What Systems Theory is Not

The definition of **Social Systems theory** must not be confused with another theory known as "**reductionism**" (Koestler, Smithies, 1969 p. 60). Reductionism is a term introduced by Rene Descartes in the 1600's which, contrary to the systems theory, offers that all things, no matter how complex they are, operate thanks to very basic units. Though the idea of smaller parts forming a complex organism is shared in both theories, reductionism differs from systems theory in that it tends to minimize the complex by focusing on how simple its parts are. (Descartes, 1637)

Systems theory does the opposite: It gives emphasis to the complexity that exists within the elements of a whole and tries to understand the dynamics that occur among such formative elements (Von Bertalanffy, 1964 p. 62)

It is safe to assume that every formative process seems to follow the same pattern of behavior: Individual parts joining together to make a whole part which may, or may not resemble the elements that built it. Yet, what motivates the individual parts to unite? How do the parts of an object interact? How do the changes within the parts affect the changes within the system? Those questions are what bring us to the analysis of four sociologists: Von Bertalaffy, Banathy, and Laszlo.

Ludwig Von Bertalanffy

Von Bertalanffy saw the world through scientific eyes (Brauckmann, 1999). As a scientist, he had already conceived a series of theories that aimed to show a structure and pattern of formation among different things. In 1930 he offered the "**Organismic Systems Theory**" (Von Bertalanffy, 1960, p. 156). This theory attempted to explain the processes of life as a phenomenon. He insisted that individuals exist because of a combination of different processes that work together in the formation of the organism. He offered that these processes are systemic, yet dynamic, and complex. To illustrate this idea, Von Bertalanffy compared the organism as a machinery out in the open trying to "maintain equilibrium". This equilibrium symbolized the individual's struggles to survive and adapt to an environment, but also the internal struggles to adapt and perform that occur within the systems that compose the individual itself (Von Bertalanffy, 1960, p. 158-159).

The **Organismic Systems Theory** gave life to a myriad of other theories proposed by Von Bertalanffy to explain the processes of unification. However, it was the General Systems Theory (GST) what seemed to encompass his entire model in a transdisciplinary way. The GST is defined as a “metatheory” that arose from the previous postulates by Bertalanffy. (Braukmann, 1999, p. 2)

In it, Bertanlaffy claimed to have found the way to “control the model of construction in all sciences” (Von Bertalanffy, 1949 p. 45). The theory is a qualitative analysis of the process of formation of things, to explain and understand the establishment of relationships between “objects and phenomena” (Von Bertalanffy, 1949 p. 45). The concept of the GST was construed from Aristotle’s “the whole is more than the sum of its parts” stating that this is a definition ‘of the basic system problem that is still valid’ (Von Bertalanffy, 1975 p. 149).

Braukman explains that this concept now views the components of an individual as complex as the individual itself. (1999, p. 3) The term “**isomorphism**” is introduced by Bertanlaffy explaining that, within individuals, each of its building elements showing the same survival process as the features of the organism that they build.(von Bertalanffy, 1949 p. 47) Therefore, if the isomorphisms are found in all complex systems, it would be feasible to use the GST as a model to be used in diverse disciplines. (von Bertalanffy, 1949 p. 45) Throughout his writings, Bertalanffy establishes that systems should be compared to living things, that things should be viewed under a biological, and less philosophic scope. Concisely, Bertalanffy believes that all systems carry the theory within. In his own words

“… this shows the existence of a general systems theory which deals with formal characteristics of systems, concrete facts appearing as their special applications by defining variables and parameters. In still other terms, such examples show a formal uniformity of nature.” (1945 p.62)

Rosnay (2002) concludes that Von Bertalanffy reacted against the idea of reductionism by bringing together the basic elements of science into his study. Among his postulates he stated two important truths:

1) That systems interact with their environment, 2) the systems are not static and continue to

change, 3) that the continual evolution of the systems depend on the changes within its properties 4) that the internal systems, undergo a type of self-organization that denotes the complexity of their actions.

