term, you can often ignore them; they're inconsequential. They only come back to haunt you in the long term.

Reinforcing feedback, balancing feedback, and delays are all fairly simple. They come into their own as building blocks for the "systems archetypes"—more elaborate structures that recur in our personal and work lives again and again.

6

NATURE'S TEMPLATES: IDENTIFYING THE

PATTERNS THAT CONTROL EVENTS

Some years ago, I witnessed a tragic accident while on an early spring canoe trip in Maine. We had come to a small dam, and put in to shore to portage around the obstacle. A second group arrived, and a young man who had been drinking decided to take his rubber raft over the dam. When the raft overturned after going over the dam, he was dumped into the freezing water. Unable to reach him, we watched in horror as he struggled desperately to swim downstream against the backwash at the base of the dam. His struggle lasted only a few minutes; then he died of hypothermia. Immediately, his limp body was sucked down into the swirling water. Seconds later, it popped up, ten yards downstream, free of the maelstrom at the base of the dam. What he had tried in vain to achieve in the last moments of his life, the currents accomplished for him within seconds after his death. Ironically, it was his very struggle against the forces at the base of the dam that killed him. He didn't know that the only way out was "counterintuitive. If he hadn't tried to keep his head above water, but instead dived down to where the current flowed downstream, he would have survived.

expanding its arsenal because of the delay in the other side's response. This delay can be as long as five years because of the time required to gather intelligence on the other side's weaponry, and to design and deploy new weapons. It is this temporary perceived advantage that

keeps the escalation process going. If each side were able to respond instantly to buildups of its adversary, incentives to keep building would be nil.

The systems viewpoint is generally oriented toward the long-term view. That's why delays and feedback loops are so important. In the short term, you can often ignore them; they're inconsequential. They only come back to haunt you in the long term.

Reinforcing feedback, balancing feedback, and delays are all fairly simple. They come into their own as building blocks for the "systems archetypes"—more elaborate structures that recur in our personal and work lives again and again.

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This tragic story illustrates the essence of the systems perspective, first shown in the beer game in Chapter 3, and again in the arms race at the beginning of Chapter 5. Structures of which we are unaware hold us prisoner. Conversely, learning to see the structures within which we operate begins a process of freeing ourselves from previously unseen forces and ultimately mastering the ability to work with them and change them.

One of the most important, and potentially most empowering, insights to come from the young field of systems thinking is that certain patterns of structure recur again and again. These "systems archetypes" or "generic structures" embody the key to learning to see structures in our personal and organizational Jives. The systems archetypes—of which there are only a relatively small number'—suggest that not all management problems are unique, something that experienced managers know intuitively.

If reinforcing and balancing feedback and delays are like the nouns and verbs of systems thinking, then the systems archetypes are analogous to basic sentences or simple stories that get retold again and again. Just as in literature there are common themes and recurring plot lines that get recast with different characters and settings, a relatively small number of these archetypes are common to a very large variety of management situations.

The systems archetypes reveal an elegant simplicity underlying the complexity of management issues. As we learn to recognize more and more of these archetypes, it becomes possible to see more and more places where there is leverage in facing difficult challenges, and to explain these opportunities to others.

As we learn more about the systems archetypes, they will no doubt contribute toward one of our most vexing problems, a problem against which managers and leaders struggle incessantly—speciali-zation and the fractionation of knowledge. In many ways, the greatest promise of the systems perspective is the unification of knowledge across all fields

—for these same archetypes recur in biology, psychology, and family therapy; in economics, political science, and ecology; as well as in management.[2]

Because they are subtle, when the archetypes arise in a family, an ecosystem, a news story, or a corporation, you often don't see them so much as feel them. Sometimes they produce a sense of dejd vu, a hunch that you've seen this pattern of forces before. "There it is again," you say to yourself. Though experienced managers already know many of these recurring plot lines intuitively, they often don't

know how to explain them. The systems archetypes provide that language. They can make explicit much of what otherwise is simply "management judgment."

Mastering the systems archetypes starts an organization on the path of putting the systems perspective into practice. It is not enough to espouse systems thinking, to say, "We must look at the big picture and take the long-term view." It is not enough to appreciate basic systems principles, as expressed in the laws of the fifth discipline (Chapter 4) or as revealed in simulations such as the beer game (Chapter 3). It is not even enough to see a particular structure underlying a particular problem (perhaps with the help of a consultant). This can lead to solving a problem, but it will not change the thinking that produced the problem in the first place. For learning organizations, only when managers start thinking in terms of the systems archetypes, does systems thinking become an active daily agent, continually revealing how we create our reality.

The purpose of the systems archetypes is to recondition our perceptions, so as to be more able to see structures at play, and to see the leverage in those structures. Once a systems archetype is identified, it will always suggest areas of high- and low-leverage change. Presently, researchers have identified about a dozen systems archetypes, nine of which are presented and used in this book (Appendix 2 contains a summary of the archetypes used here). All of

the archetypes are made up of the systems building blocks: reinforcing processes, balancing processes, and delays. Below are two that recur frequently, and which are steppingstones to understanding other archetypes and more complex situations.

ARCHETYPE 1: LIMITS TO GROWTH DEFINITION

A reinforcing (amplifying) process is set in motion to produce a desired result. It creates a spiral of success but also creates inadvertent secondary effects (manifested in a balancing process) which eventually slow down the success.

MANAGEMENT PRINCIPLE Don't push growth; remove the factors limiting growth.

WHERE IT IS FOUND

The limits to growth structure is useful for understanding all situations where growth bumps up against limits. For example, organizations grow for a while, but then stop growing. Working groups get better for a while, but stop getting better. Individuals improve themselves for a period of time, then plateau.

Many sudden but well-intentioned efforts for improvement bump up against limits to growth. A farmer increases his yield by adding fertilizer, until the crop grows larger than the rainfall of the region can sustain. A crash diet works at first to shave off a few pounds of fat, but then the dieter loses his or her resolve. We might "solve" sudden deadline pressures by working longer hours; eventually, however, the added stress and fatigue slow down our work speed and quality, compensating for the longer hours.

People who try to break a bad habit such as criticizing others frequently come up against limits to growth. At first, their efforts to stop criticizing pay off. They criticize less. The people around them feel more supported. The others reciprocate with positive feelings, which makes the person feel better and criticize less. This is a reinforcing spiral of

improved behavior, positive feelings, and further improvement. But, then, their resolve weakens. Perhaps they start to find themselves facing the aspects in others' behavior that really gives them the most trouble: it was easy to overlook a few little things, but this is another matter. Perhaps, they just become complacent and stop paying as close attention to their knee-jerk criticisms. For whatever reason, before long, they are back to their old habits.

Once, in one of our seminars, a participant said, "Why, that's just like falling in love." Cautiously, I asked, "How so?" She responded, "Well, first, you meet. You spend a little time together and it's wonderful. So you spend more time together. And it's more wonderful. Before long, you're spending all your free time together. Then you get to know each other better. He doesn't always open the door for you, or isn't willing to give up bowling with his buddies— every other night. He discovers that you have a jealous streak, or a bad temper, or aren't very neat. Whatever it is, you start to see each other's shortcomings." As you learn each other's flaws, she reminded the rest of us, the dramatic growth in feelings comes to a sudden halt—and may even reverse itself, so that you feel worse about each other than you did when you first met.

