

Systems Thinking: Foundational Research

The Natural Way The World Works

By Stephen Haines, Founder and CEO of the Haines Centre for Strategic Management®

The Haines Centre for Strategic Management utilizes the science of Systems Thinking in strategic planning and management. **The Systems Thinking Approach® is our foundation, core technology and a new orientation to life.** It is the best, most holistic organizing framework and language available to guide all our consulting, training and keynoting with clients.

A **system** is defined as a set of elements or components that work together in relationships for the overall objective or vision of the whole. For example, an organization is made of different parts. All elements in the organization should focus on attaining an organization-wide shared vision of customer satisfaction within today's complex and changing environment.

Systems thinking is an advanced method of critical thinking. It is the natural way the world works. As such, it is a more natural, simple and holistic view of living systems—such as individuals, teams and organizations—as they try to survive and thrive in today's dynamic complex global environment. Systems thinking's outcome-oriented approach distinguishes it from other modes of thought that primarily focus on separate challenges, issues and organizational functions—a more narrow, piecemeal and fragmented approach to life and work.

How we think, is how we plan, is how we act—and that determines the results we get in work and life. Systems thinking is higher-order thinking about the whole system first, rather than focusing on the system's individual parts.

The purpose of this article is to provide a basic overview of Systems Thinking and to explain its foundational research. For more detail on this topic, see Stephen Haines' book *Systems Thinking: The New Frontier*, available on systemsthinkingpress.com.

SCIENTIFIC ROOTS

Systems thinking is a heavily-researched and rigorous macro-scientific theory rooted in universal laws of living systems. It is analogous to DNA in humans in that it defines our life-giving characteristics.

Ludwig von Bertalanffy, an Austrian biologist, is considered the Father of Systems Thinking. In 1954, Bertalanffy formed the Society of General Systems Research (now ISSS), along with Margaret Mead and three Nobel Prize nominees from economics (Kenneth Boulding), physiology (Ralph Gerard) and mathematical psychology (Anatol Rapoport). They proposed the idea of a general theory of living systems that would embrace all levels of science, from the study of a single cell to the study of society and the planet as a whole. They were seeking these generalizations in order to create a recognizable standard of scientific principles that could then be applied to virtually any body of work.

The goal of these five superstars—plus key others like **James Grier Miller**—was to find a unity of science for all complex living things on earth. The long-term result of their efforts was General Systems Theory.

The Systems Thinking Approach®

The Systems Thinking Approach is an absolute necessity to make sense of and succeed in today's complex world.

If life on earth is governed by the natural laws of living systems, then a successful participant should learn the rules.

— Stephen Haines

While Bertalanffy is relatively unknown to most people, his impact through his disciples is enormous. Peter Drucker—the most revered management thinker and consultant in the 20th century—was also from Vienna, Bertalanffy's hometown, where Systems Thinking was and is still being taught. Drucker was influenced by Bertalanffy and his Society of General Systems Research.

Many people are also familiar with **W. Edwards Deming** and his TQM approach. The "T" in TQM stands for total or entire system—which was his approach as another renowned systems thinker. While Deming's thinking was not initially accepted in Western management, he became so revered in Japan that its top quality award is the Deming Prize. (The United States later established the Baldrige Award for Quality, a much less prestigious name.)

Other thought leaders in Systems Thinking have included: Russell Ackoff, Richard "Dick" Beckhard, Peter Checkland, Stephen Covey, Glenda Eoyang, Erik Erikson, Jay Forrester, Buckminster Fuller, Michael Goodman, Stephen Haines, Daniel Kim, Allenna Leonard, Abraham Maslow, Margaret Mead, Donella Meadows, Gerald Midgley, Jean Piaget, Peter Senge and David Peter Stroh.

In fact, more than 40 scientific disciplines are now moving towards Systems Thinking, as interdisciplinary research and new disciplines are now the norm in universities around the world. Leading theorists are also leaning toward Systems Thinking. Pressing world-wide issues such as global warming have only accelerated the understanding of the earth as one living system.

In fact, it takes a higher, more integrated intellect and level of human maturity (Erikson's Interdependence Level) to utilize this different but more effective worldview.

A SYSTEM DEFINED

A system is defined as a set of elements or components that work together in relationships for the overall objective or vision of the whole.

For example, an organization is made of different parts. All elements in the organization should focus on attaining an organization-wide shared vision of customer satisfaction within today's complex and changing environment.

