

T O O L B O X R E P R I N T S E R I E S



# SYSTEMS ARCHETYPES I

*Diagnosing Systemic Issues and* ←  
*Designing High-Leverage Interventions*



➤ BY DANIEL H. KIM

# THE TOOLBOX REPRINT SERIES

**Systems Archetypes I: Diagnosing Systemic Issues and Designing High-Leverage Interventions**

**Systems Archetypes II: Using Systems Archetypes to Take Effective Action**

**Systems Archetypes III: Understanding Patterns of Behavior and Delay**

**Systems Thinking Tools: A User's Reference Guide**

**The "Thinking" in Systems Thinking: Seven Essential Skills**

**Systems Archetypes I: Diagnosing Systemic Issues and Designing High-Leverage Interventions**  
by **Daniel H. Kim**

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# I N T R O D U C T I O N

The significant problems we face cannot be solved at the same level of thinking we were at when we created them.”

—*Albert Einstein*

**W**e live in the world of events. Things happen and we respond—a machine breaks down, we buy a new machine; sales drop, we launch an ad campaign; profits fall, we lay off workers. Each event creates another event, in an endless stream of cause-and-effect relationships. At this level of understanding, all we can do is react to things that are happening *to* us.

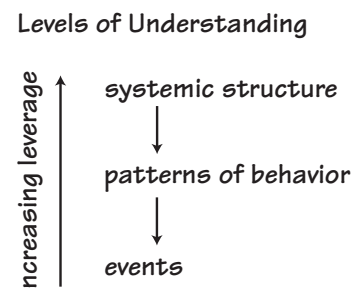
If we begin to see the world as patterns of behavior over time, we can anticipate problems (patterns of machine breakdowns, cycles of sales slumps, periodic profit squeezes) and accommodate them (schedule maintenance work, institutionalize ad cycles, sharpen cost-cutting skills). Managing at this level allows us to anticipate trends and accommodate them. At this level, we are still *responding* to events, but in a more proactive manner.

If we go deeper to the level of systemic structure, however, we can begin to see what *creates* the behaviors we observe, and then take actions to change the structures. This allows us to alter the source of a problem rather than just deal with the symptoms. The power of systems thinking comes from this focus on the level of systemic structure, where the greatest leverage lies for solving problems. The systems approach can help shed light on current problems by helping us reframe them from a fundamentally different perspective.

Systems thinking offers a range of tools for gaining deeper insight into problems—from simple pen-and-paper tools such as causal loop diagrams to more complex tools such as computer simulation models and designed learning environments (see “A Palette of Systems Thinking Tools” on page 4). Systems archetypes are one class of tools that capture the “common stories” in systems thinking—dynamic phenomena that occur repeatedly in diverse settings. They are powerful tools for diagnosing problems and identifying high-leverage interventions that will create fundamental change.

## HOW TO USE THE ARCHETYPES

The archetypes can be used as templates for diagnosing vexing long-term problems. “Systems Archetypes at a Glance” on page 6 gives you a quick overview of all the archetypes (except “Balancing Loops with Delays”). This will provide you with the archetype “templates” that you can use to identify similar dynamics occurring in your own organization. Often, an *event* that is seen as a problem symptom can be the starting point. This may lead you to trace out the *pattern of behavior* of similar events over a period of time. The archetype can then help you identify the *systemic structures* that are responsible. High-leverage interventions often become clear once the appropriate archetype is identified.





This reprint series, compiled from the *Toolbox* column of *THE SYSTEMS THINKER™* newsletter, is designed to help you better understand and apply the systems archetypes to your own business issues. Each two-page description leads you through an archetype and outlines how you can use it to better understand your own issues. On page 28 is an index listing the volume and issue numbers of the newsletter in which each archetype first appeared. If you wish to explore the archetypes in more depth, the original issue also contains either a *Systems Sleuth* or a *Systems Thinking in Action* column that shows the featured tool being applied to a real business problem. The archetypes in this booklet are organized in alphabetical order for easy reference. Feel free to use this booklet in any way that will be most helpful for gaining insight into a problem that you face. As with any new tool, the only way to get value out of it is to start using it, and the best way to improve is to use it often. . . .

Daniel H. Kim  
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P.S. We'd like to hear of your experiences as you apply the archetypes to your own business issues. Fax us at (781) 894-7175 or send a note to Pegasus Communications, One Moody Street, Waltham, MA 02453-5339.

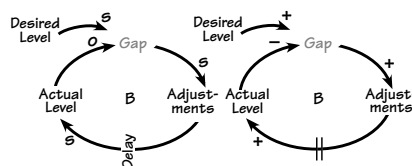
### ACKNOWLEDGMENTS

The systems archetypes included in this series have been developed over the years through the efforts of many system dynamics, including Peter Senge, Michael Goodman and Jennifer Kemeny of Innovation Associates, as well as John Sterman, Ernst Diehl, and Christian Kampmann of the MIT System Dynamics Group. The use of the term "archetype" was first coined by Peter Senge in *The Fifth Discipline: The Art and Practice of the Learning Organization* (Doubleday, 1990). *The Toolbox Reprint Series: Systems Archetypes* was compiled and edited by Kellie Wardman O'Reilly. Colleen P. Lannon provided editorial support for the original articles.

## THE LANGUAGE OF LINKS AND LOOPS

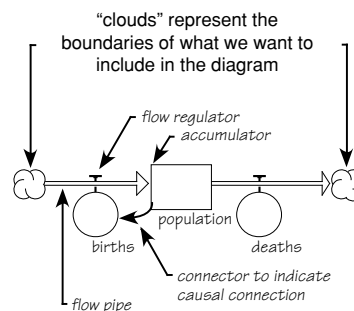
- <sup>s</sup> A causal link between two variables, where a change in X causes a change in Y in the same direction, or where X adds to Y.
- <sup>o</sup> A causal link between two variables, where a change in X causes a change in Y in the opposite direction, or where X subtracts from Y.
- R A "reinforcing" feedback loop that amplifies change.
- B A "balancing" feedback loop that seeks equilibrium.

### BALANCING LOOP EXAMPLE



If there is a gap between the desired level and the actual level, adjustments are made until the actual equals the desired level. The starting variable is grey.

### THE LANGUAGE OF ACCUMULATORS





## A PALETTE OF SYSTEMS THINKING TOOLS

**T**here is a full array of systems thinking tools that you can think of in the same way as a painter views colors—many shades can be created out of three primary colors, but having a full range of ready-made colors makes painting much easier.

There are at least 10 distinct types of systems thinking tools (a full-page summary diagram appears on the facing page). They fall under four broad categories: brainstorming tools, dynamic thinking tools, structural thinking tools, and computer-based tools. Although each of the tools is designed to stand alone, they also build upon one another and can be used in combination to achieve deeper insights into dynamic behavior.

### BRAINSTORMING TOOLS

*The Double-Q (QQ) Diagram* is based on what is commonly known as a fish-bone or cause-and-effect diagram. The Qs stand for *qualitative* and *quantitative*, and the technique is designed to help participants begin to see the whole system. During a structured brainstorming session with the QQ diagram, both sides of an issue remain equally visible and properly balanced, avoiding a “top-heavy” perspective. The diagram also provides a visual map of the key factors involved. Once those factors are pinpointed, Behavior Over Time Diagrams and/or Causal Loop Diagrams can be used to explore how they interact.

A QQ diagram begins with a heavy horizontal arrow that points to the issue being addressed. Major “hard” (quantitative) factors branch off along the top and “soft” (qualitative) factors run along the bottom. Arrows leading off of the major factors represent sub-

factors, which can in turn have *sub* sub-factors. Many layers of nesting, however, may be a sign that one of the sub-factors should be turned into a major factor.

### DYNAMIC THINKING TOOLS

*Behavior Over Time (BOT) Diagrams* are more than simple line projections—they capture the dynamic relationships among variables. For example, say we were trying to project the relationship between sales, inventory, and production. If sales jump 20 percent, production cannot jump instantaneously to the new sales number. In addition, inventory must drop below its previous level while production catches up with sales. By sketching out the behavior of different variables on the same graph, we can gain a more explicit understanding of how these variables interrelate.

*Causal Loop Diagrams (CLDs)* provide a useful way to represent dynamic interrelationships. CLDs make explicit one’s understanding of a system’s structure, provide a visual representation to help communicate that understanding, and capture complex systems in a succinct form. CLDs can be combined with BOTs to form structure-behavior pairs, which provide a rich framework for describing complex dynamic phenomena. CLDs are the systems thinker’s equivalent of the painter’s primary colors.

*System Archetypes* is the name given to certain common dynamics that seem to recur in many different settings. These archetypes, consisting of various combinations of balancing and reinforcing loops, are the systems thinker’s “paint-by-numbers” set—users can take real-world examples and fit them into

the appropriate archetype. They serve as a starting point from which one can build a clearer articulation of a business story or issue. Specific archetypes include: “Drifting Goals,” “Shifting the Burden,” “Limits to Success,” “Success to the Successful,” “Fixes That Fail,” “Tragedy of the Commons,” “Growth and Underinvestment,” and “Escalation” (see “Systems Archetypes at a Glance,” p. 6).

### STRUCTURAL THINKING TOOLS

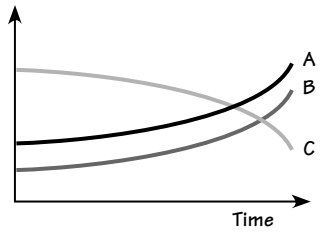
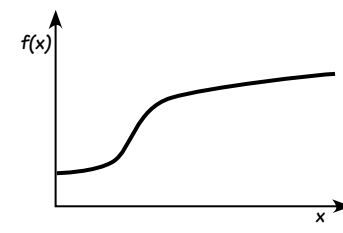
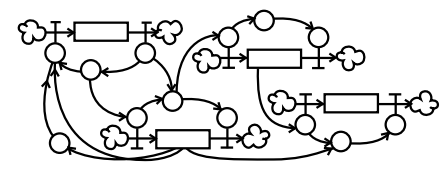
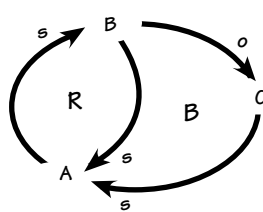
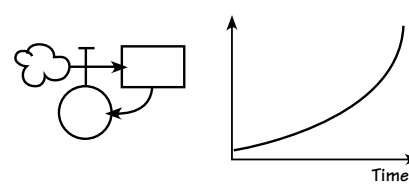
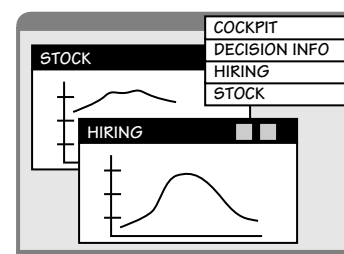
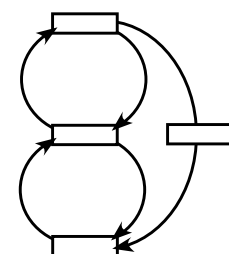
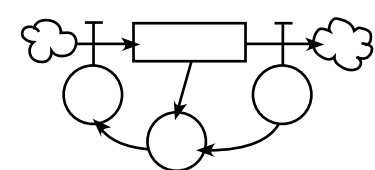
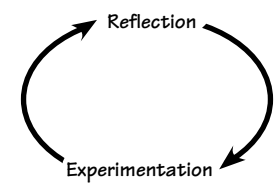
*Graphical Function Diagrams, Structure-Behavior Pairs, and Policy Structure Diagrams* can be viewed as the building blocks for computer models. Graphical Functions are useful for clarifying nonlinear relationships between variables. They are particularly helpful for quantifying the effects of variables that are difficult to measure, such as morale or time pressure. Structure-Behavior Pairs link a specific structure with its corresponding behavior. Policy Structure Diagrams represent the processes that drive policies. In a sense, when we use these tools we are moving from painting on canvas to sculpting three-dimensional figures.

