Philippine Journal of Public Administration, Vol. XXXIV, No. 1 (January 1990)

Systems Theory and Management of Organization

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Systems theory is considered to be a major reorientation in scientific thinking during the last few decades. It purports to replace the analytical and atomistic modes of inquiry by holistic and integrative ones. It offers a sophisticated, fascinating and impressive theoretical construct but is deficient in commensurate applicability to real situations. Management of organizations would remain an exasperating, frustrating, and challenging task; and experience, intuition, and judgment would continue to play an important role. Nonetheless, systems theory represents an attempt toward developing the science of management.

> "We have not succeeded in answering all our questions. Indeed, we sometimes feel we have not completely answered any of them. The answers we have found only serve to raise a whole new set of questions. In some ways we feel we are as confused as ever. But we think we are confused on a higher level and about more important things."
>
> — Anonymous

Introduction

The progress of civilization in a society has been accompanied by the emergence of numerous increasingly large, formal, and complex organizations. They vary in type, size, and form, and are designed to accomplish specific societal tasks. In order to make them operational and productive, effective management of human efforts and material resources is imperative.

With the intent of improving management practices, sporadic attempts have been made intuitively, almost since the inception of civilization, to develop a theory of management (Limerick 1987:54-76). These attempts have often taken divergent directions, and have resulted in the development of theoretical constructs that are partial, fragmented, and incoherent. The methodology used has been analytical, reductionistic, and mechanistic, focusing on separate parts, but overlooking the whole as an entity and the interactions of its constituent parts.

Toward the end of the 19th century, Frederick W. Taylor expended considerable effort in conceptualizing the process of management. His conceptualization marked the beginning of the analytical technique. It also formed the basis of the systems analysis and scientific management process.

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It was realized that the analytical approach had inherent weaknesses, and that a different approach was needed that would provide an expanded view of the manager's job and would facilitate an understanding of the organization's relationships with its complex environment (Tilles 1983:73-77). In the early twentieth century, psychologists and sociologists began the organismic or *Gestalt* approach in the study of human behavior. In 1926, Jan Christian Smuts, a South African lawyer and a military officer, implied universality of the Gestalt principle when he observed a tendency toward holism (wholeness) in all form, matter, life, and personality. He conceptualized "fields" long before Kurt Lewin, and emphasized a synergistic view of the universe when he stated that an organism was more than a sum of its constituent parts. Before Boulding, he developed the concepts of progressive gradation and levels of holistic syntheses (systems). Smut's work may very well be regarded as a precursor of the development of the systems theory.

James W. Culliton (1981) suggests that the age of analysis is being superseded by the age of synthesis. The integrative approach appears to be more promising and effective because the whole is intrinsically different from the mere combination of its parts. The age of synthesis would force management to think in terms of wholeness of operation (Culliton 1981:36-38).

Over the past few decades, a general systems theory has been developed that provides a basis for synthesizing and integrating knowledge from a variety of disciplines, and for identifying elements that are common to them. The systems theory, in its application, is holistic, congruous, and inclusive. It views phenomena in the physical, biological, and social world in terms of hierarchies of systems, subsystems, and suprasystems, in ceaseless interaction with one another. With its emphasis on synthesis, convergence, and integration of knowledge, it goes beyond the analytical process, and represents a major reorientation in scientific thinking (Exton 1982:130-133).

The Concept of System

The terms *system, systems, systems concepts, systems approach,* and *systems science* are used so broadly, profusely, indiscriminately, and interchangeably that they betray lack of preciseness in thinking and usage (Kalman 1979:107-108). Generally, the word system connotes a plan, method, order, arrangement, or Gestalt, and is antithesis of chaos, confusion, and disorder. It is an assemblage of objects or ideas united in some form of regular interaction or interdependence forming a unified, organic, or organized whole. It is a combination of things or parts that constitute a complex entity. It is a set of interrelated and interacting components that, when put together, function to achieve predetermined goals (Ackoff 1981:661-663). The concept of system can denote a wide range of phenomena in the universe. It assumes wholeness, stresses interdependence of parts, and emphasizes their interaction. The systems approach emphasizes wholeness first, then moves to the consideration of parts, including interaction among them, and between them and the whole (Figures 1, 2, 3, 4, and 5).

