# BERTALANFFY REVISITED: OPERATIONALIZING A GENERAL SYSTEMS THEORY BASED BUSINESS MODEL THROUGH GENERAL SYSTEMS THEORY THINKING, MODELING, AND Practice

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## ABSTRACT

This paper will highlight the continued development of a comprehensive, scalable, and systemic business model based on Ludwig von Bertalanffy's Informal Survey of Main Levels in the Hierarchy of Systems, (pursuant to Kenneth Boulding). This paper is about the systems based implementation of this new business model. The implementation process will include infrastructure definition, future state definition, future state design, future state development, and keys to effective and complete systemic implementation.

From a General Systems Theory perspective, the continued development of this model “reaches out” to other disciplines such as mathematics, quantum physics and architecture in search of isomorphisms applicable to business. This is in response to Bertalanffy’s desire that “general system theory should be, methodologically, an important means of controlling and instigating the transfer of principles from one field to another, and it will no longer be necessary to duplicate or triplicate the discovery of the same principles in different fields isolated from each other”.

It is necessary when describing, analyzing and implementing this new model that a certain amount of precision is required. As suggested by Bertalanffy, “by formulating exact criteria, general systems theory will guard against superficial analogies which are useless in science and harmful in their practical consequence.” The systemic business model described is applicable to businesses both large and small.

Finally, this paper will propose a new framework for the systemic implementation of new business models both locally and enterprise wide. This new method of implementation will show that theory and practice are not diametric or binary opposites, but complimentary forces necessary for the development, conceptualizing, and application of new phenomena.

Keywords: Systems theory for business; operationalizing systems theory; general systems model for a business enterprise, applied general systems theory

**Bertalanffy Revisted**

## INTRODUCTION

*In my own case, pursuit of operational analysis has resulted in the conviction, a conviction which has increased with practice, that it is better to analyze in terms of doings and happenings than in terms of objects or static abstractions.*

*--P. W. Bridgman, The Way Things Are*

How does one go about designing, structuring and perhaps most importantly, implementing a new model of business? How does one bridge the gap between theory and practice?

Ludwig Von Bertalanffy's development of General Systems Theory (GST) is usually not seen as an important moment in business history. However, the concept of General Systems Theory as a foundation for developing new business theories and models and its use as an integrative business tool holds tremendous potential. This is, in part, because Von Bertalanffy's desire to develop a methodology allowing scientific disciplines to learn from each is an excellent framework for the design, structure, and implementation of such theories and models.

Business, as practiced today in a connected, information age, is working off of models derived from, and developed in, another time and place. Many of these models are unconscious and certainly most are unquestioned. The nature of these models are extremely mechanistic and, by design, not particularly humanistic. Another important aspect of these models is they are designed to fulfill a single focus, the maximization of profit. This one-way focus on profitability as the sole measure of business has become so pronounced that to think of business in any other way is to seem out of touch with the current reality.

However, business today can be much more than the solution to the single variant problem of maximizing profit. Business has the ability, and some would argue the duty, to serve people, the environment, the community and to promote by example concepts of sustainability, cooperation and responsible progress. To reflect these and other varied desires, business organizations as we think of them today, will need to change. The creation and continuance of business should be an open-ended creative process, not single lifeless, profit directed act. Business structures that are rigid and mechanistic need to be more fluid and open. Organizations should be thought of more as living organisms as opposed to just simple machines. And when business organization is viewed as a living organism as opposed to a simple machine, it changes not only the relationships but also the outcomes.

If viewed as a "living organism", most business organizations today would not live long. Few living things could exist with the rules for running a typical current day business affixed to them. With centralized control, simulated hierarchies, arbitrary and capricious changes, and lack of a universal mission, all of these things would bring a rapid and painful death to something living. But how does one create a "living systems" model of business that honors the individual AND the collective. The answer may be in how Von Bertalanffy laid the foundations for in his development of GST.