To this analysis, Bertalanffy adds:

“It is necessary to study not only parts and processes in isolation, but also to solve the decisive problems found in organization and order unifying them, resulting from dynamic interaction of parts, and making the the behavior of the parts different when studied in isolation or within the whole.” (Von Bertalanffy 1945 p. 49-50)

Von Bertalanffy’s general systems theory basically states that the study of all systems can be modeled under the premise that the unification of elements will create a wholeness. Yet, the elements themselves are also creations of smaller elements which is what brings us to determine that the processes that enable a system to form are equally complex and interactive.

Anderson, Carter, Lowe and De Gryuter (1999), agree that one of the biggest benefits of the GST is that it opens the door to further inquiry by joining all sciences, and by expanding the study of disciplines into the understanding of the components of each. They insist that this theory is perhaps one of the most accurate ways to understand processes and to analyze them properly.

In their own words:

“Social systems theory emerged during the twentieth century as an effort to bring more coherence among the disparate theoretical fields in the social sciences. It is a way of thinking and ordering theory and knowledge with the goal of “putting the pieces back together,” rather than continually to pare social phenomena into ever smaller units of inquiry. It permits the observer or analyst to recognize different levels within the same phenomenon at the same time, and to understand the workings of the whole as well as the parts, as they occur. While this may make analysis more difficult, it also makes it more likely to be accurate, and closer to life” (Anderson; Carter; Lowe; De Gruyter, 1999 p. 19)

Bertanlaffy's main goal is to ensure that elementary units of a systems cease to be the focus of analysis, shifting instead to the study of the "wholeness" of groups to include their foundations, the dynamics occurring within them, their problems, and their basic sociology. Bertanlaffy believes that "conceptions of and problems of this nature have appeared in all branches of science, irrespective of whether inanimate things, living organisms, or social phenomena are the subject of study." (von Bertalanffy, 1988, pp. 36–37)

Von Bertalanffy, GST and Education: New Developments

Now that the premise of GST has been established, and that the term "system" has been identified as a "unified whole", lets move our focus to GST in education, mainly under the scope of Von Bertalanffy's works.

GST implies the existence of what could be compared to an inner entity within all systems which helps predict the complexity of their outcomes and behaviors. According to Frik, Thompson, and Koh (2005), the GST is a good tool to apply to understand educational systems. The authors argue that since 1983 the American educational system has been the subject of numerous experimental programs aiming to improve it (p.13). However, these programs are mostly based on rhetoric, and the changes haven't proven to be substantial, nor long-lasting. Hence, there is a clear need for a scientific approach that identifies the patterns in behavior of educational systems by studying the interdependence of each role within the system. (Frik, Thompson, Koh, 2005 p. 13)

According to Banathy, von Bertalannfy's GST has been used to study changes in the systemic design of educational institutions but there is not a common- ground scientific approach to describe the processes needed for a system to change in an expected way. Yet, the GST has been included in a myriad of studies regarding educational systems as an essential theoretical framework (Banathy, 1991, p. 7-10). This was the beginnings of the development of ATIS.

The Axiomatic Theory of Intended Systems (ATIS) was developed in 1990 after Jerome Bruner's theory on how systems take meaning from cultural context. In Bruner's words "We will be able to interpret meanings in a principled manner only in the degree to which we are able to specify the structure and coherence of the larger contexts in which specific meanings are created and transmitted (p. 64-65). This principle was based entirely on the premise of GST's comprehensive approach toward the study of systemic outcomes. As a result of GST and the subsequent development of the ATIS, new programs have been created to continue to assess change in education (Bruner, 1990 p. 64-65)

