we may say that it would not present any difficulty to the closed system logic (Henderson, *op. cit.*, pp. 82–83).

III Comparison of Two Theories

1) Influence of the two systems—that of Pareto's in particular

We have reviewed how the concept of system is understood by Pareto and Bertalanffy. The so-called social system of Pareto may be said to be structured in a manner identical to that of the physico-chemical system of Gibbs, although their respective constituents are obviously different. In other words, Pareto considers his social system as the one constituted by interaction between heterogeneous people motivated by emotion and which is isolated from environment (one cannot take everything into account at the same time, and it is more convenient to have fewer number of variables). He thought that if such a system is disturbed by some reasons, then the reaction would eventually restore it back to the original state of equilibrium. As it is, Pareto's social system is in essence a closed one, artificially an isolated product (structure) of thoughts. Bertalanffy's system concept, on the contrary, is essentially open. He starts from the interaction between the whole system and its environment, and then questions the mechanism of the formation, development and metamorophoses in the process of adaptation to such interactions. Therefore, he considers that elucidation of such phenomena like anamorphosis, growth and equifinal to be a more essential task compared with that of equilibrium.

During the several decades when the "age of analysis" characterized by the closed system failed to clarify certain phenomena because of its elementary and analytic approach, there occurred a new school of thought which tried to study the phenomena in a more realistic way, and consequently, aimed to grasp the total relationship of the surrounding dynamic reality from a more holistic point of view. This is an attitude responding to the need of the age of synthesis.

Then, how and in what form the claim of General System Theory as advocated by Bertalanffy and based on the concept of the open system could materialize into a concrete result? This is not a simple question, and it would be necessary for us to look into the views of scholars like K. E. Boulding[18] who was certainly influenced by Bertalanffy. However, one more immediate problem is that, not only business enterprises—the subjects of management theory—could be considered a system, but also the fact that Bertalanffy's theory seems to coincide much more consistently than Pareto's to the problems associated with contemporary management. As it is, evolution in methodology of science must have exerted conciderable influence on the approach to management theory. Actually, we can find a clear indication that the attention previously given to Pareto's systems concept is gradually shifted to that of Bertalanffy. The former was adopted by so-called "Human Relationists" and Barnard, while the latter is taken up by those who apply the systems theory to the modern business management[19].

18) According to K. E. Boulding, there are two approaches available to General System Theory: (1) a general field theory of actions and interaction dynamics, and (2) hierarchy of systems or 'system of systems'. He himself adopts the second position. (K. E. Boulding, "General System Theory—The Skelton of Science—", *Management Science*, Vol. 2, No. 3, April, 1956, pp. 200–208).

19) The author's, *Keiei Kanri Kateiron no Shin Tenkai*, Nippon Seisansei Hombu. 1970, pp. 26–27.

The author pointed out once the fact[20] that Pareto's concept of social system have had a significant influence on the Human Relationists. For instance, we can witness identical thinking in F. E. Kast and J. E. Rosenzweig, *Organization and Management—a Systems Approach*, 1970[21], while W. G. Scott, in his *Organization Theory—a Behaviorial Analysis for Management*, 1967, included an appendix in which the relationships between the two were explained, and he stresses the similarity on the basis of detailed analysis of social system, logical and illogical behavior, concept of equilibrium, function of language, circulation of elites and others[22].

On the other hand, there are few people who question the relationship between Pareto and Barnard. For instance, J. Woodward, in her *Industrial Organization*, 1965, states that organizational problems were conceived by Human Relationists under Pareto's influence as the interaction between two different variables of the formal and informal organizations, and that they did not go any further than to analyze such interaction and overlooked the importance of technology. Woodward in fact goes no further than to criticize that such an attitude diverted organizational study to a wrong direction[23], and that similar tendency can also be seen in Barnard.[24] Woodward does not make clear whether she considers that Barnard's use of the systems concept was based on Pareto's theory, as was the case of the Human Relationists. On the other hand, Kast and Rosenzweig in their above-mentioned book emphasize the characteristics of open system approach in modern organization theory, and states that Barnard was one of the first group of theoreticians in the domain of administration who used the systems approach, along with H. A. Simon, C. W. Churchman, G. C. Homans, P. Selznick and the Tavistock Institute group in Britain[25]. It appears then as if Barnard's system approach was in fact an open system approach as advocated by Bertalanffy.