Von Bertalanffy "advocated a new global morality, "an ethos which does not center on individual good and individual value alone, but on the adaptation of mankind, as a global system, to its new environment". "We are dealing with emergent realities; no longer with isolated groups of men, but with a systemically interdependent global community. It is this level of [reality] which we must keep before our eyes if we are able to inspire large-scale action designed to assure our collective and hence our individual survival." (Elohimjl, 2001)

While a living systems model of business may take into account many things not accounted for in current models of business, we should not dismiss what we have already learned. Said John Gardner, "In short, large-scale organization is not to be condemned out of hand. That is what makes the problem difficult—and interesting. Organization serves man and rules him, increases his scope and hems him in. We must be exceedingly discriminating in weighing its benefits against possible disadvantages. And in doing so we shall discover that everything depends on the patterns of organization. (Gardner, 1964.) Aware of this, we must master new forms of organization or the old forms of organization will master us.

This paper outlines continued development of a new comprehensive, scalable, and systemic business model. (Dawson, 2006) This paper is about the systems based implementation of this new business model. The implementation process will include infrastructure definition, future state definition, future state design, future state development, and keys to effective and complete systemic implementation. Some of these concepts are different. They entail using, analogy, metaphor, isomorphisms, and perhaps most notably, imagination. They are all, however, based in the concept and the spirit of Von Bertalanffy's concept of General Systems Theory.

Ervin Laszlo said of Von Bertalanffy in the foreword to Perspectives On General Systems Theory, "Von Bertalanffy opened up something much broader and of much greater significance than a single theory (which, as we know, can always be falsified and has usually an ephemeral existence): *he created a new paradigm for the development of theories.* These theories are and will be systems-theories, for they deal with systemic phenomena-organisms, populations, ecologies, groups, societies and the like." (Bertalanffy, 1975)

## GST AND BUSINESS

What makes GST suited for a business framework?

Three reasons:

1. GST provides excellent guidelines for the development of new theories
2. GST presents a framework for transferring information between disciplines

3. The GST concept of "system" is well suited for business

Firstly, Von Bertalanffy created a wonderful new paradigm for the development of theories. In fact, when General Systems Theory is thought of not as a single stand-alone theory, but a theory for developing theories, the possibilities seem virtually endless. "The structure of reality is such to permit the application of our conceptual constructs. We realize, however, that all scientific laws merely represent abstractions and idealizations expressing certain aspect of reality. Every science means a schematized picture of reality, in the sense that a certain construct is unequivocally related to certain features of order in reality: just as the blueprint of a building isn't the building itself and by no means represents every detail such as the arrangements of bricks and the forces keeping them together, but nevertheless and unequivocal correspondence exists between the design on paper and the real construction of stone iron and wood". (Bertalanffy,1969)

Secondly, Von Bertalanffy said "there appears to exist a general systems laws which apply to any system of a certain type, irrespective of the particular properties of the system and of the elements involved." (Bertalanffy,1969) In addition, it "appears to be that the systems concept is abstract and general enough to permit application to entities of whatever denomination." System theorists agree that the concept of system is not limited to material entities but can be applied to any "whole" consisting of interacting "components." (Bertalanffy,1969)

Finally, Von Bertalanffy even seems to have set the context for the use of GST in business in a work published before General Systems Theory. Below are his comments "Robots, Men and Minds" published in 1967.

"General systems theory (in the narrow sense of the term) is a discipline concerned with the general properties and laws of "systems". A system is defined as a complex of components in interaction, or by some similar proposition. Systems theory tries to develop those principles that apply to systems in general, irrespective of the nature of the system, of their components, and of the relations or "forces" between them. The system components need not even be material, as, for example, in the system analysis of a commercial enterprise where components such as buildings, machines, personnel, money and "good will" of customers enter." (Bertalanffy,1967)

## A REVIEW OF THE MODEL

The systemic business model below was built based on Ludwig von Bertalanffy's Informal Survey of Main Levels in the Hierarchy of Systems, (pursuant to Kenneth Boulding)

This visual representation of this model will be of service in the facilitation of understanding the model and it's relationships. Below is the model (Figure 1) and a brief explanation of its components.