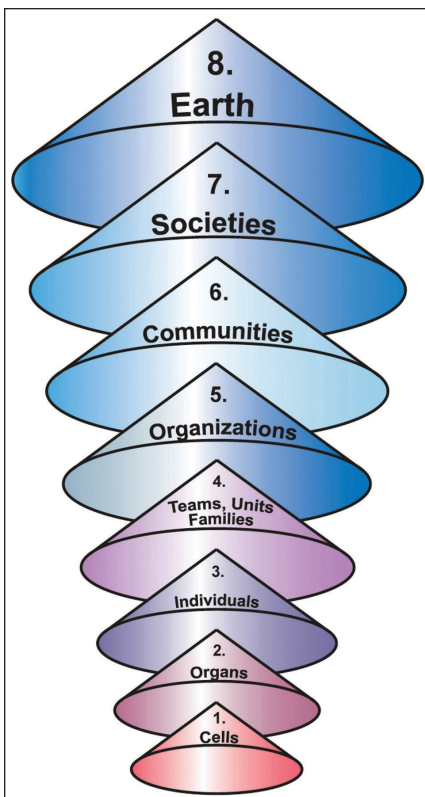
FOUNDATIONAL RESEARCH

Once we get used to the Systems Thinking mindset and worldview, complexities fade away and our perspective is like that of an astronaut taking a higher, but no less accurate, view of earth—seeing the world as it really is, not as people assume or wish it to be. Anyone can adopt these thought processes through four foundational research concepts, based on more than 50 years of scientific research:

1. **Eight Levels of Living Systems:** The eight levels of living systems on earth were identified in James Grier Miller's book *Living Systems* (updated in 1995).
2. **12 Natural Laws of Living Systems:** These laws are the touchstone for worldwide applications of the entire field of Systems Thinking. They are based on the 1973 research of the Society for General Systems Research, led by Bertalanffy.
3. **ABCs of Systems Thinking:** This model is our Universal Thinking Framework and Guide™. Based on six of the 12 Natural Laws of Living Systems, this simple model can be taught in only 10 minutes.
4. **The Iceberg Theory of Change:** This theory encapsulates the predictable nature of change and the three components that always occur in every situation in our lives: content, processes and structure.

These four fundamental research concepts make up the heart of Systems Thinking. Let's look at each one in detail.

FOUNDATIONAL RESEARCH #1: EIGHT LEVELS OF LIVING SYSTEMS



In his classic book, *Living Systems* (1978), Miller contributed the key concept of living systems levels that form a specific hierarchy. The Eight Levels are in hierarchical relationships with each other; they are systems within systems within systems. These levels begin with earth as the largest living system and extend all the way down to cells, the smallest:

- #8. Earth
- #7. Society
- #6. Community
- #5. Organization
- #4. Group
- #3. Individual
- #2. Organ
- #1. Cell

Eight Levels Explained

These “nested systems” illustrate that hierarchies are natural and normal. The focus is to have the minimum hierarchy (not bureaucracy), working with you to achieve your goals and desired outcomes. Further, it is the collisions and collaborations of systems within and among these levels—especially levels three through seven—that create the complexity and chaos we often feel in today's world.

We will be concerned primarily with the living systems at the following levels:

Level #3: Individuals (people)

Level #4: Groups (teams, departments, families)

Level #5: Organizations (companies, public sector, nonprofits)

Level #6: Communities (cities, neighborhoods, ethnic groups)

Level #7: Societies (countries, states, provinces, tribal groups)

We will also focus on the intersections or collisions of systems with other system levels. The intersections at the three levels on which we're focusing are:

- One-to-one (two people at Level #3)
- Between departments (two departments at Level #4)
- The organization and its environment (Level #5 interacting with other organizations, communities, societies and the planet.)

To implement change of any type, we must look at these systems levels and their collisions. We must also be aware that the further we move towards the higher-level systems, the more complex the system will be—and the greater our need for the skills, willingness and readiness to deal with that complexity.

This systems hierarchy illustrates the interrelatedness and interdependence of living systems, and the impact that systems have on one another. It also validates the concept of systems within systems, a key tenet of thinking about systems.

In viewing ourselves and our organizations as levels of living systems within—and colliding with—other systems, we align ourselves with the principles of openness, interrelation and interdependence, cementing the systems concept. When problem-solving, we look for patterns of behavior and events, rather than at isolated events, and we work on understanding how each pattern relates to the whole. We begin to see how problems are connected to other problems, and are forced to look at solving those problems in a new way. In fact, the solution to any systems problem is usually found at the next highest system.