Would such an interpretation of Barnard's system approach by Kast and Rosenzweig (not to mention of Woodward's) be justified? As the author pointed out in his previous thesis (op. cit.)[26], principles of Barnard's theory owe a lot to Pareto, while they show no relationship with that of Bertalanffy. One of the reasons is that Barnard's work dates back to 1938 while that of Bertalanffy was published only since 1940. The second reason, more important, is that Barnard not only quotes Pareto to express systems characteristics but also the way he develops his theory on the premises of Pareto's theory, while is is quite different from Bertalanffy's concepts. For example, quoting from Pareto, Barnard says that the system characteristics depend on the interactive variables of constituent elements[27] and for that reason, simple analysis of cause and effect is no longer

20) Ibid., pp. 45–46.
21) F. E. Kast and L. E. Rosenzweig, *Organization and Management—a Systems Approach—*. 1970, p. 91.
22) W. G. Scott, *Organization Theory—a Behavioral Analysis for Management—*, 1967, pp. 38–41.
23) J. Woodward, *Industrial Organization—Theory and Practice—*, 1965, pp. 74–77, pp. 244–245.
24) *Ibid.*, pp. 77.
25) Kast and Rosenzweig, *op. cit.*, pp. 116–117.
26) The author's *Keiei Kanri Kateiron*, pp. 26–27.
27) C. I. Barnard, *The Functions of the Executive*, 1938, pp. 77–78.

valid[28] (he also quotes Pareto to explain the concept of utility)[29]. These grounds are essentially too general to draw a prompt conclusion. Nevertheless, a problem arises when Barnard, having considered cooperative system, discusses "organization"—the essential point of his argument—and develops his own theory basing on the essence of his administration concept. In his effective analysis of the system of cooperation, Barnard extracts "organization" or a "system of activity"—which is an aspect common to all systems of cooperation—by abstracting all other elements[30]. This is because he aims at a general theory[31] and for that purpose, it is preferable to have fewer variables to be accounted for from a methodological point of view[32]. Wouldn't such a concept of analytic approach forming an isolated system remind us of Pareto's social system (we must accept, naturally, that Barnard's "organization" as a system is a system of consciously coordinated personal activities or forces which excludes individuals in general, and that his approach is different from Pareto's social system in that he defines the elements of organization as 'purpose', 'willingness to cooperate' and 'communication')? Barnard states that maintenance of such an organization is essentially the executive's functions[33] and this requires so-called 'effectiveness' and 'efficiency' which are nothing less than the problem as to how to adjust these organizational elements to the changing environment[34] and to maintain equilibrium among themselves (on the basis of inducements-contribution balance), and that such internal process is the key issue of administration. Thus, although Barnard attaches certain importance to the relationship of organizational elements, he does not attempt to tackle with the relationship in a straightforward manner. To him, maintenance of "organization" or equilibrium within itself was the most important problem[35] (it must be pointed out, however, that Barnard conceives the function of the executive similar to that of our nerve system, and that he does not introduce 'residues' as Pareto did or a function peculiar to a group of human being as maintained by the human relationists) and this again seems to place him very near to Pareto's theory. If so, then it would be a mistake to consider Barnard's system approach, like Kast and Rosenzweig did, as the one belonging to open system approach in parallel, regardless of whether or not there is any difference in the approach used by Pareto and Bertalanffy. We should say that Barnard's system approach is quite strongly influenced by Pareto[36].

2) Meaning of Openness of system

So far, we have seen how the theory of Human Relationists and that of Barnard ressemble Pareto's basic concepts and theory, bearing witness to the latter's influence.

28) *Ibid.*, p. 51.
29) *Ibid.*, pp. 244.
30) *Ibid.*, p. 66, p. 73.
31) *Ibid.*, p. 73.
32) *Ibid.*, p. 74.
33) *Ibid.*, pp. 215–216.
34) *Ibid.*, p. 6, pp. 82–83.
35) J. G. March and H. A. Simon, *Organizations*, 1958, p. 83.
36) Barber, *op. cit.*, p. 16, p. 119, pp. 126–127.

