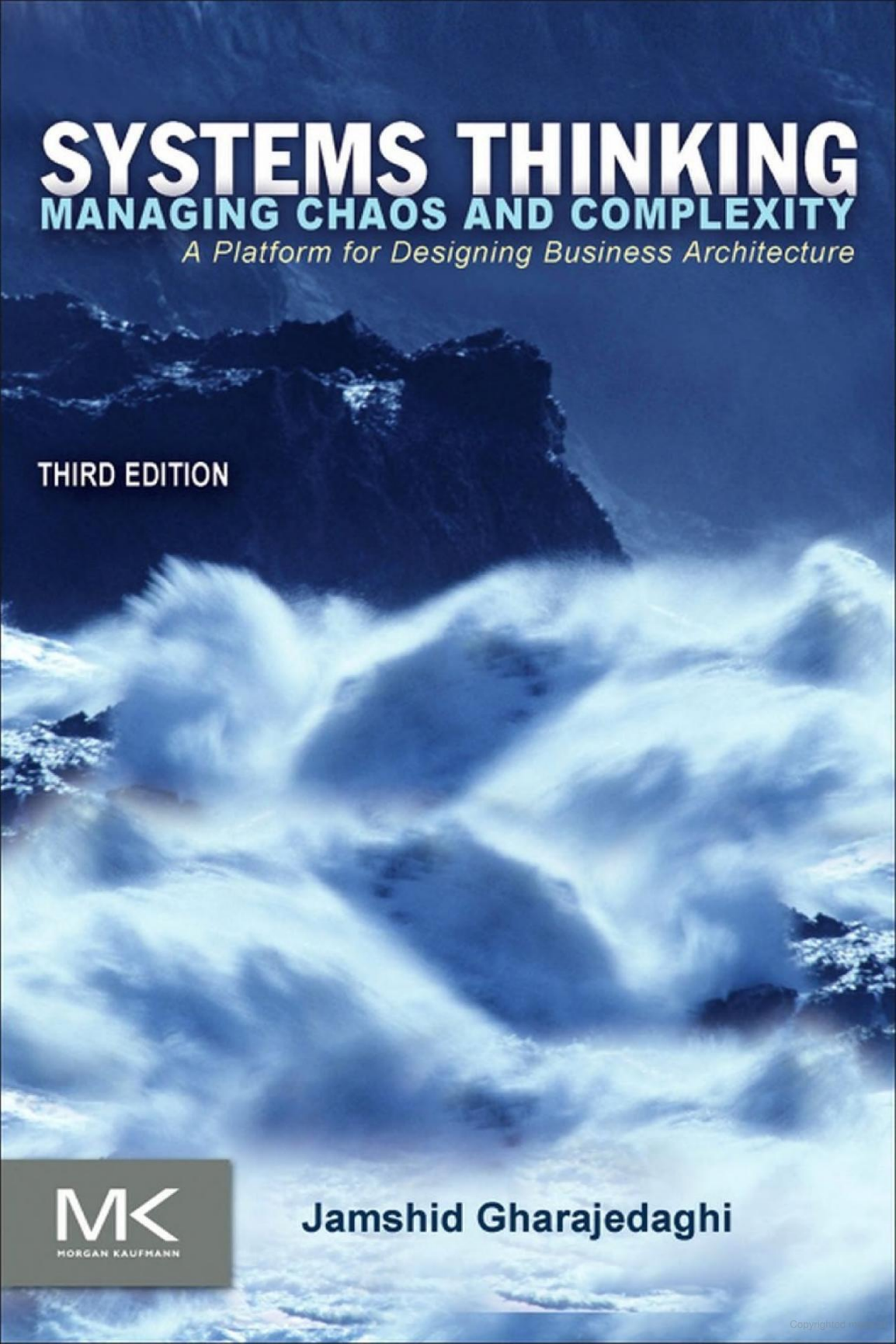
SYSTEMS THINKING
MANAGING CHAOS AND COMPLEXITY
A Platform for Designing Business Architecture
THIRD EDITION
MK
MORGAN KAUFMANN
Jamshid Gharajedaghi