To quote Albert Einstein: “Problems that are created by your current level of thinking can't be solved by that same level of thinking.”

We need to think on a higher level, taking a Helicopter View to examine the big picture. A helicopter can hover at various altitudes, slowly hovering to examine all sides of a situation, including unintended consequences. With this approach we end up with precisely what we need: fully integrated solutions to our systems problems.

FOUNDATIONAL RESEARCH #2: 12 NATURAL LAWS OF LIVING SYSTEMS

Standard and predictable system and organizational dynamics are based on the Twelve Characteristics and Natural Laws of Living and Open Systems from the research the Society for General Systems Research. This original research was first published in the 1973 yearbook of the *Academy of Management Journal*. It listed the 12 characteristics of living and open systems that allow us to better understand all situations in which we find ourselves.

An infinite number of dynamics occur daily as a result of families, teams and organizations being “living, human systems.” Most of us do not realize why and how these dynamics occur. Learning about these 12 laws and their dynamics—and understanding and applying them—is critical for maximum effectiveness and superior results. These 12 laws can be viewed in groups of six for ease and simplicity.

The Whole System

The first six characteristics describe the Whole System, which is greater than the sum of the parts. They are also the basis for the ABCs of Systems Thinking (see Foundational Research #3), as indicated by the burgundy block letters:

1. Holism: Broader, purposeful perspectives and synergy **A D E**

Holism is the opposite of elementarism, which views the whole as simply the sum of its parts. A system can only be explained as a totality. For instance, when we write letters, our hands do not write alone as separate parts—they can only write as part of our overall human body and system. A system has overall purposes and transformational synergy when it is optimally effective.

2. Open Systems: Open to the environment **E**

Any system is relatively more open or more closed. An open system accepts inputs from its environment, acts on the inputs to create outputs, and releases the outputs to its environment. The three keys to success for any system are its ability (1) to be interactive with its environment, (2) to fit in with that environment and (3) to be connected to that environment. A crucial task for any system is to scan the environment and then proactively adapt to it.

3. Boundaries: Interactive and collaborative **D**

All systems have boundaries that separate them from their environments. The relatively closed system has rigid, impenetrable boundaries, whereas the open system has permeable boundaries, allowing it to easily integrate, collaborate and fit within its environment.

4. Inputs/ Outputs: How a living system operates **C → A**

An open system can be viewed as a transformation process. Its relationship with its environment is dynamic: it receives various inputs, transforms these inputs in some way and exports outputs.

5. Feedback: Openness, circularity and constant improvement needed for transformation **B**

Information concerning the system’s outputs or processes are fed back into the system as an inputs. Often these informational inputs help us get to the roots of problems. Positive feedback indicates the

steady state of a system is effective. Negative feedback indicates it is deviating from a prescribed course and should readjust.

6. Multiple Outcomes: Desired outcomes, always multiple and often with unintended consequences. (This is the #1 Systems question—“What are my desired outcomes?”) **A**

Social organizations set multiple goals, if for no other reason than that their members and subunits may have different values and objectives. A common, detailed vision and desired outcomes are crucial to coordinated and focused actions.

Inner Workings

The 12 Natural Laws include six more standard internal dynamics that complement the laws above. We all experience them daily at work. These Inner Workings characteristics shed light on the Iceberg Theory of Change (see Foundational Research #4).

7. Equifinality: Systems need to be flexible and adaptive in order to survive, as there are many ways to achieve a desired result.

This view suggests all organizations can accomplish their objectives with diverse inputs and with varying internal activities (processes). There is usually not one “best” way to solve most problems.

8. Entropy: Living systems need continual reinforcement and inputs of energy, or they run down, become obsolete and die.

In a closed system, the change in entropy will always progress toward decline and death. However, in open systems, entropy can be arrested and may even be transformed into negative entropy, a process of more complete organization and enhanced ability to transform resources to desired outcomes. This is because any living system can import energy and resources from its environment, leading to continual renewal and enhancement.

9. Hierarchies: Systems need flatter, more productive order, rather than rigidity and bureaucracy.

Hierarchy is a fact; the issue is to flatten it in a natural, self-organizing way. Avoid rigid and artificial structures that create boundaries. “Keep it simple and customer-focused” should be the mandate, even Simplicity Police have to maintain it.