Figure 1. Basic Systems Model

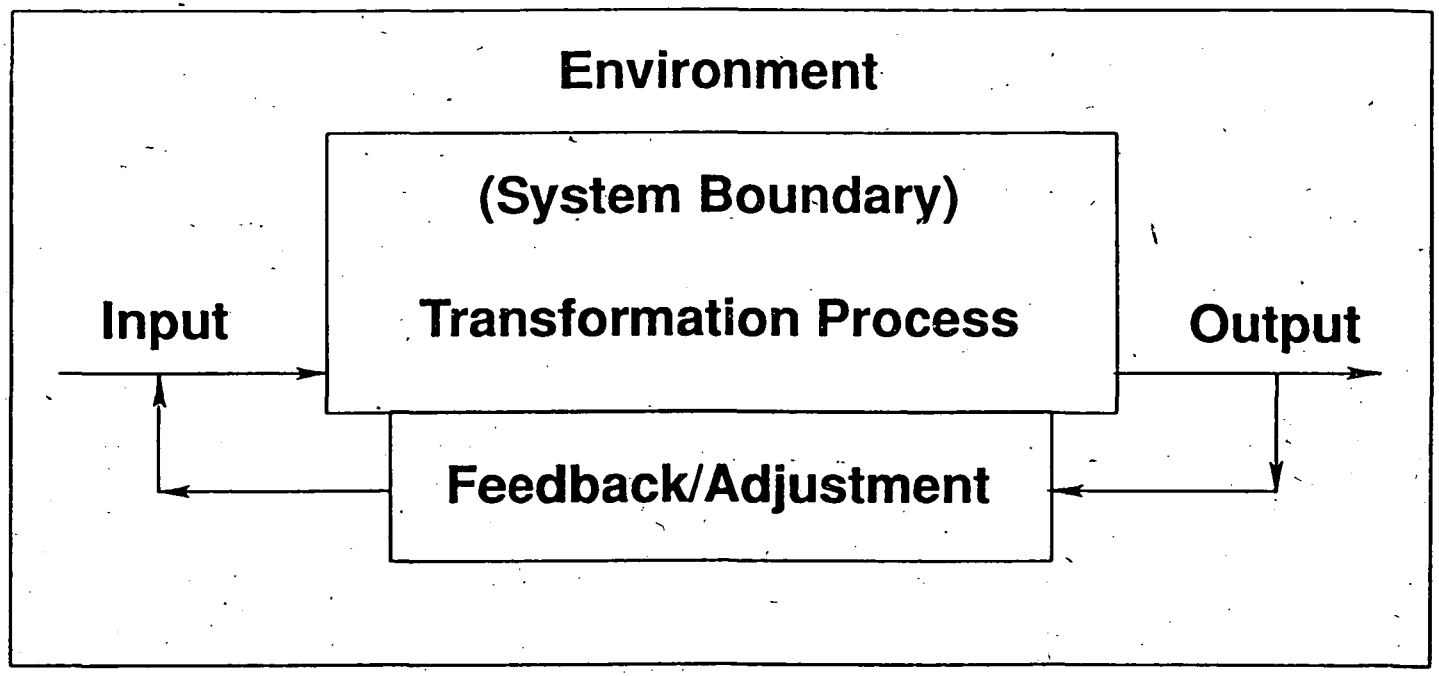


Figure 2. Systems Relationships-Hierarchical

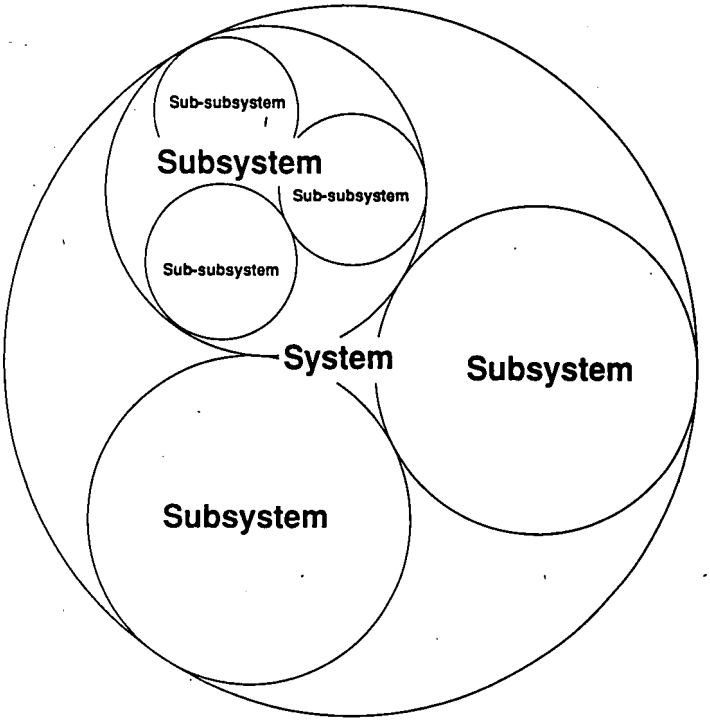


Figure 3. Systems Relationships - Centralized