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Foreword to the Third Edition

A TRIBUTE TO MEMORIES AND CONTRIBUTIONS OF RUSSELL L. ACKOFF TO DESIGN THINKING

The grand old man of systems sciences, my dear friend of the last 40 years, is no longer with us. Russell Ackoff left us, unexpectedly, on October 29, 2009, due to complications from hip surgery. Just a week prior, we had a beautiful discussion about the resurgence of the same set of old interactive problems. We also discussed how the growing concerns with frequent market bubbles, faulty business models, challenges of globalization, blind pursuit of efficiency at any cost, stubborn unemployment, surging deficit, the state of public education, and an increasingly polarized society have created an overdue doubt in the minds of many that the existing conventional tools and the dominant growth paradigm may no longer be capable of dealing with the emerging complexities of our time. Sharing these concerns, we talked about how to make systems thinking more accessible to a larger group of practitioners.

In this context and considering the current surge of interest in design thinking, I felt it was time to update and expand the methodology (Part Three) portion of this book by dedicating one full chapter to each one of the four foundations of systems thinking. This discussion also brought out memories of our historic meeting in 1974 when, for the first time, Russ had told me: "design is the future of systems methodology and is the vehicle through which choice is manifested." I told him how this statement had affected my professional life and how much I would appreciate a forward from him to the potential third edition explaining why he still believed that design thinking is the answer to the challenges of interdependency and complexity.

In the aftermath of his unfortunate hip operation, I had forgotten all about this conversation when Mrs. Ackoff kindly gave me a note she had found in Russ' working file. The note, with my name on it, was about our meeting and a reminder to write a piece for my book outlining the thinking process that had led him to "interactive design." I sadly realized that we had lost a golden opportunity to learn about a colorful thought process that for so long had affected so many people.

What a beautiful piece it would have been if Russ had the time to finish it. But all was not lost; I remembered that there was another forward written by Russ for an earlier book of mine, *Towards a Systems Theory of Organization*, published in 1985 by Intersystems. In this forward Russ tells the history from which the phenomenal conception of Social Systems

Sciences had evolved. Although nothing could replace the beautiful gift of having a forward written by him for this book, the old forward at least provided an enchanting window into the history and the traditions that had produced this incredible thought process. Unfortunately, I found out that Intersystems is no longer in operation and the old book is out of print and not readily available. It was then that I decided to ask my publisher if I could reproduce the old forward here as a tribute to Ackoff and a reminder of his vital and immeasurable contributions to the thinking that is at the core of this book. The following is that particular forward.

> There is nothing that an author who has tried to produce new ideas values more than having another take those ideas and develop them even further. Jamshid Gharajedaghi has done just this to my work. But he has done a great deal more. He has made significant additions of his own. The tradition out of which his work has come and that from which mine has arisen are very different, but these two traditions intersected a number of years ago and have merged to give his work a freshness and originality that I envy. It may be helpful to the reader to share some of the history from which Jamshid's and my joint efforts have emerged.
>
> I began graduate work in the philosophy of sciences at the University of Pennsylvania in 1941 where I came under the influence of the "grand old man" of the department, the eminent philosopher E.A. Singer, Jr. Because of the informality of the department he created I began to collaborate with two younger members of the faculty, both of whom were former students of Singer, Thomas A. Cown and C. West Churchman.
>
> Three aspects of Singer's philosophy had a particularly strong influence on me. First, that the practice of philosophy, its application, was necessary for the development of philosophy itself. Second, that effective work on "real" problems required an interdisciplinary approach. Third, that the social area needed more work than any of the other domains of science and that this was the most difficult.
>
> We developed a concept of a research group that would enable us to practice philosophy in the social domain by dealing with real problems. The organization we designed was called "The Institute of Experimental Method." With the participation of a number of other graduate students in philosophy and a few other members of the faculty we started this institute on a completely informal basis.
>
> In June of 1946 I accepted an appointment to the Philosophy Department of (then) Wayne University in Detroit. I did so because the dean of the college had shown enthusiasm for the idea of establishing an Institute of Applied Philosophy and offered to support an effort to create it. In the following year Churchman also accepted a full-time appointment in philosophy. Meanwhile, Cowan had immigrated to the

Law School of Wayne from Nebraska to which he had gone when he left Penn in 1946. The other two members of the philosophy department of Wayne viewed our efforts to establish an Institute of Applied Philosophy as prostitution of this ancient pursuit. A "fight" broke out over this issue, one that involved a large part of the faculty, administration, and student body at Wayne. My position in that department became untenable.