## Bertalanffy Revisted

Some words of caution provided by Von Bertalanffy; “The advantages and dangers of models are well known. The advantage is in the fact that this is the way to create a theory -i.e., the model permits deductions from premises, explanation and prediction, with often unexpected results. The danger is oversimplification: to make it conceptually controllable, we have to reduce reality to a conceptual skeleton-the question remaining whether in doing so we have not cut out vital parts of the anatomy. The danger of oversimplification is the greater, the more multifarious and complex the phenomenon.” (Bertalanffy,1969)


Figure 1

This model’s fields follow the impressionist lead of Von Bertalanffy’s original survey.

There are nine “fields” in this model. The strength of each field will vary depending on a variety of factors, including, but not limited to, interactions, the nature of the task, the demands on the systems, etc.

The term “fields “ has also been chosen for its metaphoric value as it relates to growth and development. These fields are designed to become isomorphic breeding grounds for the development of new paradigms both inside each field and throughout the entire system. These fields interact to form a biome, or an entire community of living organisms in a single major ecological area, in this case, the business environment. The fields include **WORK, FOUNDATIONS, TIME, RULES, METAMORPHOSIS, PEOPLE, LEADERSHIP, HABITAT**, and **KNOWLEDGE.** The relationships can be described as direct, implied, circular and most importantly mutually recursive. Each field is always in constant interaction with all other fields.

There is no “objective reality” out there that will somehow let us know when we have reached or developed the proper structures or guidelines for running a business. It is imperative that we create those realities, in ways both small and large, for now and in the future. And we must be aware of what those solutions bring. Solutions, as quantum reality teaches, are a temporary event, specific to context, developed through relationships of persons and circumstances. (Wheatley,1994)

## DESIGN, STRUCTURE, IMPLEMENTATION: DESIGN

Is it possible to design, structure and implement a business model like this? The answer is a resounding “Yes”. Part of the confusion of adapting biological models to business, or the adaptation of any other models for that matter, is the strict adherence to addition principles of similar origin even when they may or may not apply. For example, using the Second Law of Thermodynamics to describe a phenomena does not mean one must use ALL the laws of thermodynamics, or even other laws of physics for that matter, simply the ones that apply to a given circumstance or situation.

Bertalanffy even stated, “in the last resort, disappointment results from making what is a useful model in certain respects into some metaphysical reality and “nothing-but” philosophy as has happened many times in intellectual history.” (Bertalanffy,1969)

A good model for design should incorporate two other phases, structure and implementation and should do so in a recursive manner. Below are three simple rules for beginning the design, structure, and implementation process.

1. A well defined, clearly stated problem.
2. A loosely defined and subsequently coordinated set of requirements.
3. A program (or “system”) by which to execute, maintain and/or accommodate the goals and objectives.

Why then has it been so difficult to design, structure and more importantly implement new business structures that reflect this present notion and meet our future demands? Part of the reason may lie in our view of hierarchy.

## DESIGN, STRUCTURE, IMPLEMENTATION: STRUCTURE

Hierarchal organization is so universal in the biological world that we usually pass it off as a natural way to achieve simplicity of efficiency in a large collection of interacting elements. If asked the fundamental reason for hierarchal organization, I suspect most people would simply say, “How else would you do it?” (Patee,1973) How else indeed? And yet, the virtues of hierarchical organization - of matter, of life, of information, of human institutions- are mostly taken for granted…hierarchy is not really questioned in a fundamental way. (Hendland, 1993)

There have been several attempts to classify hierarchies into categories, none of them entirely successful, because unavoidably the categories overlap. Thus one can broadly distinguish between ‘structural’ hierarchies, which emphasize the spatial aspects (anatomy, topology) of a system and ‘functional’ hierarchies, which emphasize process in time. Evidently, structure and function cannot be separated and represent complementary aspects of an indivisible spatio-temporal process; but it is often convenient to focus attention on one aspect or the other. All hierarchies have a “part within a part' character but this is more easily recognized in 'structural' than in 'functional' hierarchies-such as the skills of language and music which weave patterns in time. (Koestler,1967.)