In 2005 Frik, Thompson, and Koh developed the Predicting Educational System Outcomes (PESO) program. PESO is a “logic-based simulation program” that uses the principles of GST to create real-life scenarios for educators and educational administrators. In this computer program, scripted and unscripted scenarios are brought to life the same way that pilots use flight simulators to train and predict possible outcomes in flights. The ultimate purpose of the program is to provide real-life circumstances to potential teachers and principals that will familiarize them with the processes of change and implementation that are required to gear their educational system to a higher level. (Frik, Thompson, Koh, 2005 p. 44)

Likewise, another computer software program called APT&C: Analysis of Patterns in Time and Configuration. The goal of this program is to measure the knowledge of current teachers and principals regarding educational change. This methodology researches practices in educational systems and its changes. It connects both qualitative and quantitative research by closing the gap between theory and practice. In *APT&C* the relationship between causes and effects are studied. When a change is entered, a result comes out, and the program analyzes the result, and any other result that could arise when a change is made in the system. All results are studied as part of a whole, which is what GST implies. Therefore, the APT&C follows the guidelines of GST in that they break down the elements that make up a system by roles, yet, they interconnect the roles and analyze the way their interdependence made a difference in the system. n(Frick, 1990)

Chen and Stroup (2004), confirm the opinions of Frik. Thompson, Koh, and Banathy, offering that GST is a comprehensive way to understand the science of teaching because it analyzes systems from the following perspectives:

“the multidisciplinary nature of systems theory, the ability to engage complexity, the capacity to describe system dynamics and change, the ability to represent the relationship between the micro-level and macro-level of analysis, and the ability to bring together the natural and human worlds” (Chen, Stroup, 2004, p. 447)

More methods of measurement and research of educational systems and change have been developed or are currently under development. Thompson (2005) offers that the process of implementing these software programs and other programs related to educational change is “systematic” and often “slow”. The procedures leading to change in any systems are proportional to the ability, aptitude, and attitude of the elements that compose the system. Therefore, in order for there to be a change in any educational institution, program such as PESO and others do their part by providing the information that the members of the system need to address the need of change. Ultimately, those who decide to engage in the process of

change itself will have to do that on their own accord. In other words, the GST theory has managed to develop awareness in groups on the needs for change and transmutation into the changing times. However, we must not forget that in systems established by individuals, the essence of the individual and the motivation behind the individuals involved will be what ultimately decides the distance to which a system will go.

Bela Banathy

“When a new stage emerges in the evolution of society–as was the case around the midpoint of the century –the continued use of the old paradigm, the Old World view lens, creates increasingly more problems. e.g. societal systems, such as our educational activity systems, that still operate based on the design of the bygone era, and use the world view lens of the industrial machine age, are losing their viability. They operate in a continuous crisis mode, and eventually face termination unless they frame a new mind set, learn to use the new lens of the new era, and acquire new thinking that is based on the new world view.” (Banathy, 1992 p. 4)

Bela Banathy is perhaps one of the most educationally oriented social systems theorists. In 1968, he developed the *Instructional Systems Model* (IST), with the purpose of breaking down the elements of a system, and focusing in the actual goals of the system (Banathy, 1968, p. 3)

Like von Bertalanffy, Banathy explores the aspects of change, process thinking, and systemic implementation as part of the attainment of the common goal of a system. As previously quoted, Banathy embraced the philosophy of the GST in the sense that he also believed that the analysis of social change must undergo a scientific process where all elements are thoroughly analyzed and completely put into perspective (Banathy, 1991 p. 14-17)

The systems theory proposed by Banathy explores the steps that an organization must take in order to succeed. However, he focuses particularly in the field of education and instructional systems. In Banathy’s framework, all instructional systems must first formulate objectives. The purpose of formulating objectives is to establish a common goal that should be attained as a group, and achieved by each element that makes the group

Once a goal is developed, the members of an instructional system should combine and develop a criterion test. These criterion tests aim to analyze what are the needs of the group, and what are the resources that will help the goal to be attained. After the criterion test is developed, the

group should analyze what is the learning task at hand. By doing this, the goal is revisited and the ultimate objective of the group is put into a clear perspective so that there is no doubt that the task at hand can be accomplished. Finally, once the task is defined, identified, and analyzed, the members of the instructional system should get together to design a program, service, or process that will enable the changes to take place. The result should be the implementation of a new service, program, or event that will enable the accomplishment of the goal of the instructional system. (p. 64)

Banathy synthesizes this latter process by offering three major points should be followed in his theory. In his view, all systems are composed of three major building blocks: purpose, process, and content. It is important to note that these three elements are listed in a priority level, which means that one is a consequence of the other. (Banathy, 1968 p. 83).