In the spring of 1951 Churchman and I accepted appointments to (then) Case Institute of Technology in Cleveland because Case was committed to establishing an activity in Operations Research and Churchman and I had come to believe we could probably work better under this name than under the cloak of academic philosophy. By the end of 1952 we had formal approval, but not without faculty opposition, for the first doctoral program in Operations Research. From then on the Group and the program grew rapidly and flourished. Case became a mecca to which pilgrimages of operations researchers from around the world came. In 1958, Churchman, for personal reasons, migrated to the University of California at Berkeley where he established a similar activity. Academic Operations Research activities began to proliferate and flourish, many of them modeled on those at Case.

In June of 1964 the research group and academic program moved to Penn bringing with it most of the faculty, students, and research projects. Our activities flourished in the very supportive environment that Penn and Wharton provided. The wide variety of faculty members that we were able to involve in our activities significantly enhanced our capabilities. By the mid-1960s I had become uncomfortable with the direction, or rather, the lack of direction, of professional Operations Research. I had four major complaints.

First, it had become addicted to its mathematical tools and had lost sight of the problems of management. As a result it was looking for problems to which to apply its tools rather than looking for tools that were suitable for solving the changing problems of management. Second, it failed to take into account the fact that problems are abstractions extracted from reality by analysis. Reality consists of systems of problems, problems that are strongly interactive, messes. I believed that we had to develop ways of dealing with these systems of problems as wholes. Third, Operations Research had become a discipline and had lost its commitment to interdisciplinarity. Most of it was being carried out by professionals who had been trained in the subject, its mathematical techniques. There was little interaction with the other sciences professions and humanities. Finally, Operations Research was ignoring the developments in systems thinking — the methodology, concepts, and theories being developed by systems thinkers.

For these reasons, five of us on the OR faculty designed a new program which we wanted to provide as an option to students entering the program. In addition to myself, there was Eric Trist, Hasan Ozbekhan, Thomas Saaty, and James Emshoff. We were able to initiate a new experimental program and administrative entity in The Wharton School called the Social Systems Sciences. It came to be known as "S Cubed." This program along with its research arm, the Busch Center, now hosts the largest doctoral program in the school.

The graduate and research programs are directed at producing professionals who were capable of planning for, doing research on, and designing social systems, systems in which people play the major role. It is dedicated to the development and use of theories of social systems and professional practice, and the practice of such theories. It is also committed to the development of methodology and conceptual systems, which enable us to design and manage social systems more effectively.

In 1968 I made my first trip to Iran on a mission for the UN. I met Jamshid during that visit. He was then employed by IBM. On one of my subsequent visits I found that he had assumed the direction of the Industrial Management Institute and had integrated the research and academic principles of S^3 with its own program developed locally. We started a personal and institutional collaboration. He sent a number of his staff to us for graduate work and we engaged in several joint projects. We tried to entice him to Penn as a visiting professor but he was unwilling to leave his remarkable institute. I could not blame him. In his position I would have acted as he did. Unfortunately for him, but fortunately for us, the revolution in Iran changed all that. That upheaval virtually destroyed his institute and his opportunities for carrying out his work. He left Iran with the help of our invitation and immediately joined us. Shortly after, I was able to transfer the direction of the Busch Center to him.