10. Relationships: System components are interrelated, not separate. The whole idea of a system is to optimize the fit of its elements in order to maximize the whole. If we merely maximize the elements of systems, we end up suboptimizing the whole.

11. Dynamic Equilibrium: A system seeks to maintain its stability, balance and culture. There is resistance to change, which occurs best at the chaos on the edge of the system boundary.

A closed system will eventually attain an equilibrium state with maximum entropy; an open system may remain in dynamic equilibrium with its environment through the continuous inflow of materials, energy, information and feedback.

12. Internal Elaboration: Systems tend toward details, sophistication, complexity and confusion (instead of simplicity).

Complexity must be continuously resisted, for it develops naturally into ossification, rigidity and death.

FOUNDATIONAL RESEARCH #3: THE ABCs OF SYSTEMS THINKING

Within today's dynamic and ever-changing environment, the standard functioning of every living system includes a circular framework. We call it the ABCs of Systems Thinking (see Figure 3.3). It is a **Universal Thinking Framework and Guide™** because it is the only Systems Thinking one in the world that is universal in its applications to all aspects of our daily life and work.

This conceptual model has five phases that we have interpreted from the first six characteristics of the 12 Natural Laws of Living Systems (Foundational Research #2). We have applied it to answer five crucial questions:

Phase A: Where do we want to be? (Multiple Desired Outcomes)

Phase B: How will we know when we get there? (KSMs)

Phase C: Where are we now? (Current State Assessment)

Phase D: How will we get to where we want to be? (Bridge the Gap from A to C)

Phase E: (Ongoing): What may change in the future that will affect us? (Future Environmental Scan)

In Systems Thinking, we must start where analytic thinking would have us end up—at the outputs phase (Phase A). First ask, "Where do we want to be?"—then think and work backwards to create the desired future state. This is partly why some people refer to Systems Thinking as **backwards thinking** (not backward thinking!). When applied to problem-solving, the ABCs focus on desired results rather than just knee-jerk solutions to existing problems. Systems thinking works toward long-lasting solutions to reach your goals.

Each phase in the ABCs model leads to a particular question that guides our thinking and problem-solving. Let's take a closer look.

Phase E: Environmental Scan (Ongoing)

It is essential to remember that, while asking any other questions, we keep in mind this fifth, ongoing question: What is changing in the environment that we need to consider over the next x years?

Phase A: Outputs

This is the defining phase in the systems model, the outputs that result from the system's activity. It leads us to the crucial question: Where do we want to be in the future? In other words, What are our multiple desired outcomes, purposes or goals? (Don't limit yourself to just one!) We call this finding your Ideal Future Vision.

This is the number one question that systems thinkers ask when dealing with any situation or problem. It should always be asked in the context of the system's environment and other higher system levels. Without clarity and agreement on this question from the relevant parties, it is foolish to move beyond this phase. In his best-selling book *The Seven Habits of Highly Successful People*, Stephen Covey says, "**Begin with the end in mind.**" We love this advice.

Phase B: Feedback Loop

It is at this point in Systems Thinking that we start thinking backward to determine what must take place for our desired outcomes to occur. How will we know we have reached them? How will we know we have achieved the outcomes, purposes or goals?

This phase is where we decide our Key Success Measures (KSMs) to track our results, achievements and desired outcomes. We then feed that information back into the system. This phase also operates as a way to see if Phase A needs more work. For example, we may find the goals have been too broadly defined and need redefinition.