STRUCTURE

In each case of limits to growth, there is a reinforcing (amplifying) process of growth or improvement that operates on its own for a period of time. Then it runs up against a balancing (or stabilizing) process, which operates to limit the growth. When that happens, the rate of improvement slows down, or even comes to a standstill.

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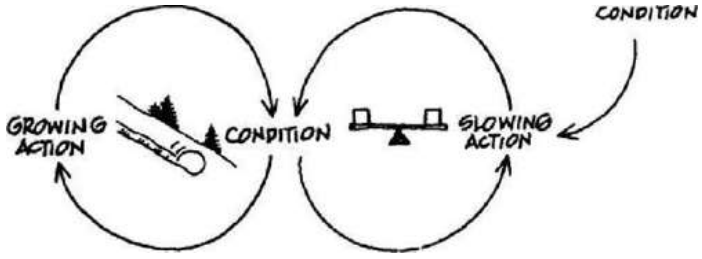
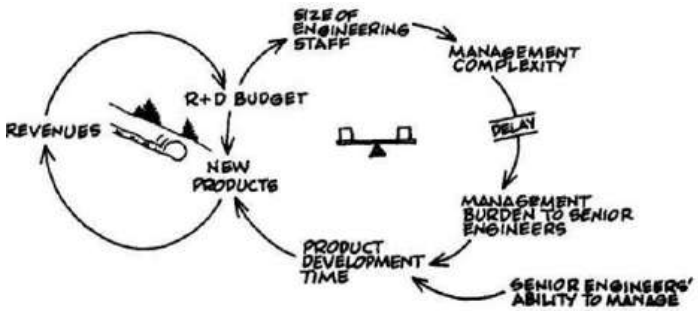


UNDERSTANDING AND USING THE STRUCTURE

Limits to growth structures operate in organizations at many levels. For example, a high-tech organization grows rapidly because of its ability to introduce new products. As new products grow, revenues grow, the R&D budget grows, and the engineering and research staff grows. Eventually, this burgeoning technical staff becomes increasingly complex and difficult to manage. The management burden often falls on senior engineers, who in turn have less time to spend on engineering. Diverting the most experienced engineers from engineering to management results in longer product development times, which slow down the introduction of new products.[3]

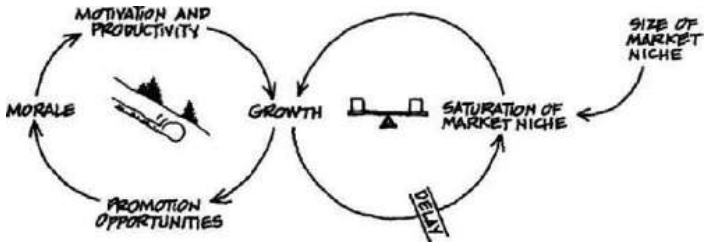


To read any "limits to growth" structure diagram, for example, start with the reinforcing circle of growth. That circle provides the structure with its initial momentum. Walk yourself around the circle: remind yourself how new product growth might generate revenues, which in turn can be reinvested to generate more new products. At some point, however, the forces will shift—here, for example, the growth in R&D budget eventually leads to complexity beyond the senior engineers' ability to manage without diverting precious time from product development.

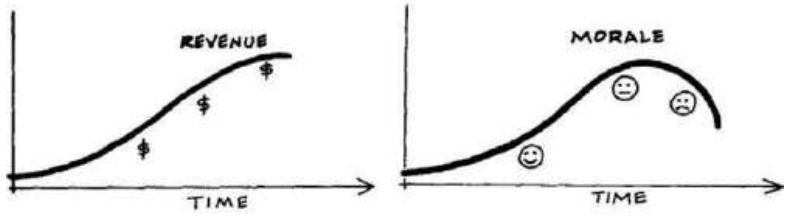
After a delay (whose length depends on the rate of growth, complexity of products, and engineers' management skills), new product introductions slow, slowing overall growth.

Another example of limits to growth occurs when a professional organization, such as a law firm or consultancy, grows very rapidly when it is small, providing outstanding promotion opportunities. Morale grows and talented junior members are highly motivated, expecting to become partners within ten years. But as the firm gets larger, its growth slows. Perhaps it starts to saturate its market niche. Or it might reach a size where the founding partners are no longer interested in sustaining rapid growth. However the growth rate slows, this means less promotion opportunities, more in-fighting among junior members, and an overall decline in morale. The limits to growth structure can be diagrammed as follows:[4]

In each of these structures, the limit gradually becomes more powerful. After its initial boom, the growth mysteriously levels off. The technology company may never recapture its capabilities for developing breakthrough new products or generating rapid growth.



PATTERN OF BEHAVIOR

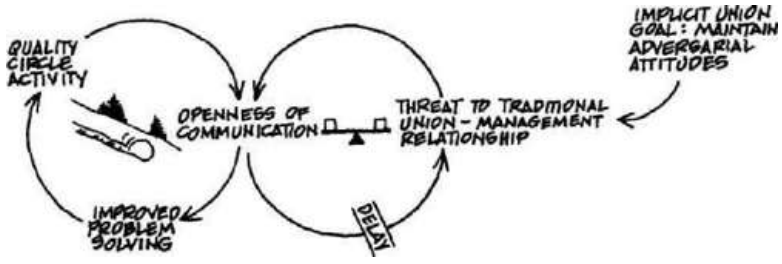


Eventually, growth may slow so much that the reinforcing spiral may turn around and run in reverse. The law firm or consulting firm loses its dominance in its market niche. Before long, morale in the firm has actually started on a downward spiral, caused by the reinforcing circle running in reverse.

Limits to growth structures often frustrate organizational changes that seem to be gaining ground at first, then run out of steam. For example, many initial attempts to establish "quality circles" fail ultimately in U.S. firms, despite making some initial progress. Quality circle activity begins to lead to more open communication and collaborative problem solving, which builds enthusiasm for more quality circle activity. But the more successful the quality circles become, the more threatening they become to the traditional distribution of political power in the firm. Union leaders begin to fear that the new openness will break down traditional adversarial relations between workers and management, thereby undermining union leaders' ability to influence workers. They begin to undermine the quality

circle activity by playing on workers' apprehensions about being manipulated and "snowed" by managers: "Be careful; if you keep coming up with cost saving improvements on the production line, your job will be the next to go."[5]

Managers, on the other hand, are often unprepared to share control with workers whom they have mistrusted in the past. They end

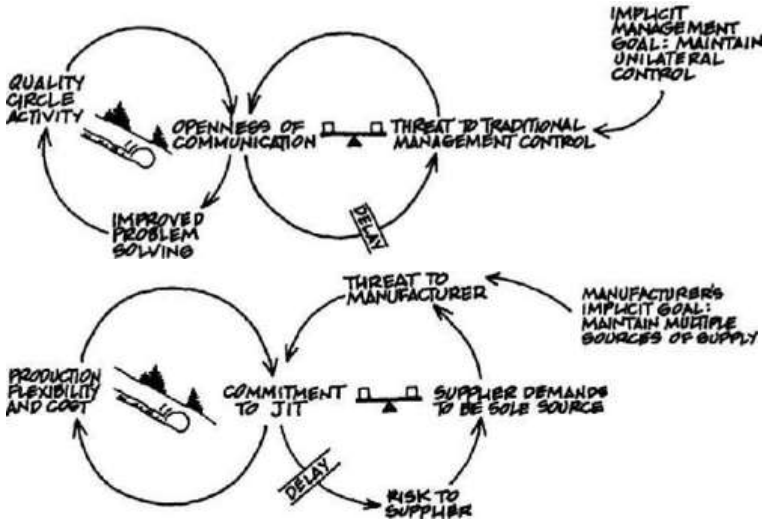


up participating in quality circle activities but only going through the motions. They graciously acknowledge workers' suggestions but fail to implement them.