In addition, as Pattee suggests, if hierarchy is paradoxical and arbitrary, can it be both and still efficient? The answer is indeed yes, if we merely look at hierarchy from a slightly different perspective. Much of hierarchical structure is based on levels of hierarchy related to "size and position" levels. In other words, top to bottom, higher to lower, left to right, bigger to smaller. This unconscious value system of rank potentially leads to many of the problems often experienced in man made hierarchal arrangements.

Take for instance Simon's "Chinese Boxes". This set of boxes of graduated size, each surrounded by the next larger box, may provide a simple and understandable model of hierarchy but would something like this work in the real world? Of course it would work, but only if you were one of the larger boxes. Imagine you were the smallest box inside an arrangemnt of nine boxes, your ability to move or open as well as your function determined by eight other boxes. It is a premise example to say the least.

At the lowest level of this hierarchical arrangement , the smallest box is not even able to leave and start it's own set of boxes. Like most ranked and ordered hierarchies, the lower levels are needed for the system to function, remove them and the system collapes. This means that the lower levels, with their assumed diminished importance, are still highly necessary for the function of the system.

Bear in mind as Bertalanffy stated: An organism displays not only a morphological hierarchy of parts but also a physiological hierarchy of processes. More accurately stated: an organism does not represent one hierarchy that can be described thoroughly in morphological terms. Rather it is in a system of hierarchies that are interwoven and overlapping in many ways, and that may or may not correspond to the levels of morphological hierarchy. (Bertalanffy, 1953.)

Finally, if hierarchy is being used to augment order, than perhaps we should reconsider order too. We do not restrict order to some regular arrangement of objects or forms in lines or in rows (e.g., as in grids). Rather, we can consider much more general orders, such as the order of growth in a living being, the order of evolution of a living species, the order of society, the order of a musical composition, the order of a painting, the order which constitutes the meaning of communication, etc (Bohm,1980.)

In the design and structure of the model above, the form of "circular hierarchy' was chosen. This concept of circular hierarchy should be thought of more as a conceptual tool than a physical arrangement, which is probably the way an organizational chart *should* be used. A circular hierarchy changes many notions about how we typically think about hierarchies. Gone are the rankings, the numerical orderings, and Chinese box constructions.

Think if you will of the color wheel. A color wheel is a non-ranked, loosely ordered arrangement of elements that allow for the combining of any or all of the elements. Each color is separate and distinct. One color has no more, or less, importance than the another colors. Each color has hundreds and thousands of variations, not related to the next color. Each may be freely combined with each other. None can be taken away and still have a "complete" spectrum. It is this type of arrangement that a circular hierarchy attempts to achieve.

The development of this model in a circular hierarchy also corresponds to what Paul Weiss termed "pure and unreducible system behaviors and indispensable principles of developmental dynamics". These irreducible characteristics can briefly be summarized as follows:

1. Organic systems are units composed of smaller units subordinated to the system as parts or components.
2. Organic systems are of heterogeneous composition, i.e., the components are not of a single (monotonic) kind, but belong to distinct and discrete classes and kinds.
3. The various populations of unit components themselves are not dispersed diffusely and intermixed at random, but show characteristic patterns of segregative and aggregative distribution, which can be mapped as the "field-pattern" of the system.
4. The field-pattern tends to retain its configuration and unity during phases of stationary equilibrium despite the relative free mobility of the component subunits.
5. Upon enforced distortion or other kinds of disturbance well below destructive magnitude, the field pattern tends to return to its former standard configuration.
6. All of these references to configuration pertain primarily to the patterned distribution of forms of energy (or forces) for which the ensuing and readily discernible stable and stationary geometric constellations serve as indicators. Thus what we recognize as the form of a system must be regarded as a derivative manifestation of ***formative***, or more precisely, transformative ***dynamics***.
7. Components of systems are often unit systems of themselves. (Weiss,1971.)