In Banathy's theory, a system has a purpose because it has a goal that needs to be achieved by the group. After the group knows what needs to be done to attain a common goal, it needs to come up with a process. The process is defined as a series of operations and things that need to be done to accomplish a purpose. Finally, the content is defined by the set of parts makes up the system. In the case of educational systems, Banathy states that in an instructional system is not an institution whose main goal is learning. Instead, Banathy describes learning institution as a research continuum where teachers identify the students' learning styles, and where the learner (and not the teacher) would be in charge of the learning process (p. 24).

Banathy proposes that all instructional systems should consist on ongoing observation, assessment and change that is related to what the learner needs. The teacher will serve as a guide rather than as the ruler of the information, and the institution itself will be the environment where the opportunities for research and development of programs will take place in a vaccuum (p. 25). It could be concluded that Banathy's view of an instructional system differs greatly from the vision of the teacher as the "shepherd" and the students as the "sheep or herd" who follows the leader. In fact, Banathy describes such scenario as one of the current trends by which programs are guided, yet, it should not be the expected outcome of all instructional systems. In Banathy's opinion, any system that operates for a common goal must have more than one direction, and more than one expected outcome. In the case of instructional systems, the students and the teacher will develop instructional goals together, will research together, and will guide each other in the process of acquiring and applying information.

Concisely, Banathy offers that the instructional system will work by creating a cooperative environment where the teacher is a resource, and not a ruler. An environment where the student is an explorer, and not a passive recipient of the idiosyncrasies of the educator, and a

continuum where the institution is a source of change, interaction, and socialization rather than a closed environment of rule following and dire consequences. (p. 61). It can be concluded that in Banathy's eyes, systems are not linear, absolute, and strict. On the contrary, systems are very dynamic, interactive and prone to change. This is a summarized form of social systems through the eyes of Bela Banathy, and the way he applies the theory to education.

Ervin László

Analyzing László is a project. It is a study much different than von Bertalanfy, or Banathy, though the latter was one of László inspirations. Von Bertalanffy advocated the study of social systems through the concrete appreciation of sociology as a scientific method. Banathy embraced Bertalanffy's point of view by emphasizing on the importance of change as an essential axis of progress, particularly in the branch of education. László, shares one common denominator with von Bertalanffy and Banathy:

The view of systems as complex entities of interaction. Down the line, however, László makes a subtle detour from the views of Banathy and Bertalanffy as he transcends from the concrete to the abstract, from the need to organize systems to the reality of systematic chaos; from the visible to the invisible. For László is more than just a social scientist: He is a philosopher, cosmologist, and in this author's opinion, a mystic whose focal point just happens to be the "concretely mundane" society.

You will find in László the backbone of all peace-loving policies ever implemented in modern times. It was László who declared the need for the utopic view of how things should work. Within his scientific frameworks, László invited the world to unite into a society where all things are loved and protected by being one of the signers of the

In a 2000 symposium titled "Is There a Purpose in Nature? How to Navigate Between the Scylla of Mechanism and Charybdis of Teleology" gave an opening statement where he exposed his innermost, philosophical frameworks about the organization of society. In his own words, László offers,

"…..empirical evidence, again, from the entire gamut of natural and human sciences, indicates that, on the whole, open-system evolution is toward higher specific negentropy in the evolving open systems, achieved through greater structural and functional complexity and producing a higher throughput of free-energy flux density and more extensive interaction between systems and environments" (László, 1998)

The above quote can be used to summarize the bases of László's theories. He concurs that systems evolve individually, intrinsically, and extrinsically. The way that they expand and grow is proportional to their role in higher systems. For example: The service within an organization will inevitably change if the circumstances of the people who provide the service also change. If a service person is sick the bank cannot provide fast and accurate service. Hence, changes are expected to take place within every organization, and the changes will make things transform.