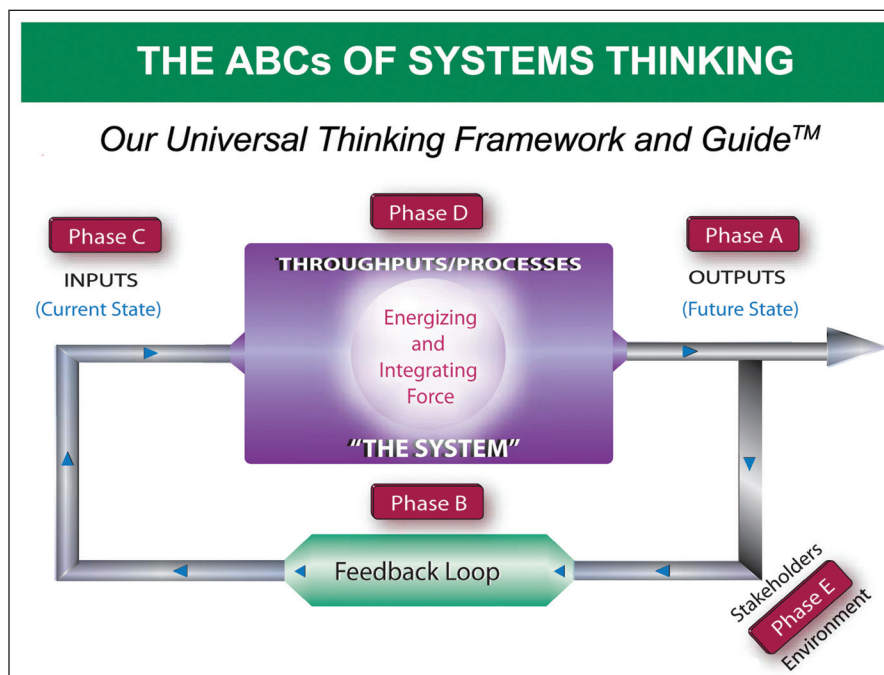
Phase C: Inputs

In this phase, we create strategies for closing the gap between what is happening right now and what we want to happen in the future (Phase A). It involves a Current State Assessment. We ask: Where are we right now? What are today's issues and problems, strengths and weaknesses?

Phase D: Throughputs

Now we look at the system and its interdependencies and ask: How do we close the gap from Phase A to Phase C in a complete and holistic way? With those interdependencies in mind, we focus on the strategies, processes, activities and relationships the system must implement in order to reach the desired outcomes. We also plan for the processes that must be developed and put into motion now.

Any set of requirements can be adapted to the ABCs as long as you use the same ABC locator phases in the proper order and include the environment. As a thinking framework and guide to life, the ABCs are applicable to virtually any situation you encounter.



FOUNDATIONAL RESEARCH #4: THE ICEBERG THEORY OF CHANGE

Your organization's required capacity for change to make your strategies win out over your culture is based on the Iceberg Theory of Change. Every situation in life has three related components and dynamics:

1. **Content**
2. **Processes**
3. **Structures**

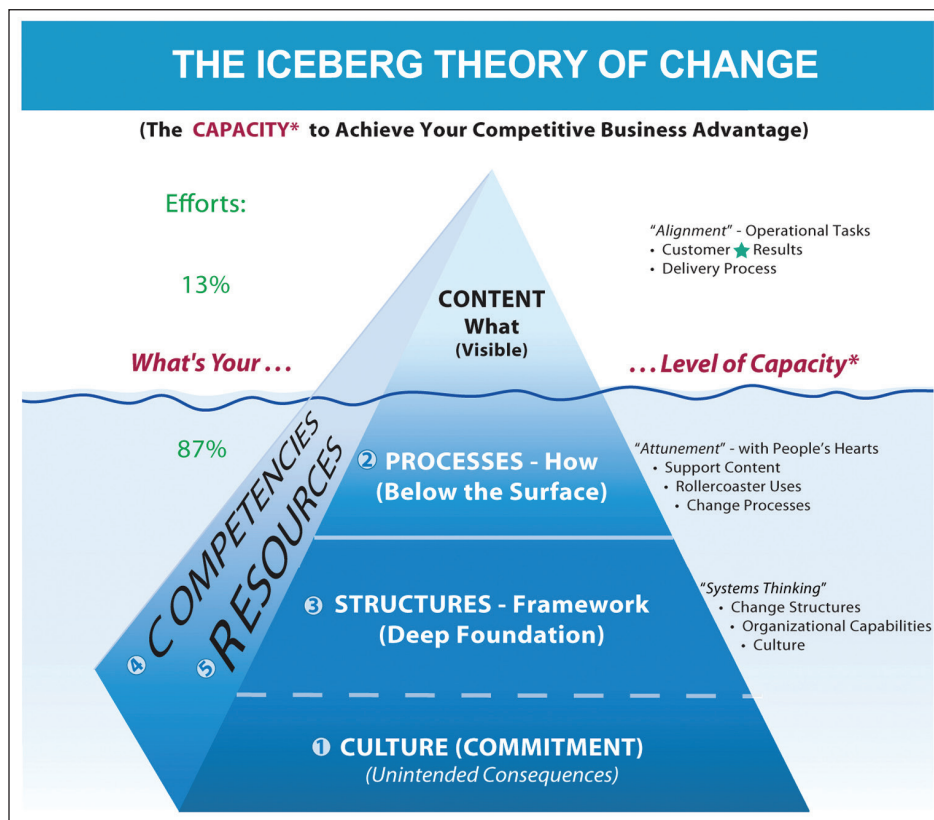
Whether or not you are aware of them, every situation you encounter in life has these three integrated dynamics occurring simultaneously and holistically. Most people take these for granted. You can ignore them to your peril or use them to your advantage. The choice is yours!