Rather than achieving steady acceptance, quality circle activity rises for a time—then plateaus or declines. Often, the response of the leader to disappointing results from the quality circle simply feeds fuel to the flame. The more aggressively the leader promotes the quality circle, the more people feel threatened and the more stonewalling takes place.

You see similar dynamics with "Just in Time" inventory systems, which depend on new relationships of trust between suppliers and manufacturers. Initial improvements in production flexibility and cost are not sustained. Often, the supplier in a JIT system eventually demands to be a sole source to offset the risk in supplying the manufacturer overnight. This threatens the manufacturer, who is used to placing multiple orders with different suppliers to guarantee control of parts supply. The manufacturer's commitment to JIT then wavers.

The supplier's commitment to JIT can likewise waver, once he realizes that the manufacturer demands to be his prime customer. Used to having multiple customers, the supplier can't help but wonder whether the manufacturer will go on ordering parts from multiple



suppliers and then suddenly cancel orders. The more aggressively

you try to change the process, the more aware both sides are of their risks. Thus, the more likely they are to hedge those risks by sticking to

traditional practices of multiple suppliers and multiple customers, thereby undermining the trust a JIT system requires.[6]

HOW TO ACHIEVE LEVERAGE

Typically, most people react to limits to growth situations by trying to push hard: if you can't break your bad habit, become more diligent in monitoring your own behavior; if your relationship is having problems, spend more time together or work harder to make the relationship work; if staff are unhappy, keep promoting junior staff to make them happy; if the flow of new products is slowing down, start more new product initiatives to offset the problems with the ones that are bogged down; or advocate quality circle more strongly.

It's an understandable response. In the early stages when you can see improvement, you want to do more of the same—after all, it's working so well. When the rate of improvement slows down, you want to compensate by striving even harder. Unfortunately, the more vigorously you push the familiar levers, the more strongly the balancing process resists, and the more futile your efforts become. Sometimes, people just give up their original goal—lowering their goal to stop criticizing others, or giving up on their relationship, or giving up on quality circle or JIT improvements.

But there is another way to deal with limits to growth situations. In each of them, leverage lies in the balancing loop—not the reinforcing loop. To change the behavior of the system, you must identify and change the limiting factor. This may require actions you may not yet have considered, choices you never noticed, or difficult changes in rewards and norms. To reach your desired weight may be impossible by dieting alone—you need to speed up the body's metabolic rate, which may require aerobic exercise. Sustaining loving relationships requires giving up the ideal of the "perfect partner"— the implicit goal that limits the continued improvement of any relationship. Maintaining morale and productivity as a professional firm matures requires a different set of norms and rewards that salute work well done, not a person's place in

the hierarchy. It may also require distributing challenging work assignments equitably and not to "partners only." Maintaining effective product development pro

cesses as a firm grows requires dealing with the management burden brought on by an increasingly complex research and engineering organization. Some firms do this by decentralizing, some by bringing in professionals skilled in managing creative engineers (which is not easy), and some by management development for engineers who want to manage.

Not surprisingly, where quality circles have succeeded they have been part of a broader change in managerial-employee relationships. In particular, successes have involved genuine efforts to redistribute control, thereby dealing with the union and management concerns over loss of control. Likewise, successful Just in Time systems have taken root as part of "Total Quality" programs that focus on meeting customer needs, stabilizing production rates, and sharing benefits with valued suppliers. These changes were necessary to overcome the distrust that lay behind traditional goals of maintaining multiple sources of supply and multiple customers. In successful cases, managers had to ignore temptations to think that quality circle failures were due to individual troublemakers; or that JIT problems came from a recalcitrant supplier.[7]

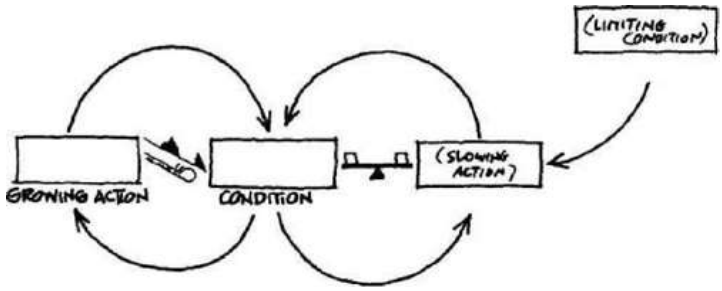
But there is another lesson from the limits to growth structure as well. There will always be more limiting processes. When one source of limitation is removed or made weaker, growth returns until a new source of limitation is encountered. In some settings, like the growth of a biological population, the fundamental lesson is that growth eventually will stop. Efforts to extend the growth by removing limits can actually be counterproductive, forestalling the eventual day of reckoning, which given the pace of change that reinforcing processes can create (remember the French lily pads) may be sooner than we think.

HOW TO CREATE YOUR OWN "LIMITS TO GROWTH" STORY

The best way to understand an archetype is to diagram your own version of it. The more actively you work with the archetypes, the better you will become at recognizing them and finding leverage.

Most people have many limits to growth structures in their lives The easiest way to recognize them is through the pattern

of behavior. Is there a situation in which things get better and better at first, and then mysteriously stop improving? Once you have such a situation in mind, see if you can identify the appropriate elements of the reinforcing and balancing loops:[8]



First, identify the reinforcing process—what is getting better and what is the action of activity leading to improvement? (There may be other elements of the reinforcing process, but there are always at least a condition which is improving, and an action leading to the improvement.) It might, for instance, be the story of an organizational improvement: an equal opportunity hiring program, for example. The "growing action" is the equal opportunity program itself; and the condition is the percentage of women and minorities on staff. For example, as the percentage of women in management increases, confidence in or commitment to the program increases, leading to still further increase in women in management.

There is, however, bound to be a limiting factor, typically an implicit goal, or norm, or a limiting resource. The second step is to identify the limiting factor and the balancing process it creates. What "slowing action" or resisting force starts to come into play to keep the condition from continually improving? In this case, some managers might have

an idea in their minds of how many women or minority executives are "too much." That unspoken number is the limiting factor; as soon as that threshold is approached, the slowing action—manager's resistance—will kick in. Not only will they resist more equal opportunity hires, but they may make life exceptionally difficult for the new people already in place.