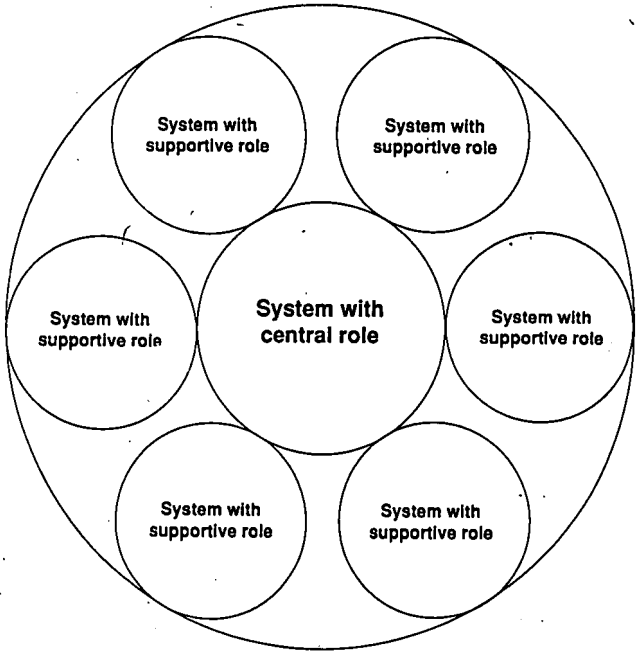


Figure 4. Systems Relationships - Equalitarian

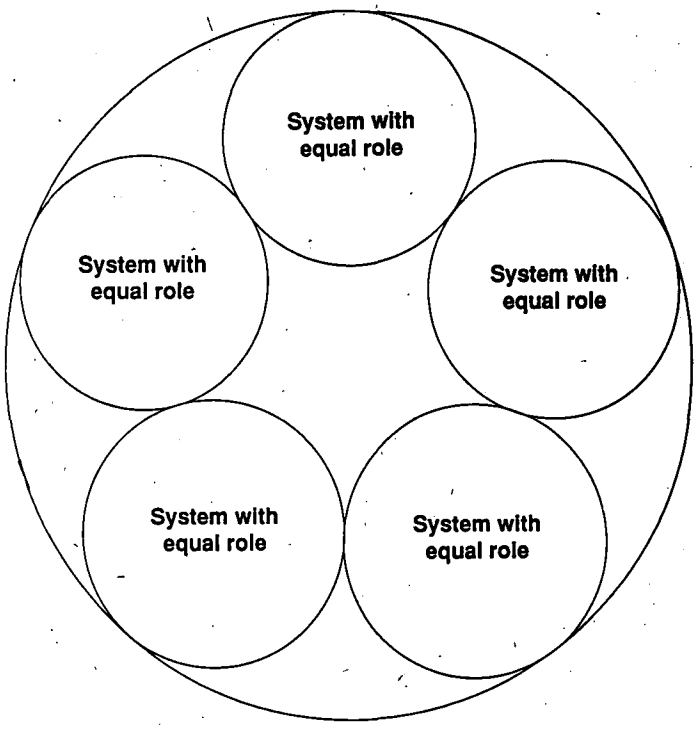
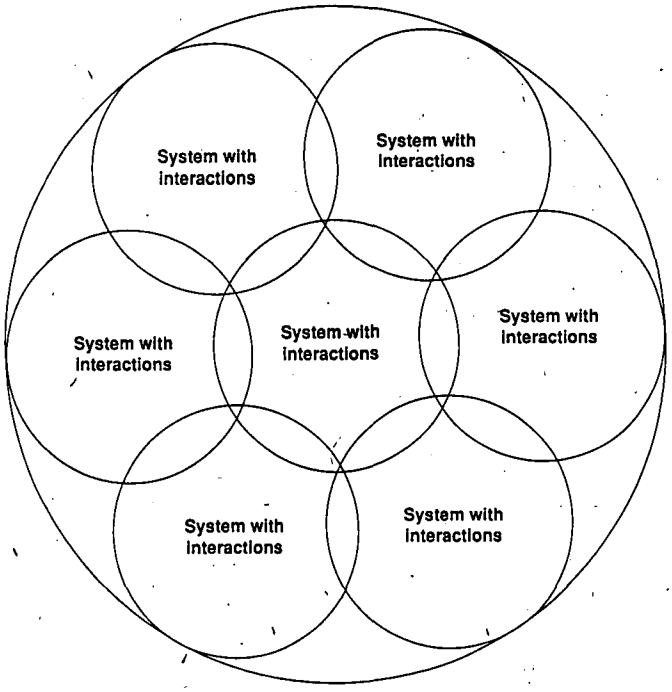


