A Theory and Practice *System* of "Systems Thinking":
with An Executive's Story of the Power of "Developmental" and "Evolutionary" Systems Thinking

by Carol Sanford

"As a manager in DuPont who finally came face to face with the Freon nightmare, I can tell you that thinking too small about a system gets you into more trouble, instead of getting you out of it. To "get out", we had to change ourselves as people and how we thought about the system we were working on. Only then did we realize we had to provide leadership to the whole (blankity blank) World if we were to really solve the problem."
 - VP of Chemicals

Why a New Typology of Systems Thinking?

A typology, as commonly used, seeks to organize our world into distinctive and manageable "buckets". Systems thinking theory introduced the understanding that the relationships between these "buckets" were super ordinate to the nature of the buckets themselves and that simply characterizing the contents of each bucket, as if they were separable phenomena, in fact made things less manageable. Unfortunately, the same approach to *typing* is often applied to systems thinking itself. We now recognize and study different types of systems, but for the most part fail to see the relationship between these systems. The different types of systems form a system themselves and each, based on its unique potential and nature, has a particular role to play within the larger system of which it is a part. The typology offered here presents a "system of systems thinking". This systemic hierarchy provides the basis for the more complex thinking processes referred to in the DuPont executive's quote above. It enables planners and managers to work interactively and to bring more collective intelligence to interventions and endeavors. But <u>most</u> importantly it suggests that we have prematurely capped the

traditional hierarchy at the level of complex adaptive systems, often erroneously labeling it "living systems". This becomes clear as we see the <u>more common</u> types of systems thinking using a new systemic hierarchy, and view them against more recent advances in living systems science. In doing so, we see that this hierarchy adds two levels beyond those presented in most discussions on system thinking, expanding and advancing the bounds of potential for systems and their value creating capacities.

- **Premises:**

    Present organizing models for systems thinking are underdeveloped and fail to provide **workable practices at very complex levels.**

- A hierarchy of **systems thinking types that is nested** (rather than one that trivializes lower levels) can explain a real dynamic world, where each type is needed at different levels of complexity.

- The hierarchy of systems thinking provides a framework for moving from the larger context and **"mind field" that is necessary for managing complexity down through application** to manifesting the best or most sustainable solution for the greatest number of wholes.

- **Systems thinking improvement ideas can be assessed and validated.** The idea of *improvement* itself suggests that some plateau or plane of manifestation brings more value than others and that we can rise to higher strata (orders) over time.

- Managers can provide **a framework for the workforce in order to shift their level of motivation in carrying out a change process**. A whole approach, as offered here, raises the level of potential involvement and the level of commitment by organizational members.

This typology of systems thinking is made up of five types or levels of systems thinking and the systems thinking attributes associated with them: **closed, cybernetic, complex adaptive, developmental, and evolutionary**. The emphasis of this paper will be on the interrelationships of these types, including their distinctiveness and their complementarities. The paper will also challenge some currently held views, practices, and understanding of existing typologies that use closed, open and living systems as an ordering approach.

System thinking Paradigm / Differentiating Attributes	Objective of System Type	Quality of Energy by Managers[i]	Basis of Change	Degree of complexity /nature of Ordering
Evolutionary	Regenerative	Creative	Supra-ordinate system aim / managing process	Heterostatic / Dissipative Structuring / Self-Organizing
Developmental	Improvement	Conscious / Consciousness	Essence / harmonizing purposes	Heterostatic
Complex Adaptive	Maintain	Sensitive	Natural Law	Homeostatic & Heterostatic
Cybernetic	Operate	Automatic	Feedback	Homeostatic & Entropic
Closed	Stabilize	Vital-life impacting	Mechanisms	Entropic

The Theory—with Business Examples

Typing or Classification of Systems Thinking

Our upbringing and particularly our education have trained our thought patterns to follow a segmented and reductionist path. As a result we have spent most of our lives seeing the world around us in a non-

dynamic and segmented way. We have to actually build new capabilities to be able to see the world from a systems perspective. The classification we are working with here is one of seeing the typologies of relationships and structures within a hierarchy wherein each "type" constitutes a level or plane of thinking capability.