Once you've mapped out your situation, look for the leverage. It won't involve pushing harder; that will just make the

resistance stronger. More likely, it will require weakening or removing the limiting condition.

For the best results, test your limits to growth story in real life. Talk to others about your perception. Test your ideas about leverage in small real-life experiments first. For example, you might seek out one person whom you perceive as holding an implicit quota for "enough women," but who is also approachable, and ask him. (See the reflection and inquiry skills section in Chapter 10, "Mental Models," for how to do this effectively.)

ARCHETYPE 2: SHIFTING THE BURDEN

DEFINITION

An underlying problem generates symptoms that demand attention. But the underlying problem is difficult for people to address, either because it is obscure or costly to confront. So people "shift the burden" of their problem to other solutions—well-intentioned, easy fixes which seem extremely efficient. Unfortunately, the easier "solutions" only ameliorate the symptoms; they leave the underlying problem unaltered. The underlying problem grows worse, unnoticed because the symptoms apparently clear up, and the system loses whatever abilities it had to solve the underlying problem.

MANAGEMENT PRINCIPLE

Beware the symptomatic solution. Solutions that address only the symptoms of a problem, not fundamental causes, tend to have short-term benefits at best. In the long term, the problem resurfaces and there is increased pressure for symptomatic response. Meanwhile, the capability for fundamental solutions can atrophy.

WHERE IT IS FOUND

Shifting the burden structures are common in our personal as well as organizational lives. They come into play when there are obvious "symptoms of problems" that cry out for attention, and quick and ready "fixes" that can make these symptoms go away, at least for a while.

Consider the problem of stress that comes when our personal workload increases beyond our capabilities to deal with it effectively. We juggle work, family, and community in a never-ending blur of activity. If the workload increases beyond our capacity (which tends to happen for us all) the only fundamental solution is to limit the workload. This can be tough—it may mean passing up a promotion that will entail more travel. Or it may mean declining a position on the local school board. It means prioritizing and making choices. Instead, people are often tempted to juggle faster, relieving the stress with alcohol, drugs, or a more benign form of "stress reduction" (such as exercise or meditation). But, of course, drinking doesn't really solve the problem of overwork—it only masks the problem by temporarily relieving the stress. The problem comes back, and so does the need for drinking. Insidiously, the shifting the burden structure, if not interrupted, generates forces that are all-too-familiar in contemporary society. These are the dynamics of avoidance, the result of which is increasing dependency, and ultimately addiction.

A shifting the burden structure lurks behind many "solutions" which seem to work effectively, but nonetheless leave you with an uneasy feeling that they haven't quite taken care of the problem. Managers may believe in delegating work to subordinates but still rely too much on their own ability to step in and "handle things" at the first sign of

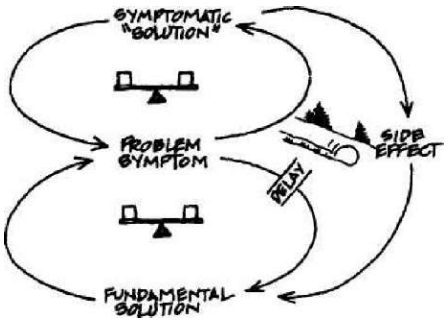
difficulty, so that the subordinate never gets the necessary experience to do the job. Businesses losing market share to foreign competitors may seek tariff protection and find themselves unable to operate without it. A Third World nation, unable to face difficult choices in limiting government expenditures in line with its tax revenues, finds itself generating deficits that are "financed" through printing money and inflation. Over time, inflation becomes a way of life, more and more government assistance is needed, and chronic deficits become accepted as inevitable. Shifting the burden structures also include food relief programs that "save" farmers

from having to grow crops, and pesticides that temporarily remove vermin, but also eliminate natural controls, making it easier for the pest to surge back in the future.

The shifting the burden is composed of two balancing (stabilizing) processes. Both are trying to adjust or correct the same problem symptom. The top circle represents the symptomatic intervention; the "quick fix." It solves the problem symptom quickly, but only temporarily. The bottom circle has a delay. It represents a more fundamental response to the problem, one whose effects take longer to become evident. However, the fundamental solution works far more effectively—it may be the only enduring way to deal with the problem.

Often (but not always), in shifting the burden structures there is also an additional reinforcing (amplifying) process created by "side effects" of the symptomatic solution. When this happens, the side effects often make it even more difficult to invoke the fundamental solution—for example, the side effects of drugs administered to correct a health problem. If the problem was caused originally by an unhealthy lifestyle (smoking, drinking, poor eating habits, lack of exercise), then the only fundamental solution lies in a change in lifestyle. The drugs (the symptomatic solution) make the symptom better, and remove pressure to make difficult personal changes. But they also have side effects that lead to still more health problems, making it even more difficult to develop a healthy lifestyle.

STRUCTURE



UNDERSTANDING AND USING THE STRUCTURE

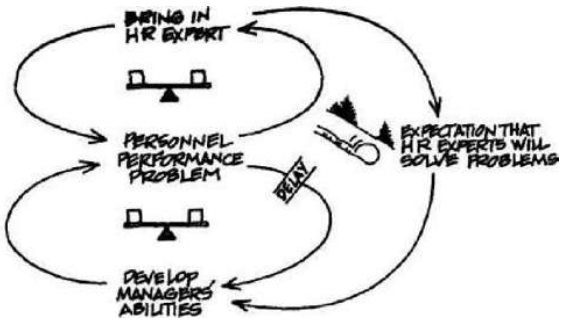
The shifting the burden structure explains a wide range of behaviors where well-intended "solutions" actually make matters worse over the long term. Opting for "symptomatic solutions" is enticing. Apparent improvement is achieved. Pressures, either external or internal, to "do something" about a vexing problem are relieved. But easing a problem symptom also reduces any perceived need to find more fundamental solutions. Meanwhile, the underlying problem remains unaddressed and may worsen, and the side effects of the symptomatic solution make it still harder to apply the fundamental solution. Over time, people rely more and more on the symptomatic solution, which is becoming increasingly the only solution. Without anyone making a conscious decision, people have "shifted the burden" to increasing reliance on symptomatic solutions.

Interactions between corporate staff and line managers are fraught with shifting the burden structures. For example, busy managers are often tempted to bring in human resource specialists to sort out personnel problems. The HR expert may solve the problem, but the manager's ability to solve other related problems has not improved. Eventually, other personnel issues will arise and the manager will be just as dependent on the HR expert as before. The very fact that the outside expert was used successfully before makes it even easier to turn to the expert again. "We had a new batch of difficulties, so we brought in the personnel specialists again. They are getting to know our people and

our situation well, so they are very efficient." Over time, HR experts become increasingly in demand, staff costs soar, and managers' development (and respect) declines.

Shifting the burden structures often underlie unintended drifts in strategic direction and erosion in competitive position. A recent group of executives in a high-tech firm were deeply concerned that their company was "losing its edge" by not bringing dramatic new products to market. It was less risky to improve existing products. However, they feared that a culture of "incrementalism" rather than "breakthrough" was being fostered. The safer, more predictable, easier-to-plan-for-and-organize processes of improvement innovation were becoming so entrenched that the managers wondered if the company was still capable of basic innovation.