It is the belief of this author that this circular hierarchical arrangement of business can, in theory and eventually in practice can fulfil these aims.

## DESIGN, STRUCTURE, IMPLEMENTATION: IMPLEMENTATION

What happens between design, structure, and the perceived last step of implementation?

Suppose implementation was a bridge between theory and practice. This bridge would typically be thought of as the Golden Gate or the Akashi-Kaikyo when, in reality, it's usually more like an old Inca rope bridge, sturdy and effective but a death defying way to cross a chasm. And the transitional chasm crossed in the process of implementation is certainly not a one-way trip. Implementation is a multi-directional activity. Implementation is not an end state or a final act but one more step in the recursive triad of design, structure and implementation.

Implementation, especially for the model above, should also be considered in terms of equifinality. Von Bertalanffy again: “An aspect very characteristic of the dynamic order is organismic processes can be termed *equifinality.* Processes occurring in machine like structures follow a fixed pathway. Therefore the final state will be changed if the initial conditions or the course of progress is altered. In contrast, the same final state, the same “goal”, may be reached from different conditions and in different pathways in organismic processes. (Bertalanffy, 1969,132.)

Additionally, the model of the behavior of an elaborate system-the second level at which modeling is essential to science and technology-begins as a map. Complex data, whose interactions are not fully understood, are selected and put into relation- more or less tentative-to each other. Then the map, so to speak, is turned on and set into motion: the changes in certain parameters are introduced into the system and their interactions followed. Where the model of an object attempts to predict performance, the model of a complex system tries to predict *outcome*. (Judson, 1980)

## SEVEN IDEAS FOR SYSTEMIC IMPLEMENTATION

These ideas are in no way perfectly put together. They are impressionistic ideas, from a variety of sources. These ideas are “reaching out” to other disciplines for insight, instruction, and information.

### 1. Relativity Rules

Einstein’s special relativity is often invoked as an intellectual support for cultural and moral relativism. Where Einstein says that we can never see beyond our own space-time framework, the relativist argue that whatever individuals and cultures think is right is right, is right, for them. Everyone has a right to his or her own opinion or practice. There is no “correct” way of thinking or acting. (Marshall,1997)

In order to discover new paradigms and new vistas, it is necessary that we adjust our perspective to find the correct answer, no matter how “wrong” it may look at first. In short, the validity of a scientific concept is no longer decided by whether it appeals to “common sense”, but by whether it “works”. (Weiss,1971, Pp4)

Challenging concepts such as hierarchy, order, organization, work, and even implementation will provide new answers, and new questions.

### 2. People As Wild Cards

People are unpredictable. However, taking our cues for the future of people from flies, fungus, or viruses is not a good strategy. People are capable and adaptable, especially to the work circumstances and environments created for their benefit.

Said Edward T. Hall, “It is never possible to understand completely any other human being; and no individual will ever truly understand himself-the complexity is too great and there is not the time to constantly take things apart and examine them. This is the beginning of wisdom in human relations. However, understanding oneself and understanding others are closely related processes. To do one, you must start with the other, and vice versa. (Hall, 1977.)

3. **Single Past, Multiple Futures**

No matter how many times we replay it, the past will always remain the same. The same is not true for the future. Equifinality, the principle that in open systems a given end state can be reached by many potential means, should be a watchword for systemic implemetation.

Said Draper Kauffman, “We are in general much less shocked by, and much better able to deal with, situations which we have at least considered in advance than situations which are totally unexpected.