### COMPUTER-BASED TOOLS

This class of tools, including computer models, management flight simulators, and learning laboratories, demands the highest level of technical proficiency to create. On the other hand, very little advance training is required to use them once they are developed. ■

*Systems Thinking Tools: A User’s Reference Guide, part of the Toolbox Reprint Series, is organized around this palette of systems thinking tools.*



DYNAMIC THINKING TOOLS	STRUCTURAL THINKING TOOLS	COMPUTER-BASED TOOLS
<p><b>Behavior Over Time Diagram</b></p>  <p>Can be used to graph the behavior of variables over time and gain insights into any interrelationships between them. (BOT diagrams are also known as reference mode diagrams.)</p>	<p><b>Graphical Function Diagram</b></p>  <p>Captures the way in which one variable affects another, by plotting the relationship between the two over the full range of relevant values.</p>	<p><b>Computer Model</b></p>  <p>Lets you translate all relationships identified as relevant into mathematical equations. You can then run policy analyses through multiple simulations.</p>
<p><b>Causal Loop Diagram</b></p>  <p>Used in conjunction with behavior over time diagrams, can help you identify reinforcing (R) and balancing (B) processes.</p>	<p><b>Structure-Behavior Pair</b></p>  <p>Consists of the basic dynamic structures that can serve as building blocks for developing computer models (for example, exponential growth, delays, smooths, S-shaped growth, oscillations, and so on).</p>	<p><b>Management Flight Simulator</b></p>  <p>Provides “flight training” for managers through the use of interactive computer games based on a computer model. Users can recognize long-term consequences of decisions by formulating strategies and making decisions based on those strategies.</p>
<p><b>Systems Archetype</b></p>  <p>Helps you recognize common system behavior patterns such as “Drifting Goals,” “Shifting the Burden,” “Limits to Growth,” “Fixes That Fail,” and so on—all the compelling, recurring “stories” of organizational dynamics.</p>	<p><b>Policy Structure Diagram</b></p>  <p>A conceptual map of the decision-making process embedded in the organization. Focuses on the factors that are weighed for each decision, and can be used to build a library of generic structures.</p>	<p><b>Learning Laboratory</b></p>  <p>A manager’s practice field. Is equivalent to a sports team’s experience, which blends active experimentation with reflection and discussion. Uses all the systems thinking tools, from behavior over time diagrams to MFSs.</p>



## SYSTEMS ARCHETYPES AT A GLANCE

ARCHETYPE	DESCRIPTION	GUIDELINES
<p><b>Drifting Goals</b></p>	<p>In a “Drifting Goals” archetype, a gap between the goal and current reality can be resolved by taking corrective action (B1) or lowering the goal (B2). The critical difference is that lowering the goal immediately closes the gap, whereas corrective actions usually take time. (See <i>Toolbox</i>, October 1990).</p>	<ul style="list-style-type: none"> <li>• Drifting performance figures are usually indicators that the “Drifting Goals” archetype is at work and that real corrective actions are not being taken.</li> <li>• A critical aspect of avoiding a potential “Drifting Goals” scenario is to determine what drives the setting of the goals.</li> <li>• Goals located outside the system will be less susceptible to drifting goals pressures.</li> </ul>
<p><b>Escalation</b></p>	<p>In the “Escalation” archetype, one party (A) takes actions that are perceived by the other as a threat. The other party (B) responds in a similar manner, increasing the threat to A and resulting in more threatening actions by A. The reinforcing loop is traced out by following the outline of the figure-8 produced by the two balancing loops. (See <i>Toolbox</i>, November 1991.)</p>	<p>To break and escalation structure, ask the following questions:</p> <ul style="list-style-type: none"> <li>• What is the relative measure that pits one party against the other and can you change it?</li> <li>• What are the significant delays in the system that may distort the true nature of the threat?</li> <li>• What are the deep-rooted assumptions that lie beneath the actions taken in response to the threat?</li> </ul>
<p><b>Fixes That Fail</b></p>	<p>In a “Fixes That Fail” situation, a problem symptom cries out for resolution. A solution is quickly implemented that alleviates the symptom (B1), but the unintended consequences of the “fix” exacerbate the problem (R1). Over time (right), the problem symptom returns to its previous level or becomes worse. (See <i>Toolbox</i>, November 1990).</p>	<ul style="list-style-type: none"> <li>• Breaking a “Fixes that Fail” cycle usually requires acknowledging that the fix is merely alleviating a symptom, and making a commitment to solve the real problem now.</li> <li>• A two-pronged attack of applying solution will help ensure that you don’t get caught in a perpetual cycle of solving yesterdays “solutions.”</li> </ul>
<p><b>Growth and Underinvestment</b></p>	<p>In a “Growth and Underinvestment” archetype, growth approaches a limit that can be eliminated or pushed into the future if capacity investments are made. Instead, performance standards are lowered to justify underinvestment, leading to lower performance which further justifies underinvestment. (See <i>Toolbox</i>, June/July 1992.)</p>	<ul style="list-style-type: none"> <li>• Dig into the assumptions which drive capacity investment decisions. If past performance dominates as a consideration, try to balance that perspective with a fresh look at demand and the factors that drive its growth.</li> <li>• If there is potential for growth, build capacity in anticipation of future demand.</li> </ul>





ARCHETYPE	DESCRIPTION	GUIDELINES
<p style="text-align: center;"><b>Limits to Success</b></p>	<p>In a “Limits of Success” scenario, continued efforts initially lead to improved performance. Over time, however, the system encounters a limit which causes the performance to slow down or even decline (B1), even as efforts continue to rise. (See <i>Toolbox</i>, December 1990/January 1991).</p>	<ul style="list-style-type: none"> <li>• The archetype is most helpful when it is used well in advance of any problems, to see how the cumulative effects of continued success might lead to future problems.</li> <li>• Use the archetype to explore questions such as What kinds of pressures are building up in the organization as a result of the growth?</li> <li>• Look for ways to relieve pressures or remove limits before an organizational gasket blows.</li> </ul>
<p style="text-align: center;"><b>Shifting the Burden/Addiction</b></p>	<p>In a “Shifting the Burden,” a problem is “solved” by applying a symptomatic solution (B1) which diverts attention away from more fundamental solutions (R1). (See <i>Toolbox</i>, September 1990). In an “Addiction” structure, a “Shifting the Burden” degrades into an addictive pattern in which the side-effect gets so entrenched that it overwhelms the original problem symptom. (See <i>Toolbox</i>, April 1992.)</p>	<ul style="list-style-type: none"> <li>• Problem symptoms are usually easier than the other elements of the structure.</li> <li>• If the side-effect has become the problem, you may be dealing with an “Addiction” structure.</li> <li>• Whether a solution is “symptomatic” or “fundamental” often depends on one’s perspective. Explore the problem from differing perspective in order to come to a more comprehensive understanding of what the fundamental solution may be.</li> </ul>
<p style="text-align: center;"><b>Success to the Successful</b></p>	<p>In a “Success to the Successful” archetype, if one person or group (A) is given more resources, it has a higher likelihood of succeeding than B (assuming they are equally capable). The initial success justifies devoting more resources, its success diminishes, further justifying more resource allocations to A (R2). See <i>Toolbox</i>, March 1992.)</p>	<ul style="list-style-type: none"> <li>• Look for reasons why the system was set up to create just one “winner.”</li> <li>• Chop off one half of the archetype by focusing efforts and resources on one group, rather than creating a “winner-take-all” competition.</li> <li>• Find ways to make teams collaborators rather than competitors.</li> <li>• Identify goals or objectives that define success at a level higher than the individual players A and B.</li> </ul>
<p style="text-align: center;"><b>Tragedy of the Commons</b></p>	<p>In “Tragedy of the Commons” structure, each person pursues actions which are individually beneficial (R1 and R2). If the amount of activity grows too large for the system to support, however, the “commons” becomes experiences diminishing benefits (B1 and B2). (See <i>Toolbox</i>, August 1991.)</p>	<ul style="list-style-type: none"> <li>• Effective solutions for “Tragedy of the Commons” scenario never lie at the individual level.</li> <li>• Ask questions such as: “What are the incentives for individuals to persist in their actions?” “Can the long-term collective loss be made more real and immediate to the individual actors?”</li> <li>• Find ways to reconcile short-term cumulative consequences. A governing body that is chartered with the sustainability of the resources limit can help.</li> </ul>



# ORGANIZATIONAL ADDICTIONS: BREAKING THE HABIT

**I**t's 6:00 A.M. on a Monday morning. The alarm clock blares, jolting you out of bed. You shuffle down to the kitchen and grab a cup of fresh coffee. A few gulps and . . . ahh. Your eyes start to open; the fog begins to clear.

10:30 A.M.—time for the weekly staff meeting. “I gotta have something to keep me awake through this one,” you think to yourself as you grab a cup of coffee and head into the conference room.

By 3:30 P.M. you start to feel that mid-afternoon energy low, so you head down toward the crowded coffee machine for another cup. “I really gotta cut down on this stuff,” you comment to the guy behind you in line. He nods. “I’m a five-cup-a-day guy,” he confesses. “I just can’t give it up.”

## ADDICTION

For most of us, the word “addiction” conjures up images of alcoholism and drug abuse or more “acceptable” habits such as coffee drinking—dependencies which are rooted in physical and neurological processes. It is not usually viewed as a social or organizational phenomena. But from a systemic perspective, addiction is a very generic structure that is quite prevalent in both social and organizational settings.

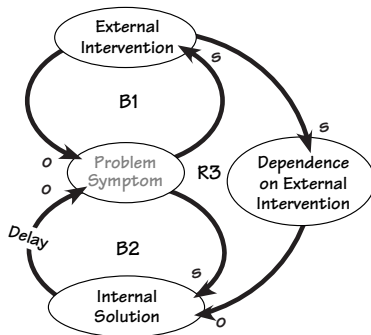
As a systemic structure, the “Addiction” archetype is a special case of “Shifting the Burden” (see “Shifting the Burden: The Helen Keller Loops,” p. 21). “Shifting the Burden” usually starts with a problem symptom that cries out for attention. The solution that is most obvious and easy to implement usually relieves the problem symptom very quickly. But the symp-

tomatic solution has a long-term side effect that diverts attention away from the more fundamental solution to the problem (see “Addiction”).

What makes the “Addiction” archetype special is the nature of the side-effect. In an “Addiction” structure, a “Shifting the Burden” situation degrades into an addictive pattern in which the side-effect gets so entrenched that it overwhelms the original problem symptom—the addiction becomes “the problem.”

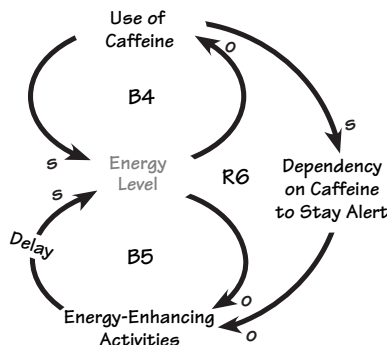
With coffee drinking, the problem symptom usually is that you feel tired (see “Caffeine Addiction”). When you drink a cup of coffee, the caffeine raises your metabolism, stimulating the body and making the mind more alert. But in doing this, it forces your body to deplete its reserves of energy faster than usual. When the effects of the caffeine wear off in a few hours, you have even less energy than before. You feel sluggish again and reach for another cup of coffee to get a jump start. Over time, your body begins to rely on the caffeine at regular intervals in order to regulate your energy and metabolism.