As I listened, I recalled a similar strategic drift described by managers of a leading consumer goods producer, which had become



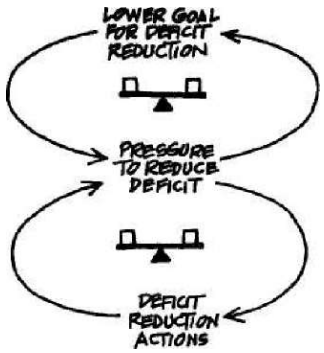
more and more dependent on advertising versus new product development. Whenever business sagged for one of its many products, the tendency was to run a new advertising promotion. The advertising culture had become so entrenched, that the last three CEOs were all ex-advertising executives, who frequently wrote ad copy personally. Meanwhile, the flow of major new products had dwindled to a trickle under their leadership.

A special case of shifting the burden, which recurs with alarming frequency, is "eroding goals." Whenever there is a gap between our goals and our current situation there are two sets of pressures: to

improve the situation and to lower our goals. How these pressures are dealt with is central to the discipline of personal mastery, as will be shown in Chapter 9.

Societies collude in eroding goals all the time: witness the lowered standards for "full employment" in the United States. The federal full-employment target slid from 4 percent in the 1960s to 6 to 7 percent by the early 1980s. (In other words, we were willing to tolerate 50 to 75 percent more unemployment as "natural.") Likewise, 3 to 4 percent inflation was considered severe in the early 1960s, but a victory for anti-inflation policies by the early 1980s. In 1984, the U.S. Congress passed the "Gramm-Rudman-Hollings" deficit reduction bill. The original bill called for reaching a balanced budget by 1991. Shortly thereafter, it was clear that the budget reduction was not proceeding on pace, so the target was shifted to 1993. This eroding goal structure can be diagrammed as follows:

As we will see in the next two chapters, similar eroding goal dynamics play out in organizations around goals for quality, goals for innovation, goals for personal growth of employees, and goals for organizational improvement. In effect, we all can become "addicted" to lowering our goals. Or, as a bumper sticker I saw recently said, "If all else fails, lower your goals."

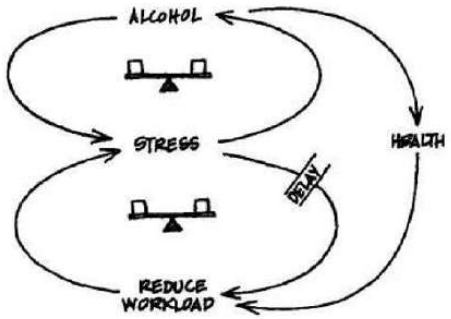


PATTERN OF BEHAVIOR

Regardless of the choice of symptomatic solution, it works—in a way. Drinking, for example, lifts some tension, at least for a while. It relieves

the problem symptom. If it didn't, people wouldn't drink. But it also gives the person the feeling of having "solved the problem," thereby diverting attention from the fundamental problem— controlling the workload. Failing to take a stand may well cause the workload to gradually increase further, since most of us are continually besieged by more demands on our time than we can possibly respond to. Over time, the workload continues to build, the stress returns, and the pressure to drink increases.

What makes the shifting the burden structure insidious is the subtle reinforcing cycle it fosters, increasing dependence on the symptomatic solution. Alcoholics eventually find themselves physically



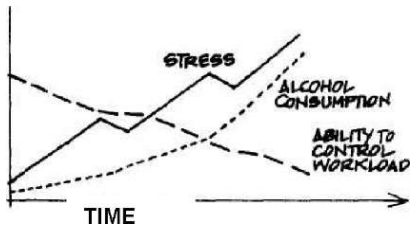
addicted. Their health deteriorates. As their self-confidence and

judgment atrophy, they are less and less able to solve their original workload problem. To trace out the causes of the reinforcing cycle, just imagine you are moving around the "figure eight" created by the two interacting feedback processes: stress builds, which leads to more alcohol, which relieves stress, which leads to less perceived need to adjust workload, which leads to more workload, which leads to more stress.

These are the generic dynamics of addiction. In fact, almost all forms of addiction have shifting the burden structures underlying them. All involve opting for symptomatic solutions, the gradual atrophy of the ability to focus on fundamental solutions, and the increasing reliance on

symptomatic solutions. By this definition, organizations and entire societies are subject to addiction as much as are individuals.

Shifting the burden structures tend to produce periodic crises, when the symptoms of stress surface. The crises are usually resolved with more of the symptomatic solution, causing the symptoms to temporarily improve. What is often less evident is a slow, long-term drift to lower levels of health: financial health for the corporation or physical health for the individual. The problem symptom grows worse and worse. The longer the deterioration goes unnoticed, or the longer people wait to confront the fundamental causes, the more difficult it can be to reverse the situation. While the fundamental response loses power, the symptomatic response grows stronger and stronger.



HOW TO ACHIEVE LEVERAGE

Dealing effectively with shifting the burden structures requires a combination of strengthening the fundamental response and weakening the symptomatic response. The character of organizations is often revealed in their ability (or inability) to face shifting-the-burden structures. Strengthening fundamental responses almost always re

quires a long-term orientation and a sense of shared vision. Without a vision of succeeding through new product innovation, pressures to divert investment into short-term problem-solving will be overwhelming. Without a vision of skilled "people-oriented" managers, the time and energy to develop those skills will not be forthcoming. Without a shared vision of the role government can and should play, and for which people will provide tax revenues to support, there can be no long-term solution to balance government spending and income.

Weakening the symptomatic response requires willingness to tell the truth about palliatives and "looking good" solutions. Managers might acknowledge, for example, that heavy advertising "steals" market share from competitors, but doesn't expand the market in any significant way. And politicians must admit that the resistance they face to raising taxes comes from the perception that the government is corrupt. Until they deal credibly with perceived corruption, they will neither be able to raise taxes nor reduce spending.

A splendid illustration of the principles of leverage in shifting the burden structures can be found in the approach of some of the most effective alcoholism and drug treatment programs. They insist that people face their addiction on one hand, while offering support groups and training to help them rehabilitate on the other. For example, the highly successful Alcoholics Anonymous creates powerful peer support to help people revitalize their ability to face whatever problems were driving them to drink, with a sense of vision that those problems can be solved. They also force individuals to acknowledge that "I am addicted to alcohol and will be for my entire life," so that the symptomatic solution can no longer function in secret.[9]

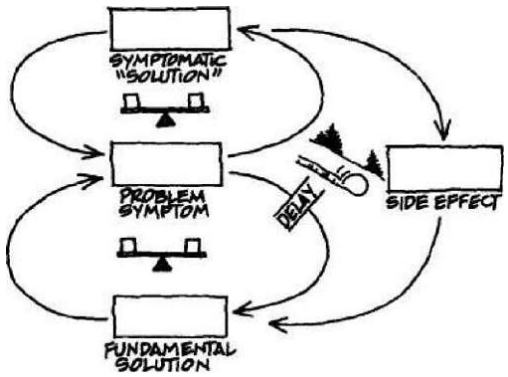
In the business example of managers becoming more and more dependent on HR consultants, the managers' own abilities must be developed more strongly, even though that may mean a larger initial investment. The HR experts must become coaches and mentors, not problem solvers, helping managers develop their own personal skills.