Figure 5. Systems Relationships - Interactional



The term system, when used in the context of an organization, implies an entity composed of a set of parts and created to accomplish certain objectives. An organization, as a social system, has certain inherent characteristics: (1) it has subsystems and is part of a suprasystem, in continual interaction with one another; (2) it has definitive objectives to accomplish; (3) there is an inflow-transformation-outflow cycle of human and material resources; (4) there are performance evaluation measures; and, (5) management is essential for its operations (Churchman 1968:28-30).

A system may be viewed in terms of information flowing between subsystems. The information is continuously recorded, processed, summarized, used, stored, and discarded. The flow of information is indispensable for the effectiveness of the management system. It is necessary for making decisions and plans, initiating and directing actions, and evaluating results (Gilchrist 1984:172-176). The system should provide information that is consistent, accurate, timely, economical, and relevant.

The aim of a system is the coordination of human efforts and material resources to produce desired results in a dynamic organization. Structured analysis is used to develop systems. It is a systematic, top-down technique that refines goals and objectives presented by means of a hierarchical model of systems requirements. The tools of structured analysis are logical models. Structured design is the physical implementation of these logical models, and it utilizes hierarchical partitioning of a modular structure in a top-down manner. It is the natural extension of the structured analysis process (Grana 1986:20-26). The structured analysis and design techniques are used during the entire system development life cycle, which comprises analysis of the existing system, designing of a new system, and seeking its implementation.

The systems concept is predicated on the application of basic logic, and generates mathematical models and paradigms. These models and paradigms are pictorial or graphics representation of abstract and complex human thought process, and can be programmed into the computer (Martan 1985:273-277). The configurations of systems, subsystems, and suprasystems are an outcome of the thinking process, and delineation of their boundaries and conceptualization of their interactions would depend upon one's perception, imagination, and creativity.

Systems theory

The ever-increasing size, complexity, and diversity of modern organizations have rendered their management exceedingly difficult. The technological advancement has made a forceful impact on organizational structure, role of authority, and decision-making process. The traditional management theories are disjointed, piecemeal, and fractional in their approach, and are generally inadequate in addressing the problems and challenges confronted by modern management (Robb 1985:463-466). Systems theory, with its emphasis on holism, offers the promise of being an effective guide to management practice. It focuses on the *whole*, its environment, and

the interactions of its constituent parts. It replaces the analytical and atomistic modes of inquiry by holistic and integrative ones (Buckley 1982:59-63).

Systems theory seeks to explain phenomena in the universe in terms of the systems concept. It varies in contents, dimensions, emphases, and complexity in its application to physical, biological, and social systems. However, despite these differences, there are elements common to all systems that provide a basis for the formulation of a general systems theory. Various scholars have attempted to identify these elements (Ackoff 1981:661-671; Berrien 1985:23-32; Boulding 1956:197-208; Buckley 1982:11-30; Hall, *et al.*, 1980:18-28; von Bertalanffy 1968:188-206).

Boulding developed a hierarchical classification of systems in the universe, according to level of complexity, ranging from the basic to the ultimate. The classification comprises the following systems (Boulding 1956:202-205):

(1) The first level is that of static structure. It might be called the level of *frameworks*. Geography and anatomy of the universe are examples.

(2) The next level might be called the level of *clockworks*. It is a simple, dynamic system with predetermined, necessary motions. The solar system is an illustration.

(3) The next level is that of the control mechanism or cybernetic system. It may be referred to as the *thermostat* level. The homeostasis model, so important in physiology, is an example.

(4) The fourth system is that of the "open system" or self-maintaining structure, and might be called the level of the *cell*. At this level, life begins to differentiate itself from non-life.

(5) The fifth level might be called the *genetic-societal* level. It is typified by the plants, and it dominates the empirical world of the botanists.

(6) Next comes the *animal* level. It is characterized by increased mobility, teleological behavior, and self-awareness.

(7) Next is the *human* level. In addition to possessing nearly all the characteristics of animal systems, human being possesses self-consciousness, self-reflective quality, and capacity to develop and employ language and symbols.

(8) The eighth level is that of *social organizations*, which should be viewed as distinct from the level of the human organism. The social systems surround the individual and offer opportunities for development.

(9) The final level refers to the *transcendental systems*. These include the ultimates, the absolutes, the inescapables, and the unknowables. They exhibit systematic structure and relationships, and provide a basis for the advancement of knowledge.

