

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. It was not enough to work from a living systems model of how we, and all of life, are connected. In order to really grasp the challenge and to overcome the fear that came up every time we saw what was really needed, we had to build a “better mind” to “think with” among our own leadership. If we had not moved to more complex thinking processes and development of ourselves, we would still be fighting regulations or maybe just gotten ourselves out of the problem production—leaving the problems to others. But definitely we would not have considered working with global infrastructure, including governments on the cusp of developing the same product and making the problem worse. Instead we, the global we, created a whole new set of products. And we made more money, felt more ethical and got a whole lot smarter about tackling challenges at this level of complexity. This included forgetting, “keep it simple stupid”. Maybe it should be, “keep it essential stupid”.” 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”, the underlying structure of which is a nested hierarchy of increasing orders of complexity and richness. Each level offers a different order of capability to manage diverse and complex dynamics with distinctive design and managing implications for how to organize at that particular level. As a hierarchy of value (vs. power), each level has its own richness and value in itself that is subsumed into higher levels as one moves up the hierarchy. In turn, each level provides a value context for lower levels when working down the hierarchy. 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 most 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 more common 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:

- There is a growing understanding among management that it is necessary to understand systems thinking and practices in order to be sustainable and effective. But the present organizing models for systems thinking are underdeveloped and fail to provide **workable practices at very complex levels or achieve the full potential that experts claim they will actualize.**

- 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 offers **design guidelines for managing change based on a systems thinking technology for application. It is inclusive of all systems thinking types and views each as appropriate under certain conditions.** The typology provides the **framework for matching the appropriate type of systems thinking to the related scale of effort and the means for organizing design processes to leverage the power** that is in the hierarchy.

- The hierarchy of systems thinking ensures a **practical application in design or planning processes by providing a sequence of systems thinking by type that leverages the best and most sustainable outcomes.** The typology is 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 against the hierarchy providing the basis for a fundamental shift in outcomes.** Proposed improvement ideas can be modified by looking to the hierarchy to ensure that the desired quality of outcome is consistent with the nature of systemic thinking going into the improvement process. Rather than simply changing the existing way of working or output of work, we change how we think about phenomena, which brings in more potential. 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. The hierarchical framework offered here, serves as a tool for understanding such improvement plateaus and provides a roadmap for pursuing change efforts. Further, managers can assess whether new techniques that are offered by the popular press and the latest guru are up to the task they have, what level of complexity the techniques really tackle or whether they are systems thinking-based processes at all.

- Managers can provide **a framework for the workforce in order to shift their level of motivation in carrying out a change process.** The typology is isomorphic with reality rather than segmented into chunks to be managed independently or worse, dismissive of the need for closed and other lower levels of systems thinking. The typical outcome of change efforts is either employees work mechanically on tasks or become frustrated when they run into illogical gaps in practice that they experience as unrelated to how the world really works. A whole approach, as offered here, raises the level of potential involvement and the level of commitment by organizational members.

The typology offered here has been developed by a collaboration of practitioners working in business and human development efforts for over four decades with a backdrop of systems thinking science as our guide. The typology is drawn partly from existing typologies in related fields, including those of the physical and biological sciences and the study of consciousness and mental processes. 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. We also do not believe it is the last word on the subject and value the continued building of this work.

Differentiating System thinking Paradigm Attributes	Objective of System Type	Quality of Energy by Managers ¹	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

When individuals first attempt to understand or to see anything from a systems point of view, let alone apply systems thinking, it is generally difficult to do this. 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. Once we have seen it through ‘systems eyes’, it is much like looking at the Gestalt pictures of the old and young woman (or the vase and two profiles facing one another). When you know how to see them both, you understand that both were there all the time. The new capability to see and to think in terms of systems thinking also starts with being able to “envision” relationships and structural components of nested whole ways of thinking. 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.