Sometimes symptomatic solutions are needed—for example, in treating a person suffering from a disease created by smoking or drinking. But symptomatic solutions must always be acknowledged as such, and combined with strategies for rehabilitating the capacity for fundamental solution, if the shifting the burden dynamic is to be interrupted. If symptomatic solutions are employed as if they are fundamental solutions, the search for fundamental solutions stops and shifting the burden sets in.

HOW TO CREATE YOUR OWN "SHIFTING THE BURDEN" STORY

There are three clues to the presence of a shifting the burden structure. First, there's a problem that gets gradually worse over the long term—although every so often it seems to get better for a while. Second, the overall health of the system gradually worsens. Third, there's a growing feeling of helplessness. People start out feeling euphoric—they've solved their problem!—but end up feeling as if they are victims.

In particular, look for situations of dependency, in which you have a sense that the real issues, the deeper issues, are never quite dealt with effectively. Again, once you have such a situation in mind, see if you can identify the appropriate elements of the reinforcing and balancing loops.



Start by identifying the "problem symptom." This will be the "squeaky wheel" that demands attention—such as stress, subordinates' inabilities to solve pressing problems, falling market share. Then identify a "fundamental solution" (there may be more than one)—a course of action that would, you believe, lead to enduring improvement. Then, identify one or several "symptomatic solutions" that might ameliorate symptoms for a time.

In fact, "fundamental solutions" and "symptomatic solutions" are relative terms, and what is most valuable is recog-

nizing the multiple ways in which a problem can be addressed, from the most fundamental to the most superficial.

Then identify the possible negative "side effects" of the symptomatic solution.

The primary insights in shifting the burden will come from (1) distinguishing different types of solutions; (2) seeing how reliance on symptomatic solutions can reinforce further reliance. The leverage will always involve strengthening the bottom circle, and/or weakening the top circle. Just as with limits to growth, it's best to test your conclusions here with small actions—and to give the tests time to come to fruition. In particular, strengthening an atrophied ability will most likely take a long period of time.

Limits to growth and shifting the burden are but two of the basic systems archetypes.—Several others are introduced in the following chapters. (Appendix 2 summarizes all the archetypes used in this book.) As the archetypes are mastered, they become combined into more elaborate systemic descriptions. The basic "sentences" become parts of paragraphs. The simple stories become integrated into more involved stories, with multiple themes, many characters, and more complex plots.

But the archetypes start the process of mastering systems thinking. By using the archetypes, we start to see more and more of the circles of causality that surround our daily activity. Over time, this leads naturally to thinking and acting more systemically.

To see how the archetypes get put into practice, the next chapter examines one way in which limits to growth and shifting the burden have proven useful—in understanding the ways a company with great growth potential can fail to realize that potential.

To me, bottom line of systems thinking is leverage—seeing where actions and changes in structures can lead to significant, enduring improvements. Often, leverage, follows the principle of economy of means: where the best results come not from large-scale efforts but from small well-focused actions. Our nonsystemic ways of thinking are so damaging specifically because they consistently lead us to focus on low-leverage changes: we focus on symptoms where the stress is greatest. We repair or ameliorate the symptoms. But such efforts only make matters better in the short run, at best, and worse in the long run.

It's hard to disagree with the principle of leverage. But the leverage in most real-life systems, such as most organizations, is not obvious to most of the actors in those systems. They don't see the "structures" underlying their actions. The purpose of the systems archetypes, such as limits to growth and shifting the burden, is to help see those structures and thus find the leverage, especially amid the pressures and crosscurrents of real-life business situations.

For example, let's look at a real story that we have seen again and again. In fact, the following case is a mosaic pieced together from several specific instances where the same story unfolded.[1]

WHEN WE CREATE OUR OWN "MARKET LIMITATIONS"

In the mid-1960s a new electronics company was founded with a unique high-tech product—a new type of computer. Thanks to its engineering know-how, WonderTech had a virtual lock on its market niche. There was enormous demand for its products, and there were enough investors to guarantee no financial constraints.

Yet the company, which began with meteoric growth, never sustained its rapid growth after its first three years. Eventually it declined into bankruptcy.

That fate would have seemed unthinkable during WonderTech's first three years, when sales doubled annually. In fact, sales were so good

one floor of an old mill building outside Boston, with about a dozen employees. As a member of Digital's Board of Directors (Digital was founded by several of Forrester's former MIT graduate students), Forrester later persuaded the board to rent the whole football-field-sized floor as soon as the space became available. But that leap in capacity, which seemed outrageous at first, allowed Digital to grow without eroding its standards. A most dramatic experience, Forrester said later, was to come back only six months later and find the entire floor full of people, productively employed. This episode was one of the first for a company that has achieved one of

the finest records of sustained growth in corporate history. For

years, Digital maintained a land bank of lots all over New England, so that it had land ready when it wanted to add capacity.

The art of systems thinking lies in being able to recognize increasingly (dynamically) complex and subtle structures, such as that at WonderTech amid the wealth of details, pressures, and cross currents that attend all real management settings. In fact, the essence of mastering systems thinking as a management discipline lies in seeing patterns where others see only events and forces to react to. Seeing the forest as well as the trees is a fundamental problem that plagues all firms, as is illustrated in the next chapter.

8

THE ART OF SEEING THE FOREST AND THE TREES

Of all recent U.S. presidents, probably none immersed himself so deeply in the issues facing the nation than Jimmy Carter. Yet, President Carter was widely seen as a relatively ineffective leader, leaving office with a 22 percent approval rating, the lowest of any president since the end of World II, including Richard Nixon.'

Jimmy Carter was a victim of complexity. Carter's thirst to know about issues firsthand left him drowning in details, without a clear perspective on those details. But, in fact, was Carter really that different from most contemporary leaders, in either the public or private sector? How many CEOs today can stand and give a fifteen-minute speech that lays out a compelling explanation of the systemic causes of an important issue, and the high- and low-leverage strategies for dealing with that issue?

We all know the metaphor of being able to "step back" far enough from the details to "see the forest for the trees." But, unfortunately, for most of us when we step back we just see "lots of trees." We pick our favorite one or two and focus our attention and efforts for change on those.

Systems thinking finds it greatest benefits in helping us distinguish high- from low-leverage changes in highly complex situations. In effect, the art of systems thinking lies in seeing through complexity to the underlying structures generating change. Systems thinking does not mean ignoring complexity. Rather, it means organizing complexity into a coherent story that illuminates the causes of problems and how they can be remedied in enduring ways. The increasing complexity of today's world leads many managers to assume that they lack information they need to act effectively. I would suggest that the fundamental "information problem" faced by managers is not too little information but too much information. What we most need are ways to know what is important and what is not important, what variables to focus on and which to pay less attention to—and we need ways to do this which can help groups or teams develop shared understanding.