### ADDICTION



The “Addiction” archetype is a special case of “Shifting the Burden.” In both cases, a problem symptom is “solved” by applying a symptomatic solution (B1), but the solution has a side-effect which diverts attention away from the fundamental solution (R3). This side-effect—the dependence on an external intervention—eventually overwhelms the original problem.

### CAFFEINE ADDICTION



Low energy can be counteracted by more sleep or exercise—but that takes time (B5). A cup of coffee immediately restores energy (B4). But it also leads to a dependence on caffeine to stay alert, which takes attention away from long-term energy-booster (R6).

## ORGANIZATIONAL ADDICTIONS

In organizational settings, addiction can take the form of a dependence on certain policies, procedures, departments, or individuals. The way we think about problems, or the policies that we pursue, can become addictions when we use them without consideration or choice, as an automatic knee-jerk response to a particular situation.

## HOOKED ON HEROICS

A common yet very subtle example of



addiction in companies is “crisis management”—fire-fighting. Most managers say they abhor fire-fighting because it wreaks havoc on normal work processes and makes it difficult to focus on the long-term. Yet fire-fighting is a way of life in most companies. Its pervasiveness and persistence are clues that maybe it is part of an addictive structure.

Suppose you have a new product-development project that has fallen behind schedule. The timing of its release is critical to its market success. In fact, the delays have reached crisis proportions. You decide to make it a high-priority project and assign a “crisis manager” to do what it takes to get that product out on time. This new manager suddenly has enormous flexibility in what he can do to get the product out. When the product is launched on time, he is touted as the hero of the day.

If we look at crisis management from the “Addiction” archetype, the symptomatic problem is the prevalence of crises that occur in the company (see “Hooked on Heroics”). When a crisis occurs, someone practices great heroism and “saves the day.” The problem is solved and the person receives praise for doing a fine job. But what happens to the rest of the organization in the meantime? Oftentimes the solution causes a lot of disruptions that form the seeds of the next problems and perpetuate the crisis cycle.

The insidious side-effect of crisis management is that over time, as crisis management becomes the operating norm, managers begin to become dependent on the use of heroics—the need to have recognition and a feeling of accomplishment in an otherwise paralyzing institution. Usually there

are roadblocks to taking action in the company: formalities and rules that say “No, you can’t do this,” “You have to do it this way,” or “We don’t have the resources.” When there’s a crisis, people are suddenly given tremendous freedom and leeway and are allowed to do what they couldn’t do before. Once it’s over, there is tremendous fanfare: The hero is rewarded or promoted. Over time, the company becomes addicted to continually creating crises, pulling the organization through tremendous turmoil, and creating new heroes.

### BREAKING THE ADDICTION CYCLE

To identify “Addiction” dynamics at work, use the “Shifting the Burden” archetype as a diagnostic to ask questions such as: “What was the addiction responding to?” “Why did we feel a need to engage in this behavior or create this institution in the first place?” and “What are the problem symptoms that we were responding to?”

“Addiction” structures can be much more difficult to reverse than “Shifting the Burden” because they are more deeply ingrained. Just as you can’t cure alcoholism by simply removing the alcohol, you can’t attempt a frontal assault on an organizational addiction because it is so rooted in what else is going on in the company.

If your company is addicted to fire-fighting, declaring that there will be no more heroics may be the worst thing you can do. If heroics were the only way your organization knew how to release the accumulated pressures produced by ineffective processes, ending that practice may lead to an eventual explosion or systemic breakdown. To break the addictive pattern, you

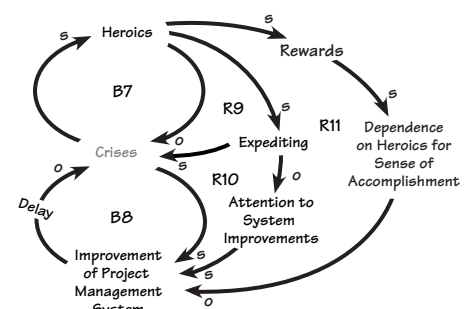
need to explore what it is about the organizational system that created the crisis and left fire-fighting as the only option.

### INNOVATION

Is there such a thing as a benign or innocuous addiction? One could argue that some addictions are worse than others, and some may not be bad at all. The fundamental problem with any addictive behavior, however, is that it can lead an organization to become very myopic. The addictive solution becomes so ingrained that no other possibility seems necessary. Preventing corporate addictions requires the ability to continually see choices in a fresh way—to shun habitual responses.

The challenge for organizations is to get all members to continually look at things with fresh eyes. That’s the essence of discovery . . . and the essence of innovation. ■

### HOOKED ON HEROICS



Crisis can be solved either through short-term “heroics” (B7) or long-term improvements in management systems (B8). “Crisis management” tactics such as expediting projects not only propagate more crises, but they also take attention away from fundamental system improvements (loops R9 and R10). Over time, managers can become “hooked” on heroics to give them a sense of accomplishment in an otherwise disempowering situation (R11).



## BALANCING LOOPS WITH DELAYS: TEETER-TOTTERING ON SEESAWS

**M**ost of us have played on a seesaw at one time or another and can recall the up-and-down motion as the momentum shifted from one end to the other. The more equal the weights of both people, the smoother the ride. At a very basic level, a free market economy is a lot like a seesaw with supply at one end and demand on the other. Prices indicate the imbalance between the two, like a needle positioned at the pivot point of the seesaw.

The goal of a seesaw ride is to always keep things in a state of imbalance (it would be pretty boring to sit on a perfectly balanced one). But the goal in the marketplace is exactly the opposite—to bring supply in balance with demand. Unfortunately, the supply and demand balancing process feels a lot more like a seesaw ride than a smooth adjustment to a stable equilibrium. As shown in “Supply and Demand,” the dynamics of this adjustment process are produced by two balancing loops that

try to stabilize on a particular price. But the process is complicated by the presence of significant delays.

side of the seesaw, an increase in price provides a profit incentive for firms to produce more. Of course, it takes time for firms to expand. The length of the delay depends on how close they already are to full capacity and how quickly they can add new capacity to produce more. Hiring new workers may take only a few days, while obtaining additional capital equipment or factory floor space may take months or even years. While firms are making supply adjustments, the gap between supply and demand widens and price goes even higher. The higher price spurs companies to increase their production plans even more.

As supply eventually expands and catches up with demand, price begins to fall. By this time, firms have over-expanded their production capacity and supply overshoots demand, causing price to fall. When the price falls low enough, the product becomes more attractive again and demand picks up—starting the cycle all over again.

### BALANCING SUPPLY AND DEMAND

Tracing through the loops, you can see that if demand rises, price tends to go up (all else remaining the same), and as price goes up, demand tends to go down. If there is enough inventory or capacity in the system to absorb the increased demand, prices may not go up immediately. As demand outstrips supply, however, price will rise.

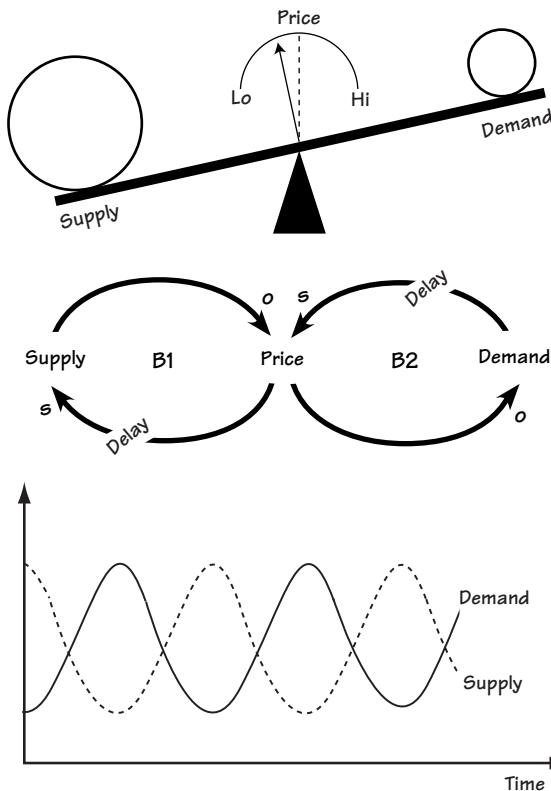
On the supply

### AIRPLANES ON SEESAWS

The supply-and-demand seesaw is played out in all but the most tightly regulated markets. A good example of this balancing act was described in a *Forbes* article titled “Fasten Seat Belts, Please” (April 2, 1990), about airplane leasing companies.

Leasing companies, which account for roughly 20 percent of all commercial jet aircraft currently on order, enjoy enormous profits during booms in air travel. One carrier alone once put in an order to lease 500 planes. Based on leasing and buying rates in the industry, the total number of air-

### SUPPLY AND DEMAND



A free market economy is a lot like a seesaw with supply at one end and demand on the other. The dynamics that result from trying to balance supply and demand are produced by two balancing loops that try to stabilize on a particular price. Due to presence of significant delays, a cycle of overshoot and collapse occurs.



planes was expected to increase by 50 percent between 1990 and 1995. But in the meantime, air-traffic growth slowed in the late 1980s. The leasing companies, however, did not seem too worried.

According to the article, “Eight years of unbroken prosperity have created the illusion that many cyclical businesses aren’t cyclical any longer.” But, as one airline executive warned, “This is a cyclical business. Always has been, always will be. With a small change in load factor, the airlines can go from spilling cash to bleeding red ink like the Mississippi River going through the delta.”

If you draw out a causal loop diagram of this industry, you see the same supply-and-demand structure at work. An increase in air-traffic growth fueled a strong demand for airplanes. That in turn sparked an increase in airplane lease rates as airlines scrambled for additional airplanes. The high lease rates led to increased profits and a surge in airplane orders. Since airplanes take many months to build, the supply of leasable airplanes did not adjust right away, making lease rates go even higher. This led to higher profits, which attracted more capital, which was then plowed into even

more orders for airplanes.

As the supply caught up to demand, however, the airplane lease rates fell (the slowing of air-traffic growth accelerated this process). With so many airplanes in the pipeline, the supply began to outstrip demand and drive lease rates down even further. This put a squeeze on profits and forced marginal firms out of business. Some orders were canceled; others were renegotiated.

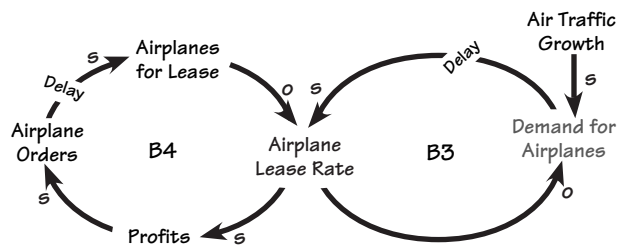
All the pieces of the airline leasing industry seemed to be operating within a seesaw structure. Although the extended period of air-traffic growth kept demand ahead of supply for several years, it did not change the

nature of the delays in the supply line. Whenever supply adjustments bring the seesaw back down, airline leasing companies face a potentially bumpy landing.

### SIMPLE AND COMPLEX

The balancing loop with delay structure is at once simple and complex: simple, because it seems to be an innocuous single-loop structure that is easy to comprehend; complex because the resulting behavior is neither simple nor easily predictable. The delays in a typical system are rarely consistent or well known in advance, and the cumulative effects are usually beyond the control of any one person or firm. ■

#### AIRPLANE LEASING INDUSTRY



A causal loop diagram of the airplane leasing industry shows the same seesaw structure at work.