The basis for differentiating between types or levels of systems thinking is based on four dynamic elements. The first is the *inherent or attributed objective of the system type*. By this I mean that a system comes into being to serve a role. The five levels of objectives are stabilization, operating, maintaining relationship or effectiveness, improving, and regeneration. (Krone:1985-2003)

The second classifying element is the *quality of mental energy* that managers must bring to their thinking to achieve the objective at each level. This typology of energies comes from the work of John G. Bennett (1964), the English Mathematician and philosopher, whose monumental work describes the system of the Universe and all its relationships. The five qualities of energy are vital, automatic, sensitive (aware and responsive), conscious (awareness of being aware and exercising management over our thinking), and creative.

The third classifying element of systems might be defined as the *basis of change or transformation*, or that which initiates or fuels change at each level of system. The five levels of change or transformation used are mechanisms (i.e. functional moving parts of machinery), feedback or information, natural principles or laws, essence and harmonizing, and supra-ordinate aims of greater wholes. These attributes are drawn from work done by Charles Krone. (C. Krone.:1985-2003)

The fourth element that distinguishes between the five levels is the *degree of ordering sought or encountered*. The lowest level is entropy, in which the objective of the system is to stem the disorder driven by its being subject to the law of entropy. At the cybernetic and complex adaptive levels, systems thinking tends to seek homeostasis, or the ability to return to a steady state but also can engage heterostatically with disruptions without loss of existence. At the Evolutionary and Developmental levels, systems thinking demonstrates the ability for homeostasis in some arenas, but also an innate drive and calling toward a state of recurring and expanding heterostasis. Bateson (1979) called this process one of seeking a difference that makes a difference or is meaningful to the whole.

HIERARCHY OF SYSTEMS THINKING TYPES

Closed Systems were designed to have limited access and ability to exchange energy with systems outside of their boundaries. (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(1968), 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 Bennett (1964) 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. They are fed continuously and repeatedly with the life giving materials and the energy of people and from the various mechanisms that can be borrowed or invented.

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. N. Wiener (1950, 1980), G. Bateson (1979), and the Cybernetics group (Heims: 1991), at the Macy conferences that began in 1946 were primary contributors to the development of this field.

The study of Cybernetic Systems is essentially the study of the theory of messages or information. Wiener points out that all information is subject to disorganization in transit resulting from nature's tendency to degrade the organization and destroy the meaningful. (1950). The objective of cybernetic systems is to continue to function or *operate* in the environment as a result of or in spite of the interactions it has with its environment. The operational feature of a cybernetic system therefore is primarily a responsive or control one based on *feedback* received from the environment. A thermostat is seeking to control the temperature in a room based on feedback from the sensors. A person, who seeks to establish an automatic maintenance system without constant effort on the part of any person to adjust the temperature, establishes the set point. This regulatory process is the means used to achieve

homeostasis and avoid rundown of the system. 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 Bertalanffy (1968), Laszlo (1972,1991), and J. Miller (1978) and other 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. (Bateson: 1979).

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, a confusion that has arisen as the descriptor Living Systems has become popular in organizational development circles. In fact, the development of living systems theory over the last few decades has moved to encompass qualities and capabilities far beyond those normally ascribed to complex adaptive systems—a development that has opened the door to additional levels in this hierarchy and which suggest we still have much to understand.

The objective of complex adaptive systems thinking is to create and maintain 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. The heterostatic mode is activated when the system determines that laws or principles it considers to be fundamental or inviolable to its capacity to maintain its integrity are being challenged.

Developmental Systems Thinking 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. Because of the segmentation in our current thinking as a means of processing phenomena, it requires practice to see developmental system thinking ideas and ways of working. Developmental, in the frameworks of Charles Krone (1984-2003), 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. Unfortunately it easily becomes lost in internal focusing on competitive ventures. With Developmental Thinking a business would ask itself what is at its core, based on several points of reference and the drivers for those choices. 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. Managers come to see people in terms of potential – a potential that will develop and enhance the greater purpose.. It is rare because it actually takes a process to develop people beyond their current state of mind and being, enabling them to do the same for their company or organization.

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.