However, it may be a little premature to conclude that their system concept has a 'closed' character of Pareto's theory, because J. D. Thompson, for instance, quoting A. W. Goulder, points out that the approach of Human Relationists characterized by their study of informal organization is similar to that of natural-system approach to organization study (an attitude to grasp a complicated organization as a system which is made up of a number of inter-dependent elements and which is in turn inter-dependent with the environments—such a system's ultimate purpose is its survival and the relationships between the constituent elements are determined by evolutional process. It should have a built-in homeostasis or self-stabilization capacity to offset any dysfunction by counteraction of its elements otherwise the system will degenerate)[37]. Moreover, such an approach devotes special attention to these variables not contained in any rational model of closed-system approach (scientific management, traditional management theory, bureaucracy theory all found their bases on this approach) such as emotion, cliques, informal control, competition for position, etc., and points out that these variables are not of random character, but are the very process of adaptation of a fixed type of human beings within a difficult environment. As it is, the central concepts of this approach is to find homeostasis or self-stabilization effect which controls naturally desired relationship between parts and activities in order to defend the system from external disturbance for survival. In this sense, the approach is necessarily different from closed logic and acquires characteristics of an open system[38]. Then, it would become possible to understand Barnard's work in the same way, but Thompson views Barnard's theory as the second type of a natural-system approach. According to Thompson, Barnard's approach stands on a global viewpoint and is less crystalized, but in the sense that an organization is considered as a unit of interaction with the environment and in which executives' plans are prone to have unintended results or are subject to control by other organizations, so it cannot be said to be an independent being. It is rather an open natural system approach in that the attention is given to those variables which are not under full control of the organization, and it considers the inter-dependence between the organization and the environment as inevitable and natural, and consequently, adaptive or functional[39].

Thus, Thompson considers that the theory of Human Relationists and Barnard are both natural system and have open character in common, and as the author previously pointed out, he does not call their approaches closed system simply because of Pareto's influence and the similarity to the latter's theory. W. G. Scott even goes further and explains that Henderson's system concept, basing on the quotation from Pareto, is an open system approach[40]. How should we understand such a

37) J. D. Thompson, *Organizations in Action*, 1967, pp. 6–7.

38) *Ibid.*, p. 7.

39) *Ibid.*, p. 7; A. Etzioni, "Two Approaches to Organizational Analysis; a Critique and a Suggestion", *Administrative Science Quarterly*, Vol. 5. No. 2., Sept., 1960, p. 273; J. G. March and H. A. Simon, *Organizations*, 1958, pp. 83–84.

40) W. G. Scott, *Human Relations in Management*, 1962, Chapt. 8.

relationship?

A closed system in the logical sense would literally be a closed and isolated system, as represented by the mixed liquids in thermos flask or a rubber ball tied to a frame, without any interference from the outside world (such as Henderson's model). In such a system, if there is any change added from the outside world, in due course it either returns to a static equilibrium because of the inter-actionary reaction of its constituent elements, or it becomes an entropy as seen in thermodynamics (such as a material which changes after combustion into a chaos in which no further exchange of energy can take place)[41]. As it is, because the systems concept of Human Relationists or Barnard is to deal with a social unit or a social phenomenon, there must be a constant interaction with their environment, and because their theory is developed in such a way as to recognize such interaction, it would be possible to say that these theories are not identified as a part of the closed system approach. In this sense, Thompson's comment as to their being an open and natural system seems to be appropriate.

However, we should not overlook the fact that the so-called "openness" is not that of today's open system approach. When a given system unit is conceived in relation to its environment and its adaptive relationship within the environment is questioned (that is to say, as an open system), it is yet possible to suppose that the essence of a closed type approach needs not be changed in any way (quasi-closed system approach). Today's open system approach is different in that it goes far beyond the quasi-closed system approach in order to develop a real system dynamics theory. The comparison made between Pareto's theory and that of Bertalanffy already illustrated this point. It would be a mistake, for example, to say that Pareto has completely neglected the relationship with outside world, and in this sense, his approach may be said to be an open one. However, he believes that if such changes would have certain known values (or if their departures from the known values are not too large), then they will not cause any difficulty to the closed logic theory itself[42], and he further develops his theory of equilibrium in a way similar to the homeostatic equilibrium[43], which is common to the above-mentioned natural system approach. If the mechanism of homeostasis is similar, for instance, to the function of a thermostat, it remains in the domain of closed logic. Bertalanffy's General System Theory, on the contrary, proposes an open system approach which tries to clarify those phenomena of trans-actional nature in the sphere of organization (for which closed system logic is of no avail) by the process of interaction. It has, for this reason, a much broader sense (in that even the total system structure such as the given conditions must be modified sometimes in order to adapt it to the change of environment and emphasizes that the real task is to find answers to such a

41) Bertalanffy, "GST", pp. 309-310; Kast and Rosenzweig, *op. cit.*, pp. 118–119.; J. G. Miller, "Living Systems: Basic Concepts", *Behavioral Sciences*, July, 1965, p. 195.