Here, Boulding emphasizes hierarchy of systems, interrelatedness of the constituent parts, and the need to determine optimum degree of generality in the various systems.

Another scholar noted for his contribution to the formulation of general systems theory is von Bertalanffy. In his view, the various scientific disciplines have evolved ideas in a characteristically parallel fashion, and there is a remarkable correspondence of general principles in the various fields. According to him, elements permeating all systems that form the nucleus of a general systems theory can be identified. The main concepts of the general systems theory are (von Bertalanffy 1968:188-206; Lilienfield 1978:7-32):

(1) *System, Subsystem, Suprasystem.* A system is an entity or a unitary whole composed of subsystems (components) that are interrelated and interdependent. The system, in turn, is part of a suprasystem.

(2) *Holism.* The whole is more than the sum of its parts. Its synergistic properties are distinctly different from those of its parts.

(3) *Open System.* An open system has permeable boundaries, and is in continual interaction with its environment. It moves toward a higher level of organization, greater differentiation and specialization, and increasing degree of elaboration and complexity. Biological and social systems are usually open. A closed system, in contrast, has rigid and almost impermeable boundaries, and is virtually nonresponsive to its environment. Physical systems usually belong to this category, and often move in the direction of positive entropy, i.e., disorder and self-destruction. In the universe, there are no open or close systems in absolute terms. They fall on a continuum between the two extremes.

(4) *Input-transformation-output.* This model facilitates understanding and improvement of the operation of a system.

(5) *Systems boundaries.* The concept of systems boundaries helps develop configurations of systems, subsystems, and suprasystems. It facilitates distinction between open and closed systems. The boundaries of physical and biological systems can be defined relatively easier. However, the delineation of social systems is rather difficult because their boundaries are amorphous. They depend upon complex and often inter-locking activities, and hence can not be easily demarcated.

(6) *Entropy.* Entropy is a measure of unavailable energy in the system. Positive entropy suggests a movement in the direction of disorder and self-destruction. Negative entropy implies the opposite. Physical systems, being rather closed, are subject to the force of entropy usually moving in the positive direction. Biological and social systems, being mostly open, may have both positive and negative entropy. However, because of the dynamic interaction with their environment, positive entropy may be checked and even transformed into negative entropy.

(7) *Steady state, dynamic equilibrium, and homeostasis.* These concepts refer to the state of relationship that a system may strive for in interaction with its environment.

(8) *Cybernetics.* Cybernetics, the discipline of feedback mechanisms, has a direct bearing on the theory of open systems. Feedback is based upon structural arrangements and point out deviant behaviors.

(9) *Hierarchy.* Systems, subsystems, and suprasystems constitute a hierarchy. Hierarchy shows superordinate and subordinate relationships among the elements.

(10) *Internal elaboration.* Closed systems move toward positive entropy, i.e., disorder. Open systems, in contrast, move in the direction of increasing differentiation, specialization, and elaboration.

(11) *Multiple goals.* Biological and social systems usually have several goals.

(12) *Equifinality.* In physical systems, there is a direct cause-and-effect relationship between input and output. The concept of equifinality suggests that in biological and social systems, similar results can be attained with diverse initial conditions and varying transformation processes.

(13) *Isomorphisms.* Systems properties can be stated in a set of mathematical forms. The forms constitute a set of isomorphisms (or similarities) that find expression in different and apparently unrelated fields.

(14) *Organicism.* This implies organic relatedness, coherence, cohesiveness, and consistency of integrating structures in a system.

Systems Theory and Organization

General systems theory is a composite of concepts that are applicable to systems in general. It provides a framework for the integration of knowledge from a variety of disciplines. Systems theory, in essence, is an extension of the general systems theory in that it concentrates on specific systems. It involves application, elaboration, and refinement of the general concepts as well as formulation of new concepts relevant to specific systems.

Societal organization may be viewed as a dynamic system composed of interdependent subsystems designed to perform the activities vital to human existence. It is a consciously created, coordinated, cooperative contrivance that may be considered as a social system amenable to the application of the general systems concepts. Since physical, biological, and social systems differ from one another with respect to their creation, structure, existence, and purpose, the specific concepts applicable to each would differ in character. For example, social systems are contrived by humans for

a variety of purposes, their activities determine their structure, and they may have infinite existence (Berrien 1985:17-20). These characteristics are not relevant to the physical and biological systems. Further, social systems are open and adaptive, individuals and groups in them interact, and interactions lead to the development of sentiments. Physical and biological systems, by and large, are deficient in this respect (i.e., manifestation of sentiments). Also, there is a cause-and-effect relationship noticeable in the operation of physical and biological systems. But, in a social system, because of the human element, this relationship becomes complicated. Finally, physical systems differ from biological systems in many respects, and concepts relevant to each would vary in formulation.