## “DRIFTING GOALS”: THE “BOILED FROG” SYNDROME

**I**t’s becoming an old story in the systems thinking field: If you drop a frog into a pot of boiling water, he will immediately hop out and save himself. But, if you put him in a pot of lukewarm water and slowly turn up the heat, something different happens. The frog swims around contentedly for a while, even enjoying the balmy water. As the temperature rises, however, he becomes more groggy and lethargic until, finally, he dies.

The frog may not have known it, but he was a victim of a drifting goals scenario. “Drifting Goals” is a structure that leads to poorer and poorer performance and/or lower and lower expectations (or in the frog’s case, higher and higher temperature). In a company setting, this structure may take the form of slipped delivery schedules, where a once-intolerable eight-week delivery delay becomes the accepted goal; or lower quality standards, as everyone focuses on decreasing

backlogs and delivery delays by just getting the product “out the door.”

Making adjustments to initial goals is not inherently wrong. Sticking to the original goal purely for its own sake is as misdirected as changing the goal at every whim. But distinguishing between legitimate goal adjustments and the “Drifting Goals” structure can be very difficult—it is easy to rationalize adjustments as “needed corrections.”

### THE BOILED FROG STRUCTURE

The archetype works in the following manner (see “Drifting Goals” Template” diagram). There is a certain goal—implicit or explicit—which is compared to the current state of affairs. If a gap persists, corrective actions are taken to improve the current state and bring it in line with the goal. This forms the basic balancing loop (B1) at the heart of any system that strives for equilibrium. A delay between corrective action and actual state represents the fact that results may take from minutes to years to materialize, depending on the specific situation.

Of course, there is more than one way to close the gap. In the “Drifting Goals” archetype, a second balancing loop is driven by pressure to lower the goal. As the gap increases (or persists over a period of time), the pressure to lower the goal increases. If the pressure is high and persistent, the goal may be lowered, thereby decreasing the gap (loop B2). The critical difference between the two loops is that lowering the goal immediately closes the gap, whereas corrective actions

usually take time.

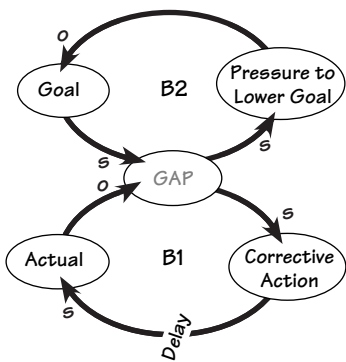
In the frog’s case, the goal is a desired body temperature. If the gap between this desired temperature and the water temperature is large, the frog will immediately take a corrective action and jump out of the water. But, if the temperature increases gradually, the gap between his ideal temperature and the water temperature widens slowly. As this happens, the frog’s perceived desired temperature may gradually drift higher. This closes the gap between desired and actual temperature, negating the need to take corrective action until it is too late.

The reason drifting goals is labeled the “boiled frog” syndrome is that goals, like the frog’s ideal temperature, tend to drift slowly and usually go unnoticed. Similar to the frog that doesn’t recognize a gradual rise in temperature, organizations are often unalarmed by deteriorating performance if it occurs over a long period of time.

### BUDGET DEFICITS, DRIFTING GOALS

The federal budget deficit is a good example of the “Drifting Goals” archetype at work (see “Budget Deficit”). If there is a gap between the previously stated acceptable deficit level and the actual deficit, it can be closed by either reducing government spending (B3) or increasing tax revenues (B4). Bipartisan compromises, however, have usually resulted in increased government spending, mixed results in terms of taxes, and, consequently, higher deficits. The rising deficits create an intolerable gap between the actual and stated maximum acceptable deficit, generating

#### “DRIFTING GOALS” TEMPLATE



In a “Drifting Goals” archetype, a gap between the goal and current reality can be resolved by taking corrective action (B1) or lowering the goal (B2).



pressure to raise deficit targets, and eventually resulting in higher maximum acceptable deficits (B5).

The Gramm-Rudman-Hollings bill (GRH) was once seen as the answer to a growing budget deficit in the U.S. By making deficit reductions a law, it was intended to force bipartisan cooperation to eliminate deficit spending. If GRH target numbers are not met, mandatory cuts go into effect, indiscriminately cutting billions of dollars from federal government programs and services. The GRH targets were meant to set a standard that lay outside of the current deficit-reinforcing system—a standard that would not succumb to the internal pressures.

In an article in *Barron's* magazine (“Rudman on Gramm-Rudman,” July 16, 1990), Senator Rudman reacted to pressures to lower the goal by suggesting that GRH targets may be changed as “long as they are accompanied by a major deficit reduction.” Rudman’s new proposal aimed to reintroduce GRH targets into the very drifting goals archetype it was intended to change (B6).

### USING THE ARCHETYPE

Drifting performance figures usually are a quick clue that this dynamic is occurring and that real corrective actions necessary to meet the targets are not being taken. It may also mean current targets are being set more by past levels of performance than by some absolute standard (zero defects) or by something outside of the system (customer requirements).

The flipside is also true: a steady pattern of improvement can mean that

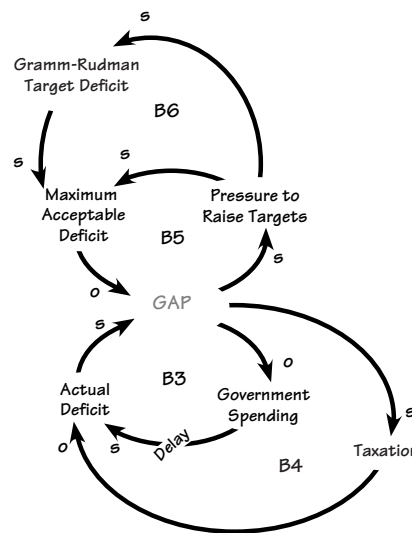
the goal is continually being adjusted upwards. Total Quality (TQ), Kaizen, and other continuous improvement efforts are examples of the “Drifting Goals” structure being used in a positive manner to drive goals higher.

The “Quality Improvement” diagram provides a useful framework for applying the “Drifting Goals” structure to other organizational issues. The lower loop (B7) represents improvements, while the upper loop (B8) represents ever-present pressures to lower the goal. TQ works well, in part, due to the reinforcing loop (R9): improvements in quality lead to higher customer expectations, raising the quality goal and increasing the gap. In a company committed to TQ,

this gap leads to further quality improvements.

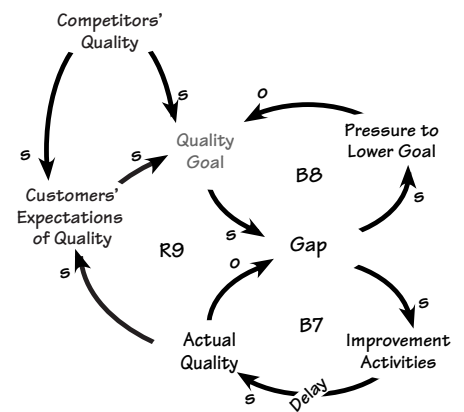
A critical aspect of evaluating a “Drifting Goals” scenario in an organization is to determine what drives the setting of the goal(s). In the “Quality Improvement” diagram, the Quality Goal can be affected by competitors’ quality, by customers’ expectations of quality, or by internal pressures. The relative strength of each potential influence will determine whether the quality will drift up, down, or oscillate. Goals located outside the system, like the original GRH targets, will be less susceptible to drifting goals pressures. ■

### BUDGET DEFICIT



Rudman’s proposal aimed to reintroduce GRH targets into the very drifting goals situation it was intended to change (B6).

### QUALITY IMPROVEMENT



In a quality improvement scenario, the quality goal can be affected by competitors’ quality, customers’ expectations of quality, or internal pressures.



## “ESCALATION”: THE DYNAMICS OF INSECURITY

**H**ave you ever been caught in a situation where you felt that things were going well beyond what you intended, but you felt powerless to stop it? As a child, perhaps, in the playground at school—a classmate makes a snide comment, and you counter with a sharp retort. The next round of insults gets uglier and louder. You each stick your neck out further and further with every remark. Classmates gather around and egg on the escalation of hostilities. Pretty soon, you are so far out on a limb that there is little else left to do but succumb to the chanting that has begun all around you—“Fight! Fight! Fight!”

### THE DYNAMICS OF INSECURITY

At the heart of an escalation dynamic are two (or more) parties, each of whom feels threatened by the actions of the other (see “Escalation’ Archetype and Price Wars”). Each side attempts to keep things under control by managing its own balancing process. Actions taken by A, for example, improve A’s result relative to B. This decreases A’s feeling of threat, so A eases off its activities (B1). B, on the other hand, now feels threatened by A’s relative advantage and increases its activities in order to improve its result over A (B2). The interaction of the

two parties trying to unilaterally maintain control produces a reinforcing spiral in which nobody feels in control.

In school, a few harsh words can quickly lead to a playground brawl. In a more deadly confrontation, the escalation structure can lead to catastrophic consequences. The Cuban Missile Crisis in October of 1962, for example, caught U.S. president Kennedy and Soviet chairman Khrushchev in an escalation structure that led their countries to

the brink of nuclear war.

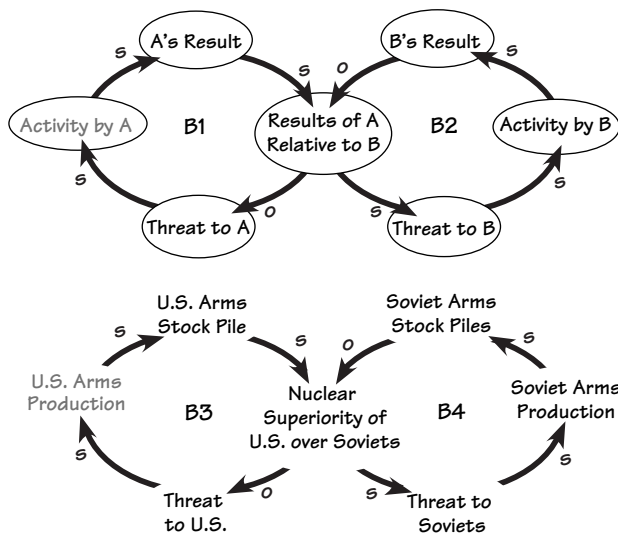
The crisis began with the discovery of offensive nuclear weapons being constructed in Cuba—contrary to repeated public assurances by the Soviet chairman. The U.S. called for complete dismantling and withdrawal of the missiles. The Soviets first denied the existence of any such missiles. Then they acknowledged the missiles but refused to remove them, claiming they were defensive. Kennedy responded by ordering a naval blockade around Cuba to prevent more missiles from being shipped. Tensions ran high. The Soviets pressed for accelerated construction of the missiles already in Cuba. The United States massed over 200,000 troops in Florida to prepare for an invasion.

When a United States U2 reconnaissance plane was shot down over Cuba, Kennedy’s advisors unani- mously proposed launching a retaliatory strike. But Kennedy stopped short. “It isn’t the first step that concerns me,” he said, “but both sides escalating to the fourth and fifth step. And we won’t go to the sixth because there [will be] no one around to do so.” Had Kennedy not broken the escalation structure at that juncture, the forces unleashed might have been beyond anyone’s control to stop.

### DE-ESCALATION

The Cuban missile crisis was one incident in a larger dynamic—the Cold War. Although that particular crisis was resolved, it did nothing to defuse the mutual distrust between the two countries, so the arms race continued. The balance of power shifted over

### “ESCALATION” ARCHETYPE AND PRICE WARS



In the “Escalation” archetype (top), one party takes actions that are perceived by the other as a threat. The other party responds in a like manner, increasing the threat to the first party, resulting in more threatening actions by the first party. The reinforcing loop is traced out by following the outline of the figure-8 produced by the balancing loops. In the case of the U.S./ Soviet arms race (bottom), each country felt threatened by the arms stockpile of the other, leading to massive buildups in both countries.



time as each side built more arms in response to a perceived threat from the other. Yet, the very act of building arms to “balance” the situation only led to further threat, which strengthened the other side’s “need” for even more arms.