42) Henderson, *Pareto's General Sociology*, 1935, pp. 82–83.

43) *Ibid.*, p. 46. Boulding also gives explanation to homeostasis and its mechanism by taking thermostats as an example. (K. E. Boulding, *Beyond Economics*, 1968, Jap. Translation by T. Kumon).

broader questions[44]. Boulding, who advocates General System Theory along with Bertalanffy, also develops similar arguments. He states that "it is obvious that the theory of individuals does not end at the theory of homeostasis. The latter is a sheer and primary approximation. We should not be satisfied by the simple fact that a given status is maintained, we should rather question what status is maintained. The answer to such a question includes a number of problems such as growth and degeneration, learning and growth, existence and evolutional development, etc. This type of problems arise in connection with every organism from the simplest living organ to the most complex social organizations. Social science has shown limited attention to these problems...[45]." As such, while we may recognize that it will be appropriate to point out a system's openness per se in relation to a natural system, and yet it cannot be identified as today's open system approach as long as it puts openness as homeostasis. In other words, a unit of system may be related to the outside world (open) but it is still not enough to qualify it as the open system approach. The problem is the characteristics of the logical structure of such a theory. Today's open system approach means that a unit of system should be understood as one open to the outside world and we should also recognize the role of some homeostatic functions, for instance, which is a mere application of closed system logic in its extended form. It should mean the use of an open system logic which is heterogeneous to closed system logic, such as for instance the move from a closed decision model to an open decision model in case of business management, or so-called strategic decision model proposed by H. I. Ansoff[46]. It should be in such a perspective that open system can have the contemporary meaning. While Thompson and Scott cannot be said to be completely wrong in their understanding of the open system, their understanding cannot be complete without recognizing the clear difference between the systems concept of Pareto and that of Bertalanffy as well as the shift of emphasis between their theories. Consequently, the so-called natural system approach of Human Relationists and Barnard cannot be considered identical to the contemporary open system approach.

IV Conclusion

We have so far established the fact that the meaning of systems concept as it is used by Bertalanffy is quite different from Pareto's. The latter's approach is essentially

44) Although Bertalanffy includes homeostatis within the dynamic teleology in his discussion of types of finality in his "An Outline of General System Theory", it is clearly different from equifinality, because the latter is not dependent on predetermined structure and such a phenomenon can be seen only in an open system (pp. 159–161). He develops similar theory in another work concerning relationship with cybernetics, biological regulation and feedback, and states that it should not be confused with the one he discusses in his open system theory ("GST, 6, Towards Physical Theory of Organic Teleology, Feedback and Dynamics", pp. 353–358.)

45) K. E. Boulding, *op. cit.*, Transl. by T. Kumon, pp. 65–66.

46) M. Alexis and C. Z. Wilson, *Organizational Decision Making*, 1967, Chapt. 3, Chapt. 7; H. I. Ansoff, *Corporate Strategy*, 1965.

a closed system, while Bertalanffy's is characterized by open system. In addition, we have also studied their respective influence over the management theory and questioned if the approach taken by Human Relationists and Barnard, who owe a lot to Pareto, could be identified as closed system. As we discussed earlier, Thompson challenges this point of view on the ground that their approach is characterized by openness of the 'natural system'. If so, we must conclude that Pareto's concept of a social system has an open character, which would mean that our understanding of the systems concept between the two poles (open and close) was overly simplistic. At this point, however, we must ask ourselves: which is the more important issue of the two? Would it be the openness of a system in the literal sense, or rather, would it be the logical structure of the systems theory? Needless to say, the latter is more important. Then, even if a natural system is characterised by its openness, we must regard it as a closed system approach having no essential difference from the closed system logic so long as the structure of the theory is based on the homeostatic mechanism. In other words, it is different in meaning from the open system approach which goes beyond the closed logic in that it proposes as a new science to consider such phenomena as equifinal or anamorphosis which are essentially different from homeostasis.

We consider therefore that the systems concept underwent a major change from Pareto to Bertalanffy. Such a shift of concept in scientific methodology must in some way be related to the evolution of human experiences. The problem facing us, of course, that part of the evolution relating to management theory. Are there any evolution in the actual management practice, as confirmed, for instance, in the history of management theory which would correspond to the conceptual evolution? Clarification of this last point and its relationship to the recent trend in management theory will constitute a more meaningful answer to the theme of our study, and the author proposes to do so in the next opportunity.