Presence of the human element, teleological behavior, continual interaction, and adaptiveness are the striking characteristics of social systems, and input-transformation-output model signifies the primary mode of their operation. While general systems concepts, by and large, would be relevant to all of them, new concepts need to be formulated to deal with specific social systems. This becomes readily apparent when one examines the military, government, business, church, or educational organizations.

Organization, as a social system, would have the following subsystems which would modify that of Kast and Rosenzweig (1979:18-20) (Figure 6):

(1) *Goals subsystem.* It determines the nature of activities.

(2) *Technical subsystem.* It produces goods and services.

(3) *Commercial subsystem.* It is in charge of purchases and sales transactions.

(4) *Financial subsystem.* It attends to the procurement and disbursement of funds.

(5) *Security subsystem.* It protects persons and materials.

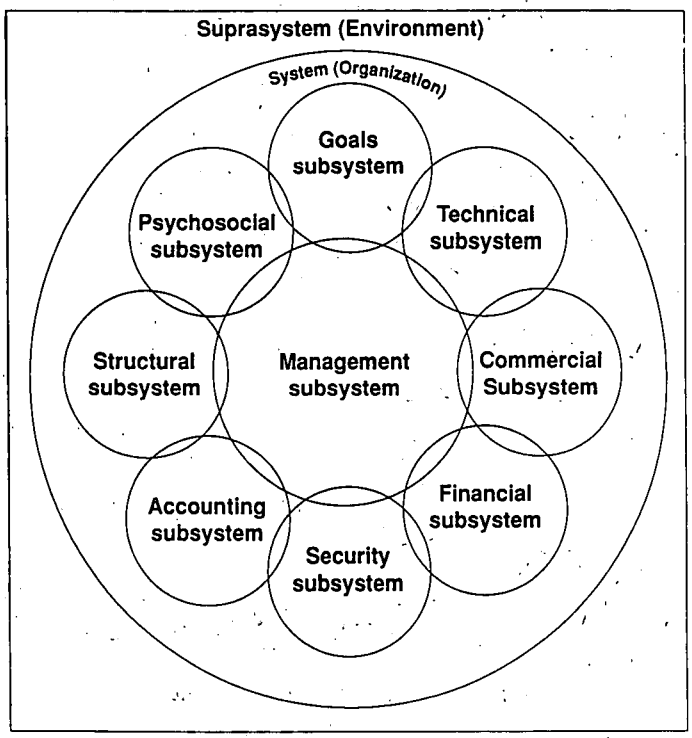
(6) *Accounting subsystem.* It checks the proper utilization of human and material resources.

(7) *Structural subsystem.* It refers to the formal structure of an organization.

(8) *Psychosocial subsystem.* It connotes the dynamics of interpersonal and group relations.

(9) *Management subsystem.* It integrates the operations of the preceding subsystems. It also coordinates the system with its suprasystem, the external environment.

Figure 6. Organizational System, Subsystems, and Suprasystem

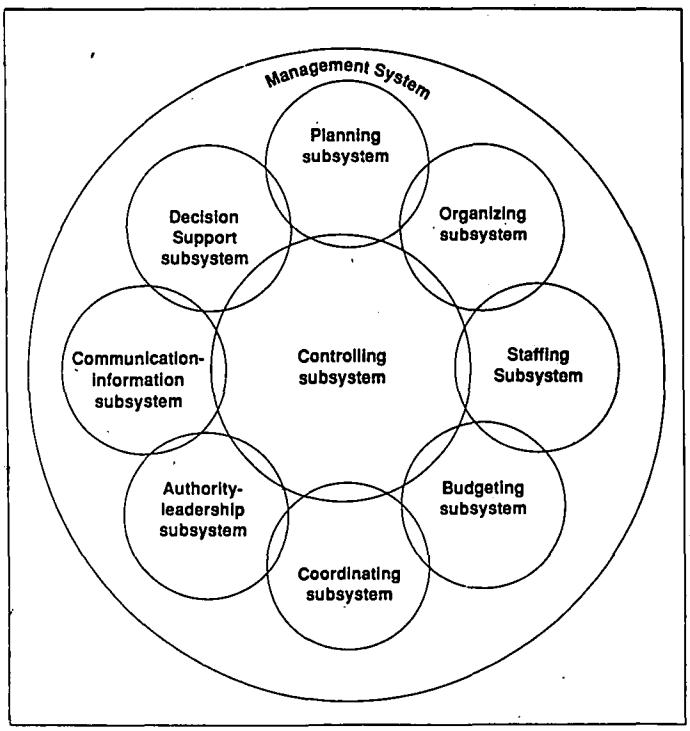


Systems Theory and Management

Management seeks effective utilization of human and material resources to accomplish organizational objectives. It is an ubiquitous phenomenon in any social system. It is inconceivable that an organization may come into existence, continue its operation, and attain its objectives without its application. The intricacy of management mechanism would vary according to the size and complexity of organizations, but its presence, even in the simplest ones, howsoever imperceptible, is indisputable.