THE PERILS OF BEING A PIONEER

One of the most spectacular and regrettable rises and falls of a prototype learning organization was People Express Airlines.[2] It is a parable of complexity that could not be disentangled in time to save the organization. Founded in 1980 to provide low-cost, high-quality airline service to travelers in the Eastern United States, People Express grew

in five years to be the nation's fifth-largest carrier. Along the way, People Express established a reputation as a corporate pioneer, crafting a stirring corporate philosophy articulated by charismatic founder Don Burr. "Most organizations believe that humans are generally bad and you have to control them and watch them," said Burr in one typical statement. "At People Express, people are trusted to do a good job until they prove they definitely won't . . ."[3] The airline translated that philosophy into a host of innovative human resource policies that have since been adopted by many other firms, such as job rotation, team management, universal stock ownership, and only four levels of hierarchy (with only four pay levels in the whole company). Yet, despite its spectacular early success, in September 1986 People Express was taken over by Texas Air Corporation, having lost $133 million in the first six months of 1986 alone. Many theories have been offered to explain People's growth and

collapse. Burr and the airline had gained much public attention for unusually "soft," people-oriented management policies. Hard-

headed business analysts felt that People's decline proved that

"business is business." Lofty ideals and democratic workplaces conflict with profits, they said. Others blamed Burr and his management team for failing to provide ongoing strategic leadership—especially after the purchase of Denver-based Frontier Airlines in 1985, which brought in four thousand new employees who shared neither People's values nor its business strategy.

Some of People's own executives, including Burr himself, offer a different explanation. In 1984, partly in response to the success of low-cost carriers such as People Express, American Airlines introduced its Sabre seat-reservation computer system, ushering in a new era of "load management"—meaning that airlines could offer a limited number of seats at much-reduced prices, while still booking business passengers and others at full coach. It was a dramatic change in the

airline business, and it brought People Express up against significant price competition for the first time.

It is no wonder that People Express poses such a puzzle. Understanding what went wrong requires sorting out an enormously complex set of factors such as:

FLEET	HUMAN	COMPETITIVE
	RESOURCES	FACTORS
Planes		
Capacity of aircraft	Service personnel	Market size Market
Routes	Aircraft personnel	segments Reputation
Scheduled flights	Maintenance	Service quality
Competitor routes	personnel Hiring	Competitor service
& flights Service	Training Turnover	quality
hours per	Morale	Fares
plane (per day)	Productivity	"Load

Fuel efficiency	Experience Team	management"
	management Job	Competitor fares
	rotation Stock	
	ownership	
	Temporaries	

FINANCIAL	"POLICY
VARIABLES	LEVERS"
Revenues	(A few of the key decisions that
Profit	People's management must make)
Cost of plane	Buying planes
operations Cost	Hiring people
of service	Pricing

operations Cost	Marketing expenditures "Service
of marketing	scope" (range of services to offer)
Wages Stock price	
Growth rate Debt	
Interest Rate	
Such "laundry lists"	of important variables hint at the enormous
detail complexity of realistic management problems. It's easy to get lost	
in the "trees" of these details and lose sight of the "forest"—	
mastering the dynamic complexity essential to successful strategy.	
Here's where the discipline of systems thinking finds its greatest	
advantage. By using the systems archetypes we can learn how to	
"structure" the details into a coherent picture of the forces at play.	

A THEORY OF WHAT

HAPPENED AT PEOPLE EXPRESS

Disentangling a complex story such as People Express Airlines starts with identifying the forces that shaped its evolution and the structures that may have lain behind those forces. This can lead to a very different picture of a firm's problems than suggested by just looking at the events.

People Express started with an innovative product concept, and the lowest costs in the industry. (People Express was the first airline founded after the 1978 U.S. airline deregulation.) The airline boasted a combination of deeply discounted fares and friendly, no-frills services (for example, meals and baggage handling were extra charges). Flying People Express on many of its East Coast routes was cheaper

than taking a bus. This quickly attracted so many new customers that, by the third quarter of 1982, Burr announced at People Express's quarterly financial meeting: "We're now the biggest carrier, in terms of departures, at any New York airport."[4]

In its early days, with universal stock ownership, People's employees had tremendous morale buoyed by the company's rapid success and exciting vision. "I have never flown on an aircraft," wrote one journalist in 1982, "whose help is so cheerful and invested in their work."[5] As Burr said, "At People Express, attitude is as important as altitude."

But that early reputation, and those low prices, brought demand that began, by mid-1982, to outstrip the company's ability to serve. Lori Dubose, managing officer for Human Resources, was quoted as having trouble finding "enough people to staff adequately" and still "have some time for management development." By November 1982, one third of People's staff was temporary help—four hundred temporaries in all. In terms of simple head count, there were probably enough "Customer Service Managers," as People Express's service personnel were

called, to keep pace. But the innovative job rotation and team management concepts meant that training and assimilation of service personnel took much longer than in more traditional airlines.

Despite these difficulties, demand for People's deep discount flights continued to grow phenomenally. Passenger seat miles more than doubled in 1982, and again in 1983. By the end of 1983, People was one of the most profitable carriers in the industry. Its stock was trading at $22 a share, up from $8.50 at startup. Despite being overworked, many of People's employees were growing wealthy. Burr preached the merits of hard work in the pursuit of a lofty vision: "People get more fatigued and stressed when they don't have a lot to do. I really believe that, and I think I have tested it. ... It's sensational what direction can do. The beauty of the human condition is the magic people are capable of when there's direction. When there's no direction, you're not capable of much." Revenues doubled again in 1984, although profits did not rise proportionately.

Meanwhile, People Express's customers were complaining more about service problems. There were more and more ticketing and reservation delays, and canceled or overbooked flights. On-board flight attendants became less friendly and less efficient. Customers forgave all this at first, and kept returning to the airline. Thus, there was no apparent penalty for poor service. But during 1984 and 1985,

increasing numbers of customers began to trickle away. Growth became entirely driven by price, and People Express's customers became increasingly price conscious, not quality conscious. Eventually, People's stock price fell, which diminished morale and service further. By its last year of operation, flying People Express had become such a dismal experience that it was nicknamed "People Distress," and its once loyal customers began to patronize other carriers.