It takes two to have an arms race, but only one to stop it. Unilateral action can break the escalation dynamic by robbing it of its legitimacy. If one side stops building arms, the source of threat diminishes, giving the other side less reason to invest in more arms. The escalation can then run in reverse. A later newspaper headline, “Gorbachev escalates arms cuts,” showed how the arms race was then being driven rapidly in reverse.

### WARS ON MANY FRONTS

Escalation dynamics, because they thrive in a competitive environment, are pervasive in business. The common logic is that whenever your competitor gains, you lose (and vice-versa). That logic leads to all kinds of “wars”—through pricing, advertising, rebates and promotions, salary and benefits, labor and management, divisions, marketing vs. manufacturing departments, and so on.

At the core of each of these wars is a set of relative measures that pits one group against another in a zero-sum game. In a typical price war, for example, company A wants to “buy” market share by cutting its price (see “Price Wars”). As A’s sales and market share increase, B’s market share decreases. B retaliates by slashing its prices, generating more sales for B at the expense of A’s sales. In the short run, consumers may benefit from low

prices. But in the long term, everyone may lose, since depressed prices mean less ability to invest in new product development, customer service, and overall attractiveness for the next round of competition.

Reversing or stopping such price wars is difficult. As competitors, A and B cannot collude to set prices. Nor is either company likely to stop unilaterally, since in the absence of other distinguishing features, the market usually favors the product with the lower price. In the heat of battle, a company can easily get locked into one competitive variable, such as price, and neglect to emphasize other strengths. Texas Instruments learned that lesson the hard way. Even though Texas Instruments had a superior technical product, it had to write off its entire personal computer business (the TI99/4A) as a result of a vicious price war with Commodore.

### INSECURITY

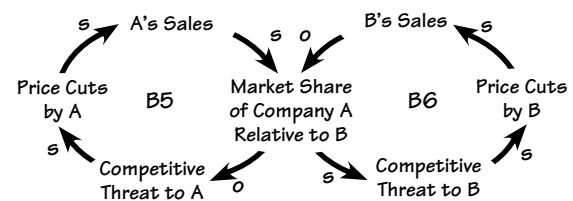
As the term “threat” suggests, the escalation archetype is about insecurity. In our playground example, the name-calling threatens our reputation and makes us insecure about our identity. The Cuban Missile Crisis and the arms race threatened the national security of both adversaries. Engaging in a price war reveals each company’s insecurity about its ability to hold on to customers on a basis other than price.

If you find yourself

caught in an escalation dynamic, drawing out the archetype can help you gain some perspective. The following questions are useful for identifying escalation structures. With advance knowledge, you can design strategies around them or use them to your advantage:

- Who are the parties whose actions are perceived as threats?
- What is being threatened, and what is the source of that threat?
- What is the relative measure that pits one party against the other—and can you change it?
- What are the significant delays in the system that may distort the true nature of the threat?
- Can you identify a larger goal that will encompass the individual goals?
- What are the deep-rooted assumptions that lie beneath the actions taken in response to the threat? ■

## PRICE WARS



In a price war, company A slashes its price in order to gain market share (B5). This poses a threat to company B, who then retaliates by cutting its price (B6). The result is a zero-sum game for all involved: companies will have less revenue to invest in new products and customer service, and customers will ultimately feel the effects of those cutbacks.



## “FIXES THAT FAIL”: OILING THE SQUEAKY WHEEL—AGAIN AND AGAIN...

**H**ow many times have you heard the saying, “The squeaky wheel gets the oil”? Most people agree that whoever or whatever makes the most “noise” grabs our attention and will presumably be attended to first. The problem with following this adage is that it leads to operating in a reactive mode, continually “fighting fires” rather than making fundamental improvements.

To make matters worse, in our haste to grab the “oil,” we often mistakenly pick up a can of water and splash it on the squeaky wheel. The squeaking stops momentarily, only to return more loudly as the air and water join forces to rust the joint. We can stay very busy running about splashing water on all the squeaky wheels. But when there are finally no more squeaks, we may discover that instead of having fixed all the problems, we

have encased the wheels in rust.

### BETTER BEFORE WORSE

In our search for a quick fix, we often rush into “solutions” without taking the time to understand the full impact of our actions. One of the tricky things about systems is that they usually point our attention toward short-term fixes and away from fundamental solutions.

In a typical “Fixes That Fail” situation (see “Fixes That Fail” Template”), a problem symptom cries out (squeaks) for resolution. A solution is quickly implemented that alleviates the symptom (B1). The relief is usually temporary, however, and the symptom returns, often worse than before. This happens because there are unintended consequences of the solution that unfold over a long period of time (R2) or as an accumulated conse-

quence of repeatedly applying the solution.

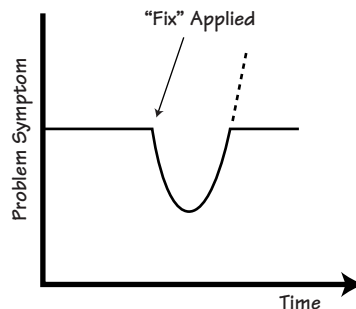
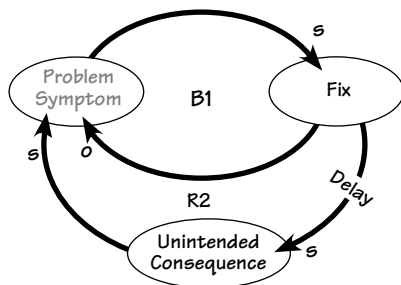
In the case of the squeaky wheel, the noise attracts our attention and we grab the nearest (easiest, most available, previously used, organizationally accepted, etc.) “fix” we can get our hands on and apply it. In the short term, even water will act as a lubricant and stop the squeaking. If we do not know anything about oxidation, we might assume that the water did, in fact, solve the squeaking problem. As the water evaporates and the metal oxidizes, however, the wheel begins to squeak again. So we reach for the water again, since it worked the last time.

Of course we all know that oil or grease, not water, should be used to lubricate a squeaky wheel. But suppose the squeaky wheel is a customer screaming for a product that is two weeks late. How do we know whether we are applying the oil or the water when we respond? Do we understand enough about this situation’s “chemical reaction” to take appropriate actions? Or, in our frenzy of fighting fires and oiling squeaky wheels, are we throwing oil on fires and applying water to the wheels?

### EXPEDITING CUSTOMER ORDERS

Expediting customer orders, a common practice in many manufacturing firms, illustrates the “Fixes That Fail” archetype. A large semiconductor manufacturer, for example, is experiencing some production problems and is running behind schedule on some

### “FIXES THAT FAIL” TEMPLATE



In a typical “Fixes That Fail” situation, a problem symptom cries out for resolution. A solution is quickly implemented that alleviates the symptom (B1), but the unintended consequences of the “fix” exacerbate the problem (R2). Over time (right), the problem symptom returns to its previous level or becomes worse (dotted line).

shipments. They know if their customers do not receive their orders on time, the customers literally will have to shut down their production lines until they receive the chips. So what happens?

Company A calls and demands that its chips be delivered immediately. The semiconductor company responds by assigning an expeditor to track down A's order and push it through the line (see "Expediting Customer Orders"). Of course it's not simply a matter of finding one item and escorting it to the loading docks. The company produces over a hundred different kinds of integrated circuits, and Company A has many different types on order. What's worse, the production steps from silicon wafers to final packaged circuits can number 50 or more. Finding and expediting A's order may mean wading through the entire factory and causing disruptions throughout the production line. Finally Company A's order is rushed through, resulting in a satisfied customer (B3).

But no sooner has A's order left the warehouse when company B calls demanding to receive *its* orders immediately—and the process begins all over again. At the same time, somebody else is expediting for company C. The squeaky wheels are getting oiled, but the number of squeaking wheels is rapidly increasing. As a result, the production line is continually being disrupted—leading to more missed delivery dates and more customer calls (R4).

### NEW PRODUCT RELEASES

Similarly, in a consumer electronics company, when one new product-

development project is in danger of missing its release date, resources are often diverted from other projects to give it a final "push." The product is released, but at a much higher cost. And as a result of all the shifting around, all the other neglected projects are more likely to need the same extra "push" in order to be finished on time.

In both the semiconductor company and the electronics company, the quickest solution was to attend to each crisis as it happened. The specific problems were resolved, but at a high price—a guarantee of more problems in the future.

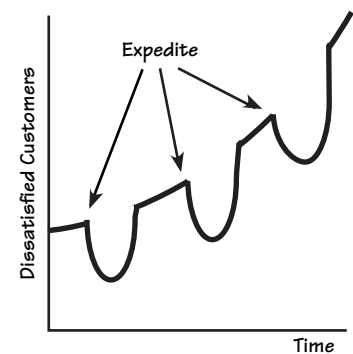
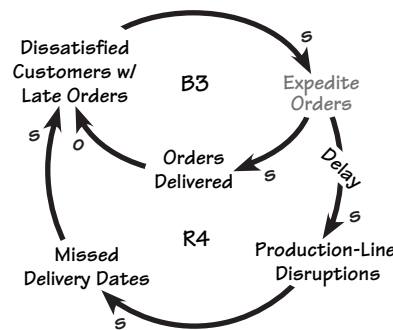
### USING THE ARCHETYPE

In most instances of "Fixes That Fail," people are usually aware of the negative consequences of applying a quick fix. But the pain of not doing something right away is often more real and immediate than the delayed nega-

tive effects. If the long-term/short-term trade-off were indeed one-for-one, where solving one problem today would create another one tomorrow, this strategy might be tolerable. But the reinforcing nature of unintended consequences ensures that tomorrow's problems will multiply faster than today's solutions.

Breaking the "Fixes That Fail" cycle usually requires two actions: acknowledging up front that the fix is merely alleviating a symptom, and making a commitment to solve the real problem *now*. Launching a two-pronged attack of applying the fix and planning out the fundamental solution will help ensure that you don't get caught in a perpetual cycle of solving yesterday's "solutions." ■

## EXPEDITING CUSTOMER ORDERS



Expediting a late order ensures that the order will be processed immediately, reducing the number of dissatisfied customers (B3). But the product line disruptions that can result will lead to more missed delivery dates and, ultimately, more unhappy customers (R4).



# “GROWTH AND UNDERINVESTMENT”: IS YOUR COMPANY PLAYING WITH A WOODEN RACKET?

**D**o you recall the first time you picked up a tennis racket? Perhaps it was an old wooden racket you found in your garage, or one a friend had outgrown. You weren't really sure you had it “in you” to play—you didn't even know if you would like the sport. But you tried playing a couple of games a week with the beat-up racket, picking up some of the basic moves and even sustaining a volley for a few rounds. After a month or so, however, you couldn't seem to improve your play beyond a certain level.

If you were a little bit better, you might have been willing to invest in a new high-performance racket. But you decide that tennis is really not for you. Besides, another friend has just given you a pair of ski boots. They're a little beat up and a bit tight at the toes,

but then again you don't know whether you'll like skiing. . . .

## GROWTH AND UNDERINVESTMENT

The above scenario is an example of the “Growth and Underinvestment” archetype at work. At its core is a reinforcing loop that drives the growth of a performance indicator and a balancing force which opposes that growth (R1 and B2 in “Growth and Underinvestment” Archetype”). An additional loop (B3) links performance to capacity investments, and shows how deteriorating performance can justify underinvesting in capacity needed to lift the limit to growth. This propensity to underinvest in the face of growth makes “Growth and Underinvestment” a special case of the “Limits to Success” archetype (see p. 20).

tim to this archetype. Without investing in better equipment, your performance will likely plateau—or even decline as you become frustrated and spend less time practicing. The result then justifies your decision not to invest in a new racket.