Organization, as a social system, has a number of subsystems, of which one is management. As an organizational component, the managerial subsystem determines overall objectives and identifies activities; sets standards and selects performance measures; and, focuses on the total plan and seeks its implementation. Management, in turn, has its own subsystems that comprise planning, organizing, staffing, budgeting, coordinating, authority-leadership, communication-information, decision-making, and controlling (Figure 7). The management subsystems are inextricably intertwined in the operation of an organization irrespective of its type, size, objectives, and structure. Traditionally, the management functions have been carried on as discrete activities. However, the systems theory requires them to be viewed as subsystems consisting of interconnected, interdependent, and integrated activities.

Figure 7. Organizational System and Subsystems



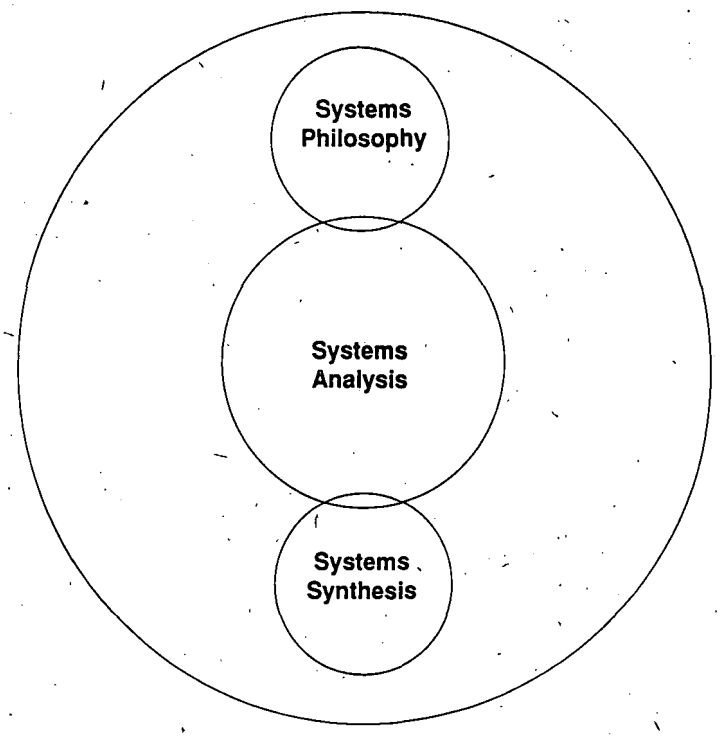
Management subsystem may be examined in terms of managerial levels in the hierarchy of complex organizations: *technical, organizational,* and *institutional.* The technical level is concerned with the production and distribution of goods and services. The organizational level coordinates and integrates activities at the technical level, and mediates between the technical and institutional levels. The institutional level relates activities of the organization to its environment. These three levels would require differentiated types of management skills and personnel. The management subsystem spans the entire organization. It directs technical activities, coordinates human and material resources, and relates the organization to its suprasystem, the environment (Parsons 1960:60-64).

Management discipline has adopted from the systems theory a number of concepts, techniques, and models. The important ones include problem solving approaches, data flow diagrams, data structure diagrams, system structure charts, system models, simulation techniques, operations research techniques, decision-making techniques, cybernetics, and communication-information theory (Phillips 1979:469-477).

Systems theory in relation to management implies the application of systems approach to the management of organizations. The systems approach emphasizes an understanding of the whole, the significance of its parts, and the value of interactions

of the parts. It subsumes the notions of systems philosophy, systems analysis, and systems synthesis (Figure 8). Systems philosophy represents a highly abstract conceptual viewpoint which postulates that a phenomenon in the universe constitutes a system with a hierarchy of interlocking subsystems and suprasystems. It is a mental proclivity that impels a person to adopt a certain posture in dealing with the things in the environment. Systems analysis is the process of analyzing a system with the objective of improving it. It involves the study and design of a system to modify it for the better. It seeks to identify and evaluate all major influences and constraints in terms of their impact on the various decision points in the system. A decision point is that point in a system at which some persons or automatic mechanism must react to input data and make a decision (Fitzgerald 1987:9-12).