HIERARCHY OF SYSTEMS THINKING TYPES

Closed Systems are designed by humans generally to have limited access and ability to exchange energy with systems outside of their boundaries-such as a car engine. (Wiener: 1950) They are subject to wearing out or running down because of an inability to import or exchange energy in any integral or permanent way. It has no ability to import energy so that it may organize itself to rebuild or replace deterioration, and it is fully subject to the second law of thermodynamics, i.e. entropy.

Since, according to Bertalanffy, it is not possible for a closed system to go beyond its initial conditions, the system's primary "objective" is to work to reduce entropy or increase *stabilization* since it is paramount for its survival. In industry, operators in a production operation are very aware of this nature of "objective" for their production line. They must keep the product within certain tolerances and standards or the product suffers reduced value for the customer. This is why *mechanisms* are built and maintained to ensure this stable outcome.   Examples of mechanisms include the electronic or mechanical testing equipment that manage the chemical or physical components of the material as it is being transformed at each stage.

The *energy* used here is what John Bennett, a brilliant English mathematician, refers to as vital, or life giving energy. The material production system itself, uses materials that are taken from the earth and transformed, hopefully for a higher value. If you spend time in a production facility, you can experience the life giving quality (or the lack of it) and the important role the material and people's response play

within working with closed systems. Since machines can have no life of their own, human energy is used to feed the closed systems.

Cybernetics Systems thinking has become synonymous for many people with the term "systems thinking". Much of the development in the Cybernetic Systems Field is a phenomenon of the computer revolution based on modeling, replicating, or simulating human activity, particularly the brain.

The study of Cybernetic Systems is essentially the study of messages or information. Cybernetic specialist point out that all information is subject to disorganization in transit resulting from nature's tendency to degrade the organization and destroy the meaningful. As a result the objective of cybernetic systems becomes continuing to function or *operate* in the environment as a result of or in spite of the interactions it has with its environment. The primary feature of a cybernetic system therefore is a responsive or control one based on *feedback* received from the environment. E. g. A thermostat is seeking to control the temperature in a room based on feedback from the sensors. In business settings this can be seen in the use of customer feedback or in employee surveys to determine the climate in a unit, especially when they are made a routine and a regular part of the business activity. Here, the ordering sought, is to prevent loss of customers and to ensure employee morale.

Complex adaptive systems thinking deals with the energy exchange in a symbiotic relationship with the environment in an effort to maintain homeostasis. The work of many systems biologists provides a clear picture of this level, often referred to as Open Systems. There is in practice today a close link between cybernetics and complex adaptive systems thinking because many of the systems concepts developed in the 60's and 70's drew on cybernetics in the move toward open systems, particularly in their application to human systems.

Complex adaptive systems and open systems exchange energy with their environment, and can change

and adapt based on response to the exchange with the environment in ways that go beyond cybernetic systems. Complex adaptive systems are not however equivalent to living systems.

Complex adaptive systems thinking focuses on creating and maintaining the effectiveness of an entity in a relationship in the context of a continuously dynamic and evolving environment within which it exists. Since the system and its environment are exchanging energies, they affect one another inadvertently. At the global business level this can be seen in businesses working to build relationships with local governments and to adapt to regional and local preferences. Being *sensitive* to changes in the relationship is the way most energy is expended.

<u>Developmental Systems Thinking</u> turns the mind outward through bringing about an introduction of consciousness (seeing and self-managing our own way of thinking and acting with a purpose as a guide), enabling people to transform themselves into being something different— a self that is of service to the present and future benefit of others. Another possible term for this level is purposeful system thinking. With Complex Adaptive Systems thinking, the mind tends to focus organizations on their own vitality. However it becomes clear, when the intention is the viability of the greater systems of which they are a part, that development of thinking capability is needed to enable people to act from such a possibility. Developmental means uncovering the full potential and expression of the unique essence of any entities or systems including the greater system of which we are a part. This uncovering can occur in a classroom or a factory as well as a global planning meeting. There is work among scientists on this type of system thinking (Bohm:1980, Hofstadter & Dennett: 1981, Prigogine, Stengers: 1984, Pribram: 1976), as well as published work in the great spiritual traditions around the world. (Govinda: 1976). Developmental systems thinking requires a spiritual approach or the introduction of a new spirit. In business systems developmental thinking manifests itself as a reconceptualization of the values of the business by exploring its core value, core process and core purpose and how they might manifest that

core uniquely which can only be determined interactively, looking beyond themselves.