Once an organization finds the essence of its business and the purpose(s) it will apply that to, it works to improve its means of production and focuses on improving everything and every person to develop that essence and pursue that purpose. Working developmentally requires a different ontology—one that sees the system as having conscious purpose in the context of other higher purposes and working to retain consciousness of these purposes as a means of developing the systems and its way of working. It seeks to align its essence and that of all people with those purposes and the new level of reciprocal maintenance. The organization works to ensure conscientiousness in regard to these purposes and develop people to use conscious mental energy.—directing their thinking rather than being at the mercy of their thinking. People across the organization become aware of their own mental faculties and how to guide their own thinking with intention, which is actually quite rare in spite of our beliefs about ourselves as people. Without the addition of development processes a company remains, at best, a

complex adaptive system working primarily to adapt or change its relationships in order to maintain homeostasis.

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. Where as developmental systems thinking will seek to make improvements based on their own essential nature and the purposes stated by the other players, the evolutionary system understands it can only recreate itself by having the field in which they operate have a generative set of players who are constantly drawing on resources from a deeper source of intelligence. In a business

setting, the business is looking at the entire value-chain and the context of its industry and beyond and what they serve. This may lead it to move away from working in just the agricultural industry, to working on the processes of “eating” as a system. It may lead to stewardship of the entire value chain from seed development to the nutrient quality of produce and its effect on health, just as DuPont Agriculture did in looking at the world from this level of system framework. The organization then returns to designing the development process, complex adaptive reciprocal processes, the cybernetic systems thinking where feedback is needed in the operations, and builds a closed system to process what had been called waste, safely, into a recycled state of value. All levels of systems thinking have a new context—building a generative field for evolving systems.

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. The team also worked with local retraining and placement groups, boldly proposing that the company offer a very generous departure package. They created a plan to give suppliers long lead times relative to their closings to ensure the supplier could transfer their business to new customers. The closure teams were feeling better about themselves, but still felt more needed doing. It was however outside their realm of accountability or ability .

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. They had to use different systems thinking frameworks to guide them in more systemic thinking.
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”. The new way of viewing systems thinking enabled the leadership to generate new product systems ideas that included many quickly implemental products, like quick lighting briquettes that did not exist at the time. 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. Unfortunately many of the workers were too unskilled. And all were not needed. For the level of change needed, they feared they would have to take on the local government and education systems and maybe the federal government’s unemployment rules to really solve their looming workforce

problem. This realization initially produced a sense of being overwhelmed. They had moved a lot closer because they were developing their business from its core and they were also actually improving the value of the business to most of its stakeholders by new offerings providing better margins, earnings and professional growth opportunities to themselves and their customers. 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. Lobbying, a more cybernetic model of working, was initially tried, but fell short, as most readers here would suspect. They had to return to a different level of thinking again. What actually 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.

First principle the Evolutionary Core Team established was:

"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”. Shifting the field, long term, called for some radical development of people. Many had worked at Kingsford for so long, it was not apparent that they were illiterate. These long-time workers knew the systems so well and since they were very intelligent, had learned to fool themselves as well as others for years. Since the **second principle** was, “people who left the company would 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. On-site education was put in place in all sites inviting in family members as well. Children learned along side their fathers, and wives with husbands. This extended to all facilities, not just those that were closing. The class participants produced a newsletter about the company and the community. The rate of learning and change was so great that in Kentucky the Governor gave Kingsford the award for Outstanding Community Contribution, and cited their unorthodox involvement of community leaders and government administrators as a core source of success. 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.

Evolutionary systems thinking practices also led Kingsford managers, over time, to understanding that new ideas came more often from something they “read” almost between the lines and that were already moving toward existence. The ideas were just “blocked” from view for most in the industry by their way of planning and thinking. Team members realized the companies or organizations that could shift their way of searching to one that had more receptive and reflective thinking would find what worked

for the whole. And the organization that could go to the place the answer was already moving toward would also be the most profitable. And the organization that could increase the intellectual capacity of the field and all the players in it, would benefit many times over from the unfolding nature of new potential to join with and draw on. They often felt more like mystics than managers. Although this thinking produced magic in the organization, the communities and the industry, really it was only a different way of thinking—evolutionary, rather than anything magical.