So what do we mean by content, processes and structures? A simple example to help clarify these terms is chewing gum. In this case, the content is the gum, the process is chewing and the structure is the mouth and body.

When facilitating a seminar or workshop on this concept, I usually ask the participants to define the terms themselves by answering a few questions about their current situation in the classroom. When I ask them to describe the content, they have no problem identifying that the content is the topic.

However, when I ask them to identify the structures, they often pause. The answer, which we uncover together, is twofold: there are physical structures, both large and small—such as the classroom, windows, projector, slides, etc.—and there are mindset structures—the concepts and models that we are trying to impart such as the ABCs, the 12 Natural Laws etc. Similarly, we identify the processes as talking, viewing slides, taking notes, dialoguing, holding subgroups, etc.

The important thing to remember about the relationship between these three terms is that the content and processes always work within infrastructures. So without the right structures, processes will fail to deliver the proper content and desired outcomes. When attempting any change, first focus on the context in which you are working. Engineer success up front!



Content Myopia

In large-scale change efforts, the failure to install the proper change structures to counteract the day-to-day organizational chart—which is the biggest resistor to change—always results in failure. This is especially true if any kind of culture change is required.

What sinks change efforts is the same thing that sinks ships: The "stuff" below the waterline that is not readily visible. In an iceberg, the "stuff" is the 87 percent of the iceberg below the waterline—the change processes and change structures that are not visible to the untrained eye. In organizations, it is the failure to understand and focus on the underlying change processes and change structures needed for successful change. The main focus is usually on the top 13 percent of the iceberg (the content) above the waterline. We call this failure to focus on these change processes and change structures below the waterline **Content Myopia**. Too often, managers are uncomfortable with change and emotions and keep the focus only on the content, thus guaranteeing its failure. Change is dependent on good processes and structures in order to achieve the content of the desired changes (what is visible above the surface).

Practitioners in Organization Development (OD) and many other professions may not understand that the Iceberg Theory of Change exists—including practitioners in fields such as Strategic Planning, Finance, Human Resources, Legal, Engineering, Information Technology, etc. This is why the research consensus shows that more than 75 percent of all major change fails to achieve its desired outcomes.

To avoid being a part of this majority, remember the following points:

1. Structures influence behaviors.
2. The Rollercoaster of Change™ is the process of change.

For more details on these applications of the Iceberg Theory of Change, see the companion article "Strategic Thinking: The Winning Formula," available on systemsthinkingpress.com.

BENEFITS OF SYSTEMS THINKING

Adopting The Systems Thinking Approach® has many benefits:

- A framework to think strategically and make sense of life's complexities, since all living things are systems.
- A way to learn new things more easily, as the basic rules stay the same from system to system.
- A higher order of strategic integration of new ideas within the systems context and dynamics.
- A clearer way to see, understand and assess what is going on in an organization or in any system. Complex problems become easier to understand as do the interrelationships and the multiple causes and effects.
- A new and better way to design solutions, create strategies, solve problems and keep goals in mind.
- The unveiling of new and higher points of leverage for strategic change that might otherwise be ignored.
- Teams and people who engage in deeper analysis and identify root problems that, when addressed, provide longer-lasting results and less negative byproducts.
- The identification and strategic resolution of issues requiring a deeper structure and obscure relationship improvement not obvious by the quick-fix mentality.
- The development of a common set of terminology or language to improve communications, teamwork, learning and results across the organization.
- A higher order of intellect and critical thinking.

SUMMARY

Remember, these four foundational research concepts are inter-related and must work together for the overall good of the whole system. Use these concepts in collaboration with each other to maximize success.

For specific applications of these research concepts, please see the companion article “Strategic Thinking: The Winning Formula,” available on systemsthinkingpress.com.

Good luck on your strategic journey. Contact us to help you begin!

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