A developmental approach is based on a paradigm that sees all living entities (e.g. humans, organizations and nations) as having a unique essence or being that is searching for the channels and means of expression. It values finding the essence of individuals and a place for them to contribute to the singular direction of the business—one that is offering a greater value from the beginning to the end of its value-chain.

It is easier for a company to continue to operate as a cybernetic or adaptive system-just raising the level of reactivity or adaptability- or even face "gut wrenching" loss of existence than to provide continuous development for its people.

Evolutionary Systems Thinking compels organizations to let go of certainty and of driving toward specific outcomes or even purposes in some arenas. It becomes apparent that the field in which creative processes take place must be seeded with a distinct way of thinking and being in order to bring anything truly renewing into existence. The purposes supported in developmental systems thinking are seen as ephemeral. What the leadership of an organization focuses on, is increasing the generative potential in the field and ability to evolve purpose and potential. The intention is to make creativity more possible. When you are working to increase the generative capacity of a field, you know you can no longer predict the trajectory of the players in that field. What the organization cares about most is the very search for a generative set of approaches. This nature of energy is focused on customers, nations, communities and other entities with the wish being for each of them to raise the level of capacity to be generative. The organization working from evolutionary systems thinking sees its primary purpose as regenerating the field "they/we" all exist in and seeking to harmonize toward where the field seems to be unfolding. They are working with "pre-existence". Building intelligence in different levels of systems thinking, itself becomes critical. To say the organization works "regeneratively" means it seeks to

source new potential for the process (the way of working), the producer (worker) and the product (the result of the work itself) to be more generative. An example of this might be an Amish farm, which seeks to create a spiritualized context for everyone to become creative in regard to the output of its farm, the quality of the output, but simultaneously to improve the soil by improving the means of growing and farming overall.

The Practice: A Case Study Summarized

Kingsford Charcoal, a division of Clorox, created a system problem when it improved production so significantly that it meant that almost half its production facilities were no longer needed. Initially the thinking was done primarily from a closed system view—only the effect on the company was considered— and it was assumed that layoffs and plant closings would follow a routine course of action, leading to enormous savings for the company. The company achieved great savings, but it followed anything but a typical closed systems model of thinking and acting.

Complex Adaptive Systems Thinking:

Kingsford had an active change process underway that had led to the improved productivity. Focused only on productivity, it had not yet considered the impact of actions from an open system view where a multitude of entities might have a stake in the outcomes of actions taken. Suppliers were assumed to be expendable, workers would sadly have to find new jobs (but that could not be helped), and the shutdown of the production process had not taken the environment or the community into account. When a manager in the process introduced a complex adaptive system process, the team looked at the side effects of their actions and what needed to be done in each case. The teams were quick to grasp the impact of the company's actions, especially in the small towns where jobs were scarce. But they lost steam quickly when it was not clear how the company could do much except give good severance packages so the people had a decent amount of time to find work.

Development Systems thinking:

There were several things missing that needed to be supplied by a developmental view of systems thinking. Luckily the senior management of the organization had just stepped up to the plate to take a very different look at how to sustain change and how this would demand a greater scope of thinking as well as greater involvement than most companies are willing to take on. First they were confronted by the idea that they actually had to have a "mind" or thinking capability that was able to conceive of different ideas . They could not "brainstorm" their way into solving these problems, because the existing way of thinking was still employed in the brainstorming task and the same level of capability was being used. They had to learn to see how their own thinking and way of thinking was getting in their way before they could take on more complex systems thinking. It quickly became clear where the idea of 'keep it simple stupid' had come in. This says, if you cannot think about something that is complex, break in down to what you can think about with your current thinking skill, e.g. into mind-sized bits that you can handle, even if the thing is indivisible in the way it works in real life. But for these teams, thinking about complexity, how the world really is, opened the door to rethinking the business. Two different processes entered at this level:

1. **Developing capability to see themselves and how they work individually and as groups or teams.** Successful athletes are generally coached to see their own thinking and responses to actions around them. They learn to self-manage their responses behaviorally and their thinking reflectively. The Kingsford leadership team worked to build the capability to exercise this same type of conscious mental energy. They learned to do it by developing their capacity to see what was actually structuring their thinking—usually some long held, but outdated ideas about how markets and people really work reified by the frames of reference they had long held.