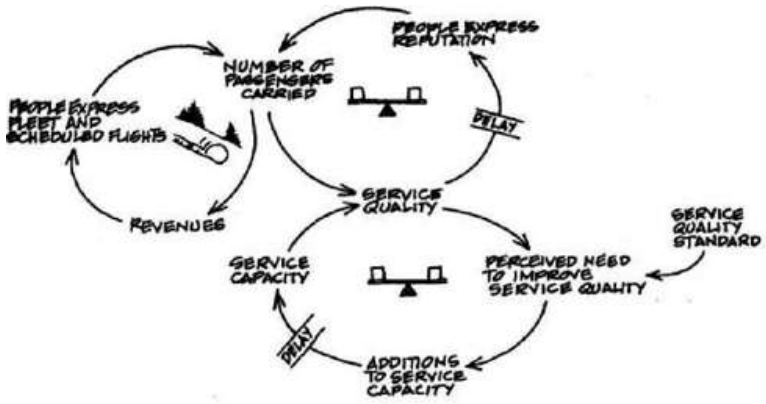
People Express's chronic problems with service quality and having enough competent and committed service personnel suggests subtle similarities to WonderTech, with its problems of inadequate

manufacturing capacity and eroding delivery service—even though the specifics at People Express differed in almost every way from the specifics at WonderTech. WonderTech was a manufacturing company. People Express was a service business. Whereas the critical capacity variable at WonderTech was production capacity, the critical capacity variable at People Express was "service capacity," the composite of personnel, experience, and morale. WonderTech drove growth through aggressive additions to its direct sales force. People Express drove growth through aggressive additions to its fleet and flight schedule. WonderTech foundered because of worsening delivery times and eroding delivery time standards. People Express foundered because of declining customer service quality and standards for service. But despite all those differences, underlying both were the dynamics of growth and underinvestment, the systems archetype that explains one of the most common ways that organizations inadvertently limit their own growth.

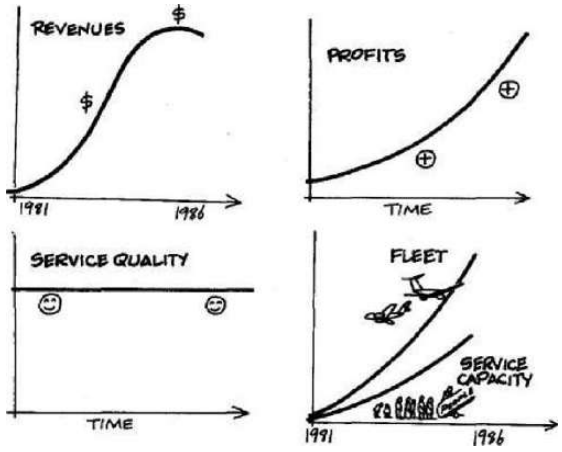
Below is how the growth and underinvestment structure looks, mapped onto the People Express story.

At People Express, this structure produced a pattern of rapid growth and equally rapid decline, which you can see in the following charts of behavior over the five years' time period.[6] Sales grew rapidly then slowed and then went into decline. Profits rose, then collapsed, and turned into large losses. Service quality started high then steadily eroded. Fleet size grew rapidly, as did the number of service personnel, but service capacity failed to keep pace with passenger growth.

For the managers at People Express, underinvestment was, perhaps, even harder to see than it was at WonderTech. After all, hadn't People been extremely aggressive in investing in aircraft capacity? But the critical underinvestment was in service capacity, not aircraft



capacity. Moreover, inadequate service capacity was masked, to a degree, by tremendous growth in total head count. People didn't fail to expand the number of service personnel to meet its customer growth; it failed to build the composite of people, skills, and organizational infrastructure that was needed to serve customer demand at high levels of quality.[7]



Yet, People Express could have been an enduring success, in the opinion of those of us who have tried to understand it systemically. It had a unique product-cost position that would have been very difficult for competitors to match. Had the firm been able to maintain

high service quality to go with its low fares, it would have been hard to beat. Falling to maintain service quality made price its only competitive advantage, which in turn made it vulnerable.

At MIT, John Sterman has created a computer-based "micro-world" of the People Express case history called the "People Express Flight Simulator." At the beginning of the school year, all incoming master's degree students in the Management School get to try their hand at seeing how well they might have done at the reins of People Express. As a learning tool, the flight simulator lets students try a wide range of policies and strategies in an attempt to exploit People Express's initial advantage in cost and market position. They try marketing promotions and price cuts. They try hiring more service personnel and less service personnel. They try not expanding the fleet so rapidly (e.g., not buying Frontier Airlines) and they try expanding more rapidly. They try redefining the "scope" of People's services to include more or fewer services for the basic fare. As they come to understand the growth and underinvestment dynamics, they come around to strategies that succeed in sustaining growth in revenues and profits, maintaining high service quality, and expanding service capacity at a pace in balance with passengers carried. The key is strengthening the "fundamental solution" of building service capacity. This is best done by limiting demand growth and by a commitment to service quality. Both objectives can be achieved through simple changes, especially through:

- 25 percent higher fares (still two thirds of average industry fares)

- Sustained, high service standards

Though simple, these high-leverage changes represent a shift in basic strategy. Sustained high service standards create a commitment to service quality as a competitive advantage. Many have suggested that People grew too fast, but the leverage lies in pricing somewhat higher, both to slow down growth and to increase profits to invest in building service capacity. Slightly higher prices would have left People Express with more room to maneuver (say by temporarily lowering price) when competitors started to chip away at the firm's price advantage. (In the simulator—even with a sharp drop in competitor fares, as occurred

when computerized reservation systems were introduced— People Express still remains successful with the above strategy.)

In the end, People Express's executives' belief that the enemy was "out there" kept them from seeing the contradictions in their

own policies and strategies. The company sought to innovate with

dramatically new ideas in human resource policies, yet it also tried to become a major national player in the airline industry within a few years. The two goals were internally contradictory. For example, to sustain 100 percent per year growth, you need "cookie cutter" jobs for which people can be trained in weeks, rather than the sophisticated human resource system requiring many months for people to master many different types of skills.

Consequently, the airline slipped into a vicious cycle of underinvestment and eroding quality (for both customers and employees) that belied all of the executives' original worthy ideals about employee management and customer service. It is impossible to say with certainty what would have happened if they had kept high service quality as an unshakable goal and priced their product so they could build adequate service capacity. With the right mix of policies, People Express's innovative human-resource policies and timely entry into the deregulated airline industry might have produced an enduring success story. One thing is certain, People Express had a unique industry position that would have been very difficult for major carriers to match if it had been able to sustain the enthusiasm and commitment of its people.

Mastering such basic archetypes as growth and underinvestment is the first step in developing the capability of seeing the forest and the trees —of seeing information in terms of broad and detailed patterns. Only by seeing both can you respond powerfully to the challenge of complexity and change.

But, ultimately, mastering the language of systems thinking also requires the other complementary learning disciplines. Each contributes important principles and tools that make individuals, teams, and organizations more able to make the shift from seeing the world primarily from a linear perspective to seeing and acting systemically.

P A R T I I I

The Core Disciplines: Building the Learning Organization

9

PERSONAL MASTERY

THE SPIRIT OF THE LEARNING ORGANIZATION

Organizations learn only through individuals who learn. Individual learning does not guarantee organizational learning. But without it no organizational learning occurs.

A small number of organizational leaders are recognizing the radical rethinking of corporate philosophy which a commitment to individual learning requires. Kazuo Inamori, founder and president of Kyocera (a world leader in advanced ceramics technology used in electronic components, medical materials, and its own line of office automation and communications equipment), says this:

Whether it is research and development, company management, or any other aspect of business, the active force is "people." And people have their own will, their own mind, and their own way of thinking. If the employees themselves are not sufficiently motivated to challenge the goals of growth and technological develop

ment . . . there will simply be no growth, no gain in productivity,

and no technological development.[1]