Perhaps the weight of László theory is the fact that change, however radical, is inevitable, and should be expected. Therefore, one could conclude that the only hindrance to the possibility of evolution, particularly those of social systems, is the inability of the system's components to accept and comply with change.

László's theory is derived from von Bertalanffy. (Bahm, 1979, p. 51) In his theory, László proposes the idea of there being "one global eco-system" in which we have the responsibility of creating "a world system". This is what László coined as the "anatomy of the next conceptual synthesis". (László, 1974,

p. 183). In the theory of the anatomy of conceptual synthesis, Laszlo advocates for the unification of all systems that are needed to combine and form a solid, unified, civilized society. This civilized society can be achieved with the proper use of current systems: Food systems, housing systems, medical and social departments. As long as these systems do their jobs by satisfying the need for the basic elements, there is no reason why a society wouldn't be able to evolve, and improve for the best. In order for these systems to have the common goal of serving society, there should be what Laszlo describes as a "level of solidarity". These levels of solidarity can be found in homogenous groups such as religious groups, sects, and other common-interest associations. However, he makes a very clear distinction between belonging to a common group and belonging to a common group that distances itself from other groups. Solidarity, hence, is achievable through setting goals of enhancing society within each of the roles each person takes. It is achievable through doing each individual job required for the enhancing of society to the utmost potential. It is also achievable through accepting the different roles within each societal group, not allowing intolerance or divisiveness, and helping those less developing nations catch up to the ones who are in advantage.

Conclusion

A system is a unified, complex, whole that operates as a result of the different interactions and independent performance of each elements that form it. The mode of operation of each of its parts is what will ultimately decide whether the system will be deemed functional within a macrocosmic scenario. This implies that each element that interacts within a system is responsible of the consequential interaction of the system among other systems.

In order to understand the mechanics behind the operational functions of elements, philosophers such as von Bertalanffy, Banathy, and László provide diverse ways to view the unfolding of these performances under different perspective.

Ludwig von Bertalannfy observed systems through the eyes of a scientist and sociologist who rejected the idea of mechanizing the perspective of man as a predictable entity. His General Systems theory aimed to bring together an organismic view of the interaction among the elements that form any systems. Contrary to the idea of Reductionism, Systems theory claims that more than just a few perspectives should be taken into consideration to study the interaction of elements (von Bertananffy, 1962 p. 14-15) The psychological, circumstantial, physical, chronological, biological, and even aesthetic characteristics within each element have everything to do with the level of performance of the element. Likewise, the system will react as a result of those interactions. (Hammond, 2003 p. 34) The main idea of von Bertalanffy's theory is to stay away from the notion that systems are merely a combination of parts working together. It should be noted that the parts are themselves a combination of other parts, made up of a combination of other essential elements. Such combinations are complex, and not as predictable as a reductionism advocate would preview. Hence, the GST is a philosophical theory that aims to apply organismic (life-like) attributes to both living and non living things, in an effort to comprehend the complexity of their make up. (Hammond, 2003 p. 32)

Banathy applies the concept of systems theory to Instructional Systems (Banathy, 1968). His IST (Instructional Systems Theory) is a version of the GST applied to educational programs. His theory aims to break down the needs and goals of educational systems so that each of them can establish common path to better productivity. Banathy strongly advocates for the creation of a standardized criterion-based analysis where each educational institution can clearly assess the initiative of their group, and can accurately develop programs that will take them towards the achievement of their goal. (Banathy, 1991)

Banathy and von Bertalannfy share the common view of systems as people. Each is given a set

of elements that ensure their performance, yet, each element has to be studied separately, and should be assessed independently. Banathy differs from von Bertalannfy in that he does not believe that generalizations should be allowed in any kind of assessment. The correct study of the interaction of elements within systems occurs when the elements involved are viewed by their individual role within the whole.