Figure 8. Systems Approach to Management



System synthesis goes beyond the process of systems analysis. It forces the management to adopt the view that the whole is a distinct entity, different from a combination of its parts. It requires examination of a system in a top-down manner to develop a holistic picture of the organization. Finally, it facilitates coordination of the various decision points in a system to avoid conflicts and improve operation. A manager inclined to apply systems approach to management must have implicit faith in the systems philosophy, understand the significance of systems analysis, and recognize the value of systems synthesis.

Limitations of Systems Theory

Systems theory, from its very inception, has extended to a number of fields, and has assumed the character of a fad. The application of systems theory at the professional level is apparent in such diverse fields as psychiatry, psychoanalysis, psychology, sociology, philosophy, organizational theory, economics, biology, and engineering. However, the systems concept, when used in popular parlance by such people as ecologists and population planners, is nothing more than an expression in cybernetic terms. It is often indiscriminately used, sometimes denoting an open system, sometimes in cybernetic sense, sometimes to signify simulation models, and frequently as a medley of all these.

Systems theory has become a popular ideology (Lilienfield 1978:227). As it is applied to more and more areas, its scope becomes wider, but its concepts become less precise; and often, any set of orderly routine procedures is referred to as a system. As systems theory progressively loses its links with the specific disciplines, it becomes a mass of imagery drawn from a variety of sources. It is a kind of mosaic composed of fragments of ideas, theories, and methodologies from a number of disciplines (Wren 1987:404).

Systems theorists assume existence of systems that have clearly defined boundaries, purposes, and interrelated, and cooperative elements. The configuration of systems in the natural sciences may be relatively easy, but in the social sciences that deal with the infinitely complex reality, conceptualization of systems is arbitrary. Likewise, the selection of elements composing the system as well as their presumed interconnectedness and cooperativeness are speculative.

Systems theory is an attempt to create a myth based on the prestige of science. It does not offer a unified philosophy. It has an aura of mystification. It provides rhetoric for new forms of opportunism. Its serious limitations include "a weakness for programmatic statement coupled with a scarcity of concrete results, a fondness for abstract schematic formulae and diagrams having little practical reference; a fundamental begging of questions that takes the form of an unstated and presumably invisible shift from concrete world systems in their fullness and complexity to closed formal models based on convenient "simplifying assumptions," a shift we are not expected to notice; and finally, the absence of concrete work done beyond the refinement of the system itself (Lilienfield 1978:227).

Conclusion

Systems theory has evolved as an alternative to the traditional theories of inquiry. It has derived inspiration from orderliness in nature and from such concepts as *organicism, Gestalt,* and *synergism.* It represents a philosophy that emphasizes holism, in contrast with the earlier mechanistic and analytical modes of inquiry. A number of concepts including *system, holism, dynamic equilibrium, openness of*

system, cybernetics, and *entropy* have been formulated, with implications for organizational management.

Systems theory offers a sophisticated, fascinating, and impressive theoretical construct that is based upon a high level of conceptualization. It has enchanted scholars from diverse disciplines with varied assumptions, hypotheses, methodologies, and objectives. Through interpretation, extension, and extrapolation, they have attempted to apply the systems concepts to their respective disciplines. In the process, the systems theory has become amorphous, elusive, incoherent, and abstruse, virtually incapable of integrating knowledge. In certain instances, scholars, not fully conversant with the systems orientation, have been thrilled by the cliche "system," which they have often used to signify what is merely a set of orderly routine procedures.

Systems theory has generated abstract concepts and mathematical models that are difficult to relate to real societal situations (Pope 1988:71-74). It is based on observation of phenomena in the physical and biological world, whereas organizations are socially contrived entities having myriads of variables with complicated interactions (Hodgets 1986:611-614). The systems theory has become too cumbersome and diffused to permit the conduct of meaningful research, and too nebulous and complex to prescribe management practice (Thayer 1979:481-493). Management of organizations would remain an exasperating, frustrating, and challenging task; and experience, intuition, and judgment would continue to play an important role. Because of the interplay of human element, the discipline of management, unlike natural sciences, is not likely to develop predictive laws. Nonetheless, with the introduction of the computer, the increased application of quantitative methods, and the proliferation of the findings of behavioral sciences, there is a movement toward making management — the decision-making component of an organization — an identifiable, observable, measurable, and verifiable process. Systems theory is a strand of this movement that seeks to develop the science of management.

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