This is true even if we have also considered many events which never do occur. If we think through five alternative possibilities in advance, and only one of them actually occurs, we will still be better prepared to cope with that one than s we had considered none of the possibilities at all.” (Kaufmann, 1976)

4. **Entropy**

Entropy is a key concept in physics, related in a fundamental sense to the flow of time. The Second Law of Thermodynamics states that natural processes always move toward an increase of disorder, or that entropy always increases. (Gribbin, 1984.)

The more we try to organize, the more we encounter entropy. Entropy seemingly makes things move away from order precisely because we are trying to apply order. The most highly specialized and well-constructed machines can never have one hundred percent efficiency because of entropy.

There will be some “loss” from design, through structure, and finally implementation. Entropy should be acknowledged, planned for, and accepted.

5. **Loose Structures**

If things change on an hour-to-hour, minute-to-minute, second-to-second basis, why should we think we could get things right on paper to last any longer? We must design and implement structures that are flexible, accommodating and most of all, capable of handling the variety that is thrust upon them.

Bertalanffy noted, “What are called structures are slow processes of long duration. Thus, organic structures cannot be considered as static but must be considered as dynamic. (Bertalanffy, 1952) Structures must be designed in an accommodating manner and implemented to accommodate change, variety, and growth.

### 6. Quantum Mechanics

The quantum world, the unseen world of micro particles, is a fascinating environment for looking at change, development, and perspective. However, like most new scientific ideas, the concepts realities of quantum mechanics take some getting used to.

“Scientific revolutions are forced upon us by the discovery of phenomena that are not comprehensible in terms of old theories. Old theories die hard. Much more is at stake than the theories themselves. To give up our privileged position at the center of the universe, as Copernicus asked, was an enormous psychological task. To accept that nature is fundamentally irrational (governed by chance), which is essentially the statement of quantum mechanics is a powerful blow to the intellect. Nevertheless, as new theories demonstrate superior utility, their adversaries, however reluctantly, have little chance but to accept them. In doing so, they must also grant a measure of recognition to the world views that accompany them. (Zukav. 1979.)

### 7. Generalization

If we look at the lack of organization and lack of clarity of the forms around us, it is plain that their design has often taxed their designer’s cognitive capacity well beyond the limit. (Alexander, 1964)

Von Bertalanffy introduced the term “General Systems Theory, “deliberately in a catholic sense (Bertalanffy, 1969).” He wanted his theory to have a broad and liberal scope. Life is a great model of itself and we should continue to learn as much as we can from it. The more we can learn, and apply, from the world around us, the closer we are to achieving the new paradigms that will serve us all.

## CONCLUSION

General Systems Theory, as originally intended by Von Bertalanffy, is an ideal framework for the modeling of a business enterprise. Work, in its most civilized form should enrich, empower and emancipate. Thus we must continue to find ways to support work as a humanistic, not mechanistic endeavor. We must continue to seek out new models of business that support and enhance the individual as well as the collective whole. Given all this new technology, we need new institutions for handling it. “ (Beer, 1974) It is hoped that this is a start to those new institutions.

In closing, and appropriately, the words of Ludwig Von Bertalanffy:

We may, however, conceive of a scientific understanding of human society and its laws in a somewhat different and more modest way. Such knowledge can teach us not only what human behavior and society have in common with other organizations, but also what is their uniqueness. Here the main tenet will be: Man is not a political animal; he is, before and above all, an individual. The real values of humanity are not those which it shares with biological entities, the function of an organism or community of animals, but those which stem from the individual mind. Human society is not a community of ants or termites governed by inherited instinct and controlled by the laws of the superordinate whole; it is based on the achievement of the individual and is doomed if the individual is made a cog in a social machine. This, I believe, is the ultimate precept a theory of organization can give: not a manual for dictators of any denomination more efficiently to subjugate human beings by the scientific application of Iron Laws, but a warning that the Leviathan of organization must not swallow the individual without sealing its own inevitable doom. (Bertalanffy, 1969)

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