2. The second element was **how to see the heart or essence of their businesses and what it took to grow a business in value toward that essence** (also the essence of each person in the

organization) and the purposes of the markets they served. For Kingsford the essence connected to purpose was "creating the ultimate backyard BBQ experience". Working to develop products from the essence of the business also provided a great deal of room and capability stretch toward some new and exciting products as they could develop new technologies and as the market evolved to value new purposes.

The managers now realized they would need some of the people targeted for lay off to build the new products. And their ability to think about more difficult challenges had whetted their appetites to try to resolve the challenge.

Evolutionary Systems thinking:

The closure team's initial anger and frustration with the governmental and educational infrastructure was quickly checked when the intention to create a true evolution become the commitment. What happened, and is fundamental to evolutionary systems thinking, was that the whole they called "a system" was redefined. And what they had as an aim was superceded by the need to grow the systems that were effecting the field. It was no longer about jobs. It was about regenerating communities and the players in them. It was now a whole of which they were a part and in which each action of the elements of the whole was creating "it" through their collective actions. It was no longer possible to see the infrastructure as "the other" which had to be confronted. They were "it". Or more precisely, the "us and them" disappeared. The question became "What are the supra-ordinate aim and the supra-ordinate managing principles that will evolve the potential of *the whole*?" Now teams had to include the community education system and workforce planning entities among other agencies and as a part of the field of their factories. Their generative capacity mattered in the long term. It became apparent that creative principles were needed to drive the thinking to a new level and hold it there.

Evolutionary Principles:

"Every person leaving does so only when they have an equal or higher level job in terms of income and a greater ability to contribute".

"As people leave the company upgrade the overall workforce level and creative potential of the community and any new employer they joined bringing 'state of the art' skills and abilities", the demand for this closing was very different than typical closings.

The commitment to truly ensuring something worked for the Greater Whole, not just the company, ensured they did not raise the unemployment rate nor turn low skilled workers into a community putting higher pressure on the social service system. They raised the overall community even in closing facilities. The Chairman of Clorox's board could not believe the number of letters from 'those who left the company" and level of passion they felt for the company values and the respect with which it had treated them. The same was true of letters from leaders in government, education, and social services.

Complex Adaptive Systems: Viewed from an Evolutionary Level of Systems Thinking

If an organization has in place the evolutionary and developmental systems thinking, they come to complex adaptive systems thinking with a different understanding.   Where before the limit had been "how to think about the impact of other stakeholders on them", now the question became "how to set up reciprocal maintaining processes between themselves and other stakeholders that keep the dynamics in the forefront rather than waiting until a problem is apparent". People developed greater ability to think about greater connections and not to fall prey to their fears or sink into competitive responses that reduce the effect on new potential creativity as it emerges across the system.

Summary:

It is important to understand that this typology is not segmented, or dismissive of "lower levels of systems thinking" as our mind would frequently invite us to see them. There is a nested relationship between all levels where the higher ordering systems thinking types include the capacities of the less complex ordering of types. It is helpful to avoid the picture of these as parallel but different, and instead to visualize them as concentric rings. Any one entity does or should have all levels of systems thinking operating within it and must use many overlapping elements at work.

The systems thinking typology offers ways to consider the limits that we place on objectives that can be achieved and in some cases are being achieved outside of our awareness. It is an attempt to place systems thinking concepts under the same microscope that the use of *systems*, as a concept, has enabled us to scrutinize other phenomena. This gives us more options, fewer limitations, and better understanding of our own work, as we inquire, articulate, and seek to guide change.