## LEGACY OF THE PAST

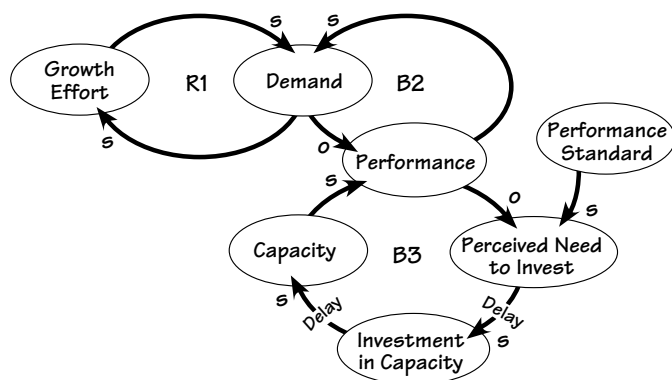
Often in a “Growth and Underinvestment” situation, ghosts of past failures remain as a systemic legacy, influencing current decisions. A classic example is the story of a capital equipment manufacturer. The company's CEO had seen an industry downturn in which the company had been saddled with too much capacity, so he was cautious about expanding. The company's product was selling well, however, and a backlog began to pile up—three months' worth of orders, then four, then five. The CEO continued to believe that it was just a temporary spurt. When the backlog grew to six months, he finally agreed to expand production capacity.

In the tennis example, the reinforcing process is practice, which improves performance (R4 in “Practice Makes Perfect?”). Improvement slows, however, as you reach the point at which the equipment limits your ability (B5). If your decision to purchase better equipment is dependent on your past performance, you may fall vic-

It took about a year and a half for the additional capacity to come on-line. In the meantime, demand trailed off as people found alternative sources. The company gradually worked off the backlog, and orders started to pick up again. After a couple of years they were in a similar backlog, but the CEO was even more reluctant to invest in new capacity because of what appeared to be a continual cycle of growing and falling demand.

The “Growth and Underinvestment” archetype reveals that the company's slow response may actually

### “GROWTH AND UNDERINVESTMENT” ARCHETYPE



“Growth and Underinvestment” has at its core a “Limits to Success” archetype (R1 and B2). The additional loop (B3) shows how deteriorating performance can justify underinvesting in the very capacity that is needed to forestall the limit to growth.

have created the cyclical demand. The reinforcing action of marketing activities, coupled with the balancing action of delivery delays, trace out a “Limits to Success” archetype in which the limit is production capacity (R7 and B8 in “Capacity Delays and Underinvestment”). As performance declined relative to performance standards, the perceived need to invest increased, until investments were finally made (B9).

Because of the delay in capacity coming on-line, however, delivery performance continued to decline for a while, hurting new orders. In the meantime, deliveries began to increase and the company crawled out of backlog. This led the CEO once again to question the need to invest in capacity, making him even more conservative the next time they were in a backlog situation.

## DOWNWARD SPIRAL

If this dynamic continues through many cycles, customers are not likely to keep coming back. The result may be a downward spiral of cutting back on investments: The two balancing loops lock into a figure-8 dynamic in which the effects of the reinforcing loop no longer have much impact on growth, while the combined balancing loops create a counter-reinforcing process of continual cutbacks. As demand goes down, delivery performance goes back up, creating less need for capacity investments. If capacity dips below the level needed to service incoming orders, performance will go down again, reducing demand even further. Perceived need to invest will decrease, so investments will drop, leading to even less capacity over time (as older equipment depreciates or is taken off-line). Thankfully, the reverse situation

can also be true: The two balancing loops can trace out a reinforcing loop that continues to expand demand and performance.

## BREAKING THE CYCLE

To determine whether a “Growth and Underinvestment” structure is at work, start by looking for patterns of oscillations in customer demand. If you overlay that with capacity investments and find that they follow the same pattern, you’re probably in a “Growth and Underinvestment” situation.

If a company waits until it receives signals from the marketplace to invest in capacity, it may be too late to prevent some fall-off in demand that will result because of the delay between investment decisions and capacity coming on-line. The key is to develop a way of assessing capacity needs relative to demands before the performance indicator starts to suffer.

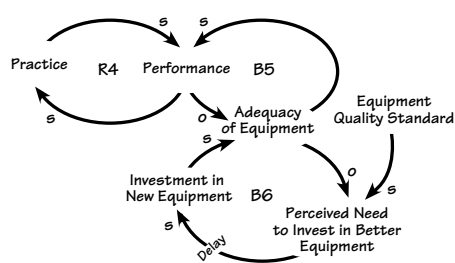
Take some time early in the

growth phase to determine what the limits may be, especially with respect to capacity. Studying the market response and characteristics of your target customers during an upswing can help you anticipate future capacity needs.

Also make sure internal systems are set up to deal with growth: If you have an aggressive growth strategy but a sluggish internal system for responding to performance shortfalls, then you might have created a structural inability to handle continued growth.

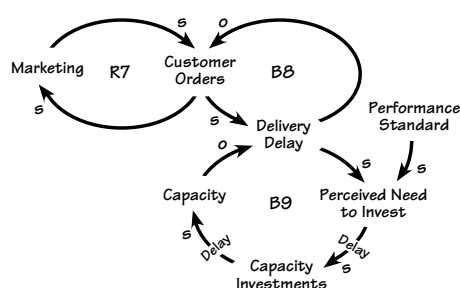
Most important, explore the assumptions driving your capacity investment decisions. Past performance may be a consideration, but it should not dominate your decisions. Instead, identify the marketplace factors that are driving growth. Otherwise you may end up with investment decisions that are too dependent on past experience and not enough on present (and future) needs. ■

## PRACTICE MAKES PERFECT?



In any sport, practice improves performance (R4). But performance is also affected by the adequacy of equipment (B5). If performance is not improving or actually decreases, the perceived need to invest in new equipment also decreases, leading to underinvestment which further affects performance (B6).

## CAPACITY DELAYS AND UNDERINVESTMENT



Marketing efforts produce more customer orders (R7)—but increasing demand also causes a longer delivery delay (B8). As the delay increases, the company realizes its need for capacity investment. However, delays in implementation further lengthen the delivery delay (B9) and in the end, affect future customer orders.





# “LIMITS TO SUCCESS”: WHEN THE “BEST OF TIMES” BECOMES THE “WORST OF TIMES”

**I**t was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness,” wrote Charles Dickens in *A Tale of Two Cities*. Life often seems full of such paradoxes. When we are busy earning lots of money, we have little time to enjoy it. When we do have time available, it seems we don’t have much money to spend. A rapidly growing company finds itself too busy to invest its profits in internal development, but when sales begin to slow, it no longer has the resources (money and people) to spend on needed

improvements. The “best of times” for investing in resource development always seems like the “worst of times” for actually carrying out such plans, and vice-versa.

## THE STRUCTURE

Recognizing this paradox can help individuals and companies avoid the “Limits to Success” trap. In a typical scenario (see “Limits to Success” Template”), a system’s performance continually improves as a direct result of certain efforts. As performance increases, the efforts are redoubled, leading to even further improvement (R1). When the performance begins to plateau, the natural reaction is to increase the same efforts that led to past gains. But the harder one pushes, the harder the system seems to push back: It has reached some limit or resistance that is preventing further improvements in the system (B2). The real leverage in a “Limits to Success” scenario doesn’t lie in pushing on the “engines of growth,” but in finding and eliminating the factor(s) that are limiting success while you still have time and money to do so.

In a rapidly growing company, for example, initial sales are spurred by a successful marketing program. As sales continue to grow, the company redoubles its marketing efforts — and sales rise even further. But after a point, pushing harder on the marketing has less and less effect on sales. The company has hit some limit, such as market saturation or production capacity. To continue its upward path, the company may need to invest in

new production capacity or explore new markets.

## DIETS AND WEIGHT LOSS

Examples abound where rapid success is followed by a slowdown or decline in results. Dieters usually find that losing the first 10 pounds is a lot easier than losing the last two, and losing weight the first time around is a lot easier than losing it the next time.

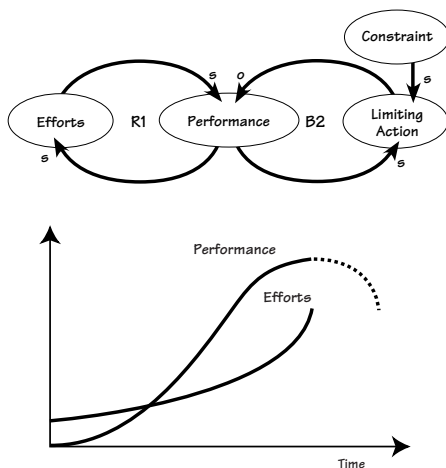
On a diet, eating less leads to weight loss, which encourages the person to continue to eat less (R3 in “Dieting Bind”). But, over time, the body adjusts to the lower intake of food by lowering the rate at which it burns the calories. Eventually the weight loss slows or even stops. The limit here is the body’s metabolic rate—how fast it will burn the food. To continue losing weight, the person needs to increase the metabolic rate by combining exercise with dieting.

But pushing equally hard on exercising isn’t the full answer either, since intense exercise burns simple sugars and not the stored fat that is the real target for weight loss. Intense exercise is counterproductive towards the dieter’s goal because it increases appetite while only temporarily raising the metabolism. The real leverage is to engage in steady exercise such as long, brisk walks that will increase the metabolic rate to a permanently higher level.

## SERVICE CAPACITY LIMIT

People Express airlines was one of the best-known casualties of the “Limits to Success” archetype. Its tremendous

### “LIMITS TO SUCCESS” TEMPLATE



In a “Limits to Success” scenario, continued efforts initially lead to improved performance (R1). Over time, however, the system encounters a limit that causes the performance to slow down or even decline (B2). Once the system has hit a limit, performance begins to level off (or “crash”), even as efforts continue to rise (bottom).



growth was fueled by a rapid expansion of its fleet and routes, along with unheard-of low airfares. As its fleet capacity grew, People Express was able to carry more passengers and boost revenues, allowing it to expand fleet capacity even more (loop R5). The quality of its service was initially very good, so the positive experience of many fliers increased word-of-mouth advertising and the number of passengers.

The “engine of growth” at People Express was its physical capacity—expanding fleet size, employees, and routes. But its “limit to success” was service capacity—the ability to invest time and money in training its employees—which became more difficult to sustain as the company grew (R6).

The number of passengers eventually outstripped the airline’s capacity to provide good service. As a result, quality suffered and People’s began losing passengers (B7). When competitors began matching low rates on selected routes, People Express’s market competitiveness suffered even more. Focusing only on the reinforcing side of the structure turned rapid growth into a tailspin, contributing to the airline’s demise.

Simply hiring more employees was not the answer to People Express’s ser-

vice-capacity problems. Similar to the dieter’s reliance on intense exercise, it only masked the real need for the steady long-term commitment to hire and train the necessary people to bring service quality up to a high and sustainable level.

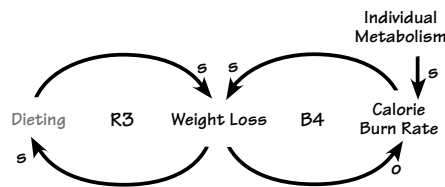
### USING THE ARCHETYPE

The “Limits to Success” archetype should not be seen as a tool that’s applied only when something “stalls out.” It is most helpful when it is used in advance to see how the cumulative effects of continued success might lead

to future problems. When the times are good and everything is growing rapidly, we tend to operate with an “if ain’t broke, don’t fix it” attitude. By the time something breaks, however, it may be too late to apply a fix.