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. This view becomes one of a value-adding process mindset where you are always looking up and down stream for ways to evolve the business and the field it is in. The Kingsford production employees now began to see, with the new mind and way of looking, areas where environmental impacts could be eliminated in their products, ones that saved money for the company and made a better product for the customer. For example, where they were drying out charcoal with lots of heat, one employee saw that the water put in further up stream could be reduced. This lowered the heating bill and reduced use of water from nearby dams, while making the briquettes easier to light for the customer, resulting in less pollution. The teams set up cybernetic feedback loops on their machinery to start getting more information on use of other materials. They discovered on their own what Donella Meadows (1997) helped many of us see; that information

offered from one level, if put into a shifted paradigm, can have a huge impact on creativity and the will to change. With cybernetic information held in the context of an evolutionary system, you understand what really is the best leverage for the whole. Several “closed systems” were subsequently designed for the distillation of charcoal where by-products were better managed with less and less lost energy and waste. Even these closed system teams found further product improvements while working on effluent reduction. But from the evolutionary mindset, they developed education programs for the industry to better understand what they were discovering.

All levels of systems thinking were used in redesigning the company and its products and in developing the producers. But if the work were limited to, or initiated with closed system or with the cybernetic thinking, too much would have been missed. The connection to supra-ordinate aims and to new managing processes and principles limited where the mind could go and where the discovery could be focused. As the visionary systems biologist, Elizabeth Sahtouris reminds us, “The best life insurance for any species in an ecosystem is to contribute usefully to sustaining the lives of other species, a lesson we are only beginning to learn as humans.”

Nested Relationships: Systems thinking Levels to the 5th Power

Each of these types sits in a nested or enfolded relationship with the previous and next type. Let us take the example of a business that is faced with a new product introduced by a competitor; one that is a replacement for their product, and is cheaper and more desirable. A system operating only from conceptualizing itself, although unconsciously and without a construct for doing so, as a cybernetic system may drop its own prices and try to hang onto some market share assuming feedback has been given. An organization that has a concept that is coincident with complex adaptive might work on the relationship with the customer and work to adjust their own product to best meet the customer demands and then move into the new product line through acquisitions or product development work. The

cybernetic system functioning is also present in the complex adaptive concept, but the perspective of the complex adaptive concept enables a heterostatic based understanding and direction setting in utilizing the information and feedback presented to it. Each new level of system adds new perspective and therefore utility to the previous level of system.

In a developmental systems thinking concept, the company asks whether the changes that are occurring are consistent with its own essence and therefore its core mission in service of the purposes of broader set of constituents. Most likely, the organization would probably have their own substitute products on the drawing boards already, ones that would be more compatible with all other systems and their need for expressing the essence of that product's intended effect. They are aware of how their products compare to upcoming offerings, but are more aware of the changing possibilities for their customers and of how to improve their customer's success. The feedback loops are present, from cybernetics models, but they are highly interactive with downstream stakeholders and are not separated out as a mode of gathering information internally. The company is reforming the output based on their own reading of patterns about their industry and what it serves, before changes arise.

A system thinking of itself as an evolutionary system would have been working with governmental infrastructures or industry organizations to create the appropriate capacity to bring about innovation. Again they would have access to the lower ordering concepts from complex adaptive, cybernetic, and developmental systems thinking thereby maintaining sensitivity to the changing world and dynamics coming in, as well as the feedback that guides the specific activities set in motion as part of evolving to a new state of doing business. It certainly would not have been surprised by the introduction of substitute products because it has as an objective, the building of a generative field, which nurtures such spontaneous creation. A company would be seeking regenerative processes and would probably be building consortiums to change the field in which new products are generated or would seek ways to

have new product introductions be rejuvenating to the industry and would be seeking to understand the value changes that were happening in the marketplace in order to be a better contributor in the restructuring that is going on in the industry. The company would more likely be playing a key role in the restructuring of the industry when it sees that opportunity to bring it more in line with the values that are emerging in the world around it. By working from a conceptualization of all four levels of systems thinking it may even have co-created a partnership in a joint venture with customers or competitors from early groundwork.

Again it would be bringing the disordering, dissipative structures, from the evolutionary process, and working from principles and environmental sensing processes of lower systems thinking, in this level of systems thinking. The concepts from lower systems thinking would be interpreted differently however as a result of the higher ordering perspective of developmental concepts.

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.

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