The systems studies of László are different from Banathy and von Bertanalffy only in the ideologies beneath them. László, as a humanist and as a scientist, concurs with the previous philosophers in his view of systems as organisms. He, however, tends to look at the future and the results of what would happen should all elements within a system work properly. As stated previously, Laszlo believes that all systemic forms tend to gear toward a status of consistent change and complexity. László says that systems produce “a higher throughput of free-energy flux density and more extensive interaction between systems and environments” (1998, p. 17) which basically points out the need to examine roles and positions within systems. However, László adds the psychological, emotional, and human factor to the theory, by strongly arguing the need to get together as civilized individuals to make the system work. As we studied before, László’s peaceful ways resulted in the creation of the “Human Manifesto” of 2002, where he and other famous individuals famous for their world-peace efforts signed a bill asking the world to basically get fixed.

The combination of perspectives, goals, plans, and theories presented in this analysis show three philosophers with three different dimensions to achieve a common goal: Von Bertalanffy’s scientific approach and organismic views of systems, Banathy’s stardardized and criterion-based solutions for the enhancement of instructional systems under von Bertalanffy’s general systems theory, and László’s humanistic approach to the organismic reality of systems.

All theories discussed in this analysis agree in pointing out to one same source for the understanding of elements: This source is individuality, and the need to understand its complexity to realize how they affect systems.

Perhaps if we all agree to isolate the characteristics of each individual element that makes up a system we will be also able to understand the complex behaviors, thinking modes and rationale behind most of the theories that we have studied today. Maybe we could even enter inside the brains of the theorists and understand the reasons behind their postulates. Concisely, one must not take lightly the fact that complexity is everywhere, and that reducing a system to the study of a bunch of working parts is not the way to approach the uniqueness of each group. Therefore, this analysis serves to propose a continuous examination of items, circumstances, histories, and expectations in order to create and maintain an organized and unique society.

References

APT&C (2005). Research reports. Retrieved April 10, 2006, from

http://www.indiana.edu/aptfrick/reports/

http://www.indiana.edu/%7Eaptfrick/reports/3ATISaxiomsfromSIGGS.pdf

Banathy, B. (1968). *Instructional Systems.* Palo Alto: Fearon

Banathy, B. (1991). *Systems design of education*. Engelwood Cliff Educational Technology

Bertalanffy, L. von (1950). "The theory of open systems in physics and biology", *Science*, (1) *11* , 23-29

Bertalanffy, L. von (1950). "An outline of General Systems Theory", *British Journal for the Philosophy of Science* , *(1)* 139-164

Bertalannfy, L. von (1962) **"**General System Theory – A critical review" *General Systems*, (7) 1-20

Bertalanffy, L. von, (1968). General system theory: Foundations, Development, Applications. New York: George Braziller.

Bertalanffy, L. von, (1972). “The History and Status of General Systems Theory”. In G.J. Klir (Ed.): *Trends in genera l systems theory* . New York: Wiley-Interscience.

Bruner, J. (1990). *Acts of meaning*. Cambridge: Harvard University

László, E (2004). *Science and the Akashic Field: An Integral Theory of Everything*. Rochester, Vermont: Inner Traditions.

Thompson, K. R. (2005). “ ‘General System’ defined for predictive technologies of A-GSBT (Axiomatic- General Systems Behavioral Theory)’. Manuscript accepted for publication, *Scientific Inquiry Journal*

http://lingtechguistics.wordpress.com/2008/08/13/analyzing-systems-theory-under-the-second-language-scope-von-bertalanffy-banathy-and-laszlo/