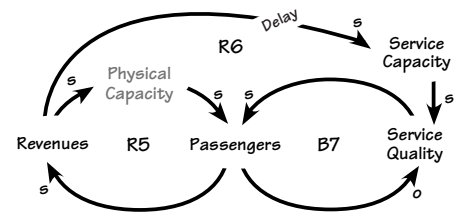
Using the “Limits to Success” template can help highlight potential problems by raising questions such as “What kind of pressures are building in the organization as a result of our growth?” By tracing through their implications, you can then plan for ways to release those pressures before an organizational gasket blows. ■

#### THE DIETING BIND



On a diet, an individual’s metabolic rate becomes the limiting factor for weight loss. The leverage point lies in boosting the metabolism to a permanently higher level through slow, steady exercise.

#### LIMITS TO PASSENGER GROWTH



At People Express, physical capacity—fleet size, routes, and employees—was seen as the “engine of growth” (R5). The limit to that growth was the company’s service capacity (R6).



## “SHIFTING THE BURDEN”: THE “HELEN KELLER” LOOPS

**M**ost of us know the story of Helen Keller and have probably sympathized with her and her parents, whose actions to protect their handicapped daughter seemed not only compassionate but necessary. After all, how could a blind and deaf child ever be expected to take care of herself? But had it not been for the determined efforts of her teacher, Ann Sullivan, who refused to let Helen’s handicaps prevent her from becoming self-reliant, Helen probably never would have achieved her real potential. She went on to graduate from Radcliffe College and became an author as well as spokesperson and role model for many of the nation’s handicapped.

Helen Keller’s story is much more than an inspirational human interest story; it illustrates a pervasive dynamic that is rooted in an archetypal structure. The well-intentioned actions of

her parents shifted the burden of responsibility for Helen’s welfare to them. Every problem or failure on Helen’s part brought the parents rushing to her aid. Helen learned that no matter what she did, her parents would accommodate her. And each incident reinforced her parents’ belief that she was indeed helpless. All three were caught in a system that was eroding Helen’s ability (and desire) to cope with the world and shifting the responsibility for her well-being to her parents.

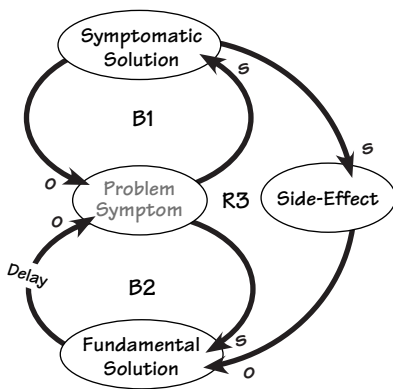
### THE STRUCTURE

The basic structure of this archetype is shown in “Shifting the Burden” Template.” The archetype usually begins with a problem symptom that prompts someone to intervene and “solve” it. The solution (or solutions) that are obvious and immediately

implementable usually relieve the problem symptom very quickly. But these symptomatic solutions have two specific negative effects. First, they divert attention away from the real or fundamental source of the problem. More subtly, symptomatic solutions cause the viability of the fundamental solution to deteriorate over time, reinforcing the perceived need for more of the symptomatic solution.

In the Helen Keller story, her parents’ intervention is the symptomatic solution, Helen’s failure to cope with the real world is the problem symptom, the development of Helen’s own abilities to care for herself is the fundamental solution, and the side-effect is that her parents assume increasing responsibility for her well-being. This particular type of “Shifting the Burden” structure, in which responsibility is shifted to a third party, is

### “SHIFTING THE BURDEN” TEMPLATE



In the “Shifting the Burden” Template, a problem symptom is “solved” by applying a symptomatic solution, which diverts attention away from a more fundamental solution.

### “SHIFTING THE BURDEN” EXAMPLES

PROBLEM SYMPTOM	SYMPTOMATIC SOLUTION	FUNDAMENTAL SOLUTION	SIDE EFFECT(S)
Slow/Declining revenue growth	Increased marketing	New products	Diverts resources away from R&D, increased reliance on marketing
Bank failures	FDIC, FSLIC	Prudent banking practices	Responsibility for protecting deposits is shifted to government
Employee performance problem	Manager “provides” solution	Necessary training for employee	Growing dependence on manager; decreasing confidence of employee
Low self-esteem	Drug use	Invest time in personal development	Drug addiction; further debilitation of personal development





known as “Shifting the Burden to the Intervener.” Over time, the role of the intervener increases, until it becomes an essential part of the system. In Helen’s case, her parents’ actions reinforced the underdevelopment of her abilities and therefore strengthened their role as “protectors.”

Another very common side-effect that occurs in “Shifting the Burden” situations is that the person may become addicted to the symptomatic solution. For example, a person who turns to alcohol or drugs to boost his self-esteem or deal with stress may end up developing an alcohol or drug dependency.

### CENTRAL VS. LOCAL

The “Shifting the Burden” archetype and its variants—“Addiction” and “Shifting the Burden to the Intervener”—comprise perhaps the single most pervasive systems structure. “Central Support vs. Branch Capability” illustrates a classic example of this dynamic.

A claims office in a local branch of a large insurance company is faced with a large, complex claim that requires more expertise than it possesses. The central office responds by sending out its corps of experts, who take care of the complex claim while the branch office goes about its other, more routine business (B5). Although the occurrence of large claims may be infrequent—making it hard to justify keeping such experts in every branch—over time the interventions can result in deteriorating branch capability.

The reason is that, after a while, an implicit operating norm develops. The

norm says that says if a person wants to handle complex, technically challenging claims, she has to either join the central office or move to a different firm (R6). Gradually, the most talented people take either of the two options. Unless these people can be replaced by equally capable adjusters, the talent of the branch office gradually erodes, making it even more reliant on central support (R7). The cycle is reinforcing—as the central staff becomes better at intervening, the branch seeks their help more often.

### USING THE ARCHETYPE

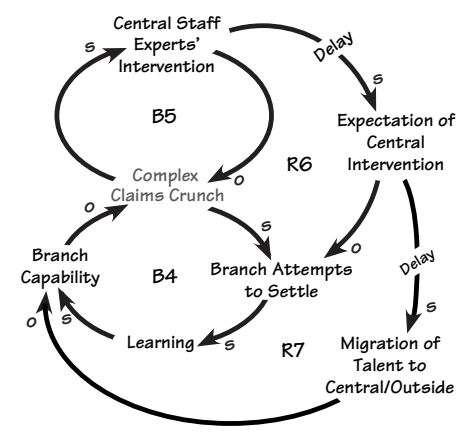
Templates—causal loop diagrams that trace out generic dynamic structures—serve as useful guides for mapping out archetypes. The basic “Shifting the Burden” template is a good starting point, but templates are not meant to be rigid structures in which we must “fit” a specific case. Tracing out the fundamental solution in the Central vs. Branch situation, for example, requires more than a single variable—“Branch attempts to settle claims,” “Learning,” and “Branch ability” are all part of the fundamental solution.

In theory, any one of the four elements of the template—problem symptom, symptomatic solution, side-effect, and fundamental solution—can help us identify a “Shifting the Burden” structure at work. Side-effects, however, are usually very subtle and difficult to detect from inside the system. Solutions such as alcohol use, increased marketing, oil imports, or federal insurance are more readily identified, but there may not be complete agreement on whether they are “symptomatic” or “fundamental.”

Identifying problem symptoms such as high stress, falling revenues, energy shortage, or bank failures (see “Shifting the Burden’ Examples” on p. 22) is probably the easiest way to begin filling out a “Shifting the Burden” template.

Keeping in mind that the “rightness” of a solution depends on one’s perspective, it can be helpful to ask whether we are seeing the situation from the parents’, Helen Keller’s, or Ann Sullivan’s point of view. Examining a problem or issue from these different viewpoints can help us understand why a “Shifting the Burden” archetype is operating and point us toward a fundamental, not symptomatic, solution. ■

### CENTRAL SUPPORT VS. BRANCH CAPABILITY



In this example of a “Shifting the Burden” archetype, the symptomatic problem is a complex claim that the branch cannot handle alone. Experts from the central office help out, but over time the branch’s ability to handle difficult claims atrophies.



## “SUCCESS TO THE SUCCESSFUL”: SELF-FULFILLING PROPHECIES

**I**magine you have two new direct reports, Stan and Frank. Both seem equally qualified—a degree from a good school, a couple of years of solid business experience, and youthful enthusiasm. You want to fill an upcoming opening in a management position, but you aren’t quite sure which one is the best candidate. You want to be as objective as possible in your recommendation, so you decide to encourage both of them and see which one demonstrates the most ability.

After a couple of weeks, Stan has gotten a jump start on the latest assignment and is doing a stellar job. Frank was out with the flu, so when he comes back, he’s a little bit behind. You keep your eye on him and continue to encourage him, but you really start to focus on Stan. Before you know it, you’re giving him more and more responsibility, and he does exceedingly well each time. Frank is

doing adequately, but for some reason, you just don’t feel that he has that extra “umph.” Since you already have a “hot one” on your hands, you feel it’s not as necessary to invest as much time and energy in Frank.

In time, you promote Stan into the management position and pat yourself on the back for having picked the right person from the beginning. Frank, in your assessment, turned out to be just an average performer. But is that really the case?

### SELF-FULFILLING PROPHECIES

The “Success to the Successful” archetype suggests that success may depend as much on structural forces as innate ability or talent (see “Success to the Successful” Template”). The performance of individuals or teams is often the result of the structure they are put in, which forces them to compete for a limited resource such as a

manager’s time, a company’s investments, or training facilities.

Assuming that both groups (or individuals) are equally capable, if one person or group (A) is given more resources, it has a higher likelihood of succeeding than B. That initial success justifies devoting even more resources to A and robs B of further resources

(R1). As B gets fewer resources, its success diminishes, which further reinforces the “bet on the winner” allocation of resources (R2). The structure continues to reinforce the success of one player, and the eventual demise of the other.

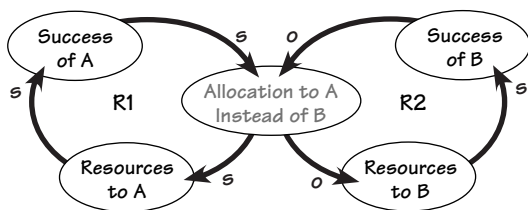
“Success to the Successful” is an archetypal case of self-fulfilling prophecies. The outcome of a situation is highly dependent on the initial conditions (or expectations) and whether they favor one party or the other. If B had received more resources in the beginning, the roles would be reversed: B’s success would increase, and A would suffer.

In effect, our mental model of what we believe will determine success shapes the very success we seek to assess. In the case of Stan and Frank, you may not have had a strong feeling either way in the beginning. But initial events—Stan’s success with the first project and Frank’s illness—quickly became the shaper of your expectations and actions, reinforcing what you later believed to be an objective assessment that Stan was “right” for the job.

### BALANCING WORK AND FAMILY

The tension between work and family is another example of the “Success to the Successful” archetype (see “Balancing Work and Family”). We each have a certain amount of time and attention available. The more we devote to work, the more successful we may become, which fuels the desire to put more time into work (R3). A similar result occurs if we devote our energy to our family (R4).

### “SUCCESS TO THE SUCCESSFUL” TEMPLATE



The “Success to the Successful” archetype suggests that success may depend as much on structural forces as talent. If one person or group (A) is given more resources, it has a higher likelihood of succeeding than B (assuming they are equally capable). The initial success justifies devoting more resources to A than B (R1). As B gets fewer resources, its success diminishes, further justifying more resource allocations to A (R2).



Most of us struggle to maintain a balance between the two.

Suppose, however, that a large project forces you to put in long hours at work for an extended period of time. The time away from the family begins to create tension at home. Your family complains that you are never around. But when you do come home, you get hit with all of the problems that have been accumulating. So you withdraw further from your family, devoting yourself even more to the work project. Your effort on the project is starting to generate interest throughout the company. At the same time that praise at work is building, the complaints at home are piling up, driving you even further from your family. The two situations—the downward spiral of one, and the upward spiral of the other—mutually feed each other.

### REWRITING THE PROPHECIES

The “Success to the Successful” archetype highlights how success can be determined by initial chance and how the structure can systematically eliminate the other possibilities that may have been equally viable (or even superior). If we are not conscious of being in this archetype, we become a victim of its structure, which continually pushes us to do whatever has been successful in the past. After a while, the choice between work and family doesn’t seem like a choice anymore—the structure has determined the outcome.

As in most of the archetypes, managing a “Success to the Successful” situation requires looking at it from a more macro level and asking ourselves “What is the larger goal within which the situation is embedded?” In the case of work vs. family, a larger goal that includes both of them, such as “I seek a balance between my success at work and time with my family,” must guide the daily decisions. In the case of

the two protégés, the goal might be to provide an environment in which the full potential of both employees can be developed. Without the guidance of a larger goal, the structure will continue to dictate your actions.

### CREATING ENVIRONMENTS FOR SUCCESS

At the heart of the “Success to the Successful” archetype lies the competitive model of Western economies, which is characterized by a win-lose philosophy. An implicit assumption of the competitive model is that whoever wins must, by default, be the best. In reality, however, it may not be the individuals, but the structure they are in, that determines the “winner.” The assumption here is that you need a competitive environment to bring the best candidates to the surface.

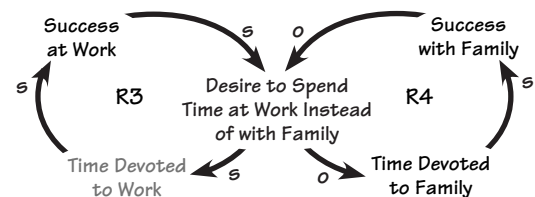
A fundamental question that the Archetype begs us to ask is, Why put two groups or individuals into the structure in the first place? If we want a single “winner,” why not put our energy toward understanding what it takes to develop such a winner? We can then focus our energy and resources on that person or project from the beginning, rather than waste time, money, and morale by stringing along multiple people and projects. We can, in effect, lop off the other half of the “Success to the Successful” archetype. Instead of diverting resources and systematically letting other groups fail, we can focus all our efforts and resources on finding ways to build a supportive environment for success.

A way to break out of the “Success to

the Successful” archetype is to get rid of its competitive structure and find ways to make teams collaborators rather than competitors. Many Japanese companies, for example, often have multiple project teams working on the same design. Unlike American companies, however, the goal is not to compete against each other and have one team’s design win. All of the teams are seen as part of the same larger effort to develop the best design for the company. The teams collaborate with each other, sharing ideas and information, and produce a design that may feature a combination of innovations from each of the groups.

The “Success to the Successful” archetype highlights the need for creating a win-win environment where cooperation replaces competition and where creating an environment for success is more important than trying to identify successful individuals. In fact, that’s what good academic institutions provide, and ultimately what good corporate environments should provide—an environment in which all members can thrive and contribute their unique talents. ■

### BALANCING WORK AND FAMILY



If not carefully managed, the allocation of time between work and family can fall into a “Success to the Successful” trap. Extended time away from the family (due to a large project, for example) can create tension at home, making it more desirable to spend time at work. As job success and time at work continue to build, family relationships can suffer.



## “TRAGEDY OF THE COMMONS”: ALL FOR ONE AND NONE FOR ALL

**D**o you recall any hot summer days when you and your family decided to spend a relaxing day at the local swimming pool? You loaded up the car and arrived at the pool, only to discover that every other family had the same idea. So instead of the relaxing outing each family anticipated, everyone ended up spending a nerve-racking day dodging running children and trying to cool off in a pool filled with wall-to-wall people. In many similar situations, people hoping to maximize individual gain end up diminishing the benefits for everyone involved. What was a great idea for each person or family becomes a collective nightmare for them all.

### INDIVIDUAL GAIN, COLLECTIVE PAIN

At the heart of the “Tragedy of the Commons” structure lies a set of reinforcing actions that make sense for each individual player to pursue (see “Tragedy of the Commons” Template”). As each person continues his individual action, he gains some benefit. For example, each family heading to the pool will enjoy cooling off in the swimming area. If the activity involves a small number of people relative to the amount of “commons” (or pool space) available, each individual will continue to garner some benefit. However, if the amount of activity grows too large for the system to support,

the commons becomes overloaded and everyone experiences diminishing benefits.

Traffic jams in Los Angeles are a classic example of how a “public” good gets overused and lessened in value for everyone. Each individual wishing to get to work quickly uses the freeway because it is the most direct route. At first, each additional person on the highway does not slow down traffic, because there is enough “slack” in the system to absorb the extra users. At some critical level, however, each additional

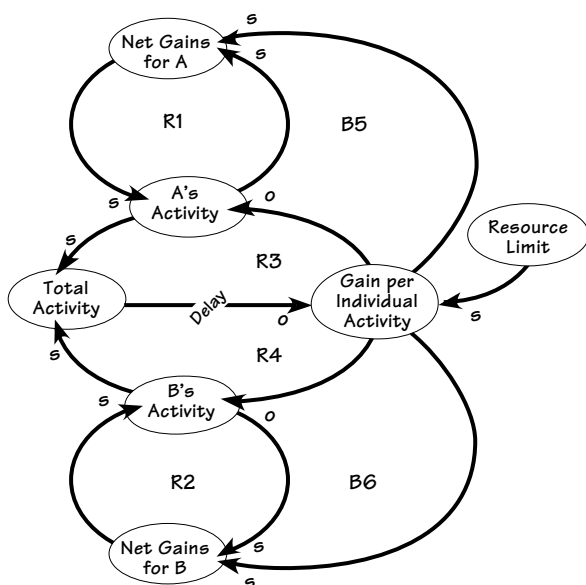
driver brings about a decrease in the average speed of everyone. Eventually, there are so many drivers that traffic crawls at a snail’s pace. Each person seeking to minimize driving time has in fact conspired to guarantee a long drive for everyone.

This structure also occurs in corporate settings all too frequently. A company with a centralized sales force, for example, will suffer from the “Tragedy of the Commons” archetype as each autonomous division requests that more and more efforts be expended on its behalf. The division A people know that if they request “high priority” from the central sales support, they will get a speedy response, so they label more and more of their requests as high priority. Division B, C, D, and E all have the same idea. As the net result, the central sales staff grows increasingly burdened by all the field requests, and the net gains for each division are greatly diminished. The same story can be told about centralized engineering, training, maintenance, etc. In each case, either an implicit or explicit limit is keeping the resource constrained at a specific level, or the resource cannot be added fast enough to keep up with the demands.

### BRAZIL’S INFLATION GAME

When the shared commons is a small, localized resource, the consequences of a “Tragedy of the Commons” scenario are more easily contained. At a national level, however, the “Tragedy of the Commons” archetype can wreak havoc on whole economies. Take inflation in Brazil, for example. That country’s inflation reached 367

### “TRAGEDY OF THE COMMONS” TEMPLATE



In a “Tragedy of the Commons” structure, each person pursues actions that are individually beneficial (R1 and R2), but that eventually result in a worse situation for everyone (B5 and B6).

percent in 1987, 933 percent in 1988, 1,764 percent in 1989, and 1,794 percent in 1990. With prices rising so rapidly, each seller expected inflation to continue. Therefore, seller B would raise his price to keep up with current inflation and hedge against future inflation. With thousands of seller B's doing the same thing, inflation increased and reinforced expectations of continued inflation, leading to another round of price increases (R5 in "Brazil's Inflation 'Tragedy'").

Inflation also led to indexation of wages, which increased the cost of doing business. In response to rising business costs, Seller A raised her price, which fueled further inflation (R6). Since there were thousands of Seller A's doing the same thing, their collective action created runaway inflation. The underlying health of the economy steadily weakened as the government and businesses perpetuated endless cycles of deficit spending to keep up with escalating costs. Over time, everyone grew increasingly preoccupied with using price increases to make profits rather than investing in ways to be more productive. Eventually, such an economy can come close to collapse, owing to high debts and loss of global competitiveness. Dramatic price adjustments can result (B7 and B8).

**COMMON "COMMONS"**

Perhaps the trickiest part of identifying a "Tragedy of the Commons" archetype at work is coming to some agreement on exactly what is the commons that is being overburdened. If no one sees how his or her individual action will eventually reduce everyone's benefits, the level of debate is likely to revolve around why individual A should stop doing what she is doing and why individual B is entitled

to keep doing what he is doing. Debates at that level are rarely productive, because effective solutions for a "Tragedy of the Commons" situation never lie at the individual level.

In the sales-force situation, for example, as long as each division defines the commons to include only its performance, there is little motivation for anyone to address the real issue—that the collective, not individual, action of each division vying for more sales support is at the heart of the problem. Only when there is general agreement that managing the commons requires coordinating *everyone's* actions can issues of resource allocation be settled equitably.

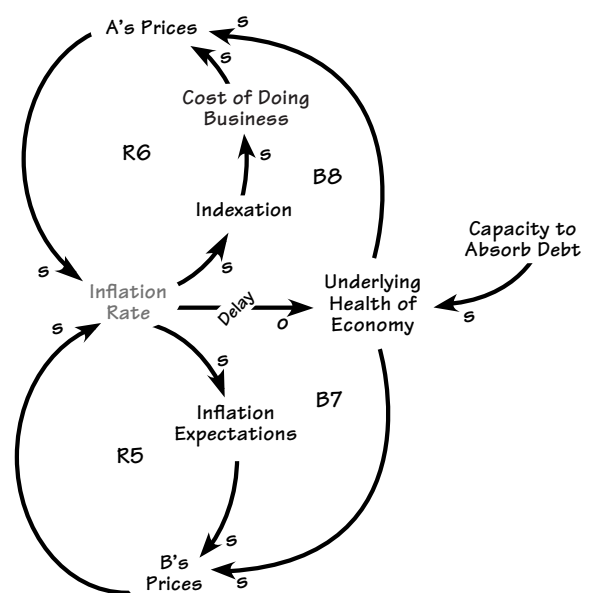
**MANAGING THE COMMONS**

Identifying the commons is just the beginning. Other questions that help define the problem and identify effective actions include: What are the incentives for individuals to persist in their actions? Who, if anybody, controls the incentives? What is the time frame in which individuals reap the benefits of their actions? What is the time frame in which collective actions result in losses for everyone? Can the long-term collective loss be made more real, more present? What are the limits of the resource? Can it be replenished or replaced?

The leverage in dealing with a "Tragedy

of the Commons" scenario involves reconciling short-term individual rewards with long-term cumulative consequences. Evaluating the current reward system may highlight ways in which incentives can be designed so that coordination among the various parties will be both in their individual interest as well as the collective interest of all involved. Since the time frame of the commons "collapse" is much longer than the time frame for individual gains, it is important that interventions are structured so that current actions will contribute to long-term solutions. ■

**BRAZIL'S INFLATION "TRAGEDY"**



Brazil's runaway inflation shows how the "Tragedy of the Commons" archetype can play out on a national level. As companies raise prices in order to offset rising costs and inflation expectations, they simply add more fuel to the fire of rising inflation.



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