His joining us was a major event in my life. An investigator into a serious and complex subject welcomes a convergence of a broad stream of ideas, experience, and hard work of a distinctively different cultural origin. This book is a record of collaboration between the system of systems thought stemming originally from the works of Edgar A. Singer, T. Cowan, C. West Churchman, and myself working primarily in the cultural milieu of the western world and the author of this book working for many years in the apparently quite dissimilar situation of an ancient eastern culture. An apparent miracle happened. What was originally thought of as a fundamentally disparate source of alien views on the nature of systems organization turned easily and naturally into a joint effort. The fundamental nature of systems organization was at once perceived to be a unity in diversity. When Professor Gharajedaghi joined the Social Systems Science department of

> the Wharton School and assumed the direction of its research, the Busch Center, he began a two-pronged activity of research into the nature of systems organization and applied research and application. In a series of his writings on systems theory it became evident quite early that the two streams of thought were not only basically compatible but also had the happy effect of enriching each other. The evidence of this fortunate coalescence of a different cultural rapprochement is the present work.
>
> Jamshid is not only an invaluable friend and colleague, he is also a constant source of inspiration. Therefore I was delighted by the invitation to open this book, which enables me to invite you to share in the inspiration he has provided me.
>
> **Russell L. Ackoff**

Ackoff retired from the University of Pennsylvania in 1986 at the age of 65, due to a mandatory retirement rule at the time. Many at the Busch Center joined him to create INTERACT, The Institute for Interactive Management. For the next 20 years INTERACT became Ackoff's professional home until his retirement in 2006.

In addition to being a great mentor, Ackoff was a wonderful friend and an exceptional human being. I miss him enormously.

Jamshid Gharajedaghi

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Foreword to the Second Edition

Professor Thomas Lee of MIT was a dear friend. I met him in the early 1980s when he was the Secretary General of the International Institute for Applied Systems Analysis (IIASA). Tom was obsessed with the notion that two distinct traditions of systems thinking — Ackoff's interactive design and Forrester's systems dynamics — were complementary. For years he insisted that we should work together to merge the two prominent systems methodologies into a single unified one. But at the time I was preoccupied with two other exciting conceptions. The first one was consideration of culture as an operating system that guides social organizations toward a predefined order. The second was a hunch that iteration is the key for understanding complexity.

Sadly, Tom passed away, but he managed to get a promise from me to work on his favorite project. To fulfill my promise I tried several different approaches, all in vain, before realizing that I had the solution all along. I had used it in the first edition of this book to combine my version of holistic thinking — iteration of structure, function, and process — with interactive design. Suddenly it became clear that interactive design is not just a simple methodology. It is also a platform that could be used to integrate the iterative approach, systems dynamics, and the challenge of self-organization of sociocultural systems (neg-entropic process) into a comprehensive systems methodology.

I prepared a draft of my thinking and showed it to my mentor Russ Ackoff. He liked it very much and insisted that I should publish it in a new book.

Coincidentally, at that time, Dean Thomas Manahan of Villanova University and Niel Sicherman, Associate Dean of Executive Education, asked me to help them design a distinctive Executive MBA program that would use systems thinking as a platform to integrate the relevant subjects into a unified whole. I was ready for this assignment. The systems methodology I had developed was uniquely qualified to deal with the challenge that most MBA programs have not been able to deliver. Ten successful classes of Villanova Executive MBA graduates are testimony for the effectiveness of this approach.

When Dennis McGonagle, my editor from Elsevier, called to see whether I was ready for a new edition, I welcomed the opportunity to revise Chapters 4 through 7 from the previous edition to incorporate this exciting concept.

But, in the end, it was the remarkable support of my valued partner Susan Leddick that got the job done. Susan not only edited the revised chapters with utmost attention but also had many invaluable suggestions that improved the outcome significantly.

So, here it is, my new version of a comprehensive systems methodology. I sincerely believe that the beauty of interactive design and the magic of the iteration of structure, function, and process — when combined with the power of operational thinking, and genuine understanding of neg-entropic processes — create a competent and exciting systems methodology that goes a long way in dealing with emerging challenges of seemingly complex and chaotic sociocultural systems.

Jamshid Gharajedaghi

Preface

This is an unconventional book for an unconventional reader. It is intended for those professionals who, in addition to their specialized knowledge, would like to get a handle on life so they may put their special text into its proper context. It speaks to those thinkers and practitioners who have come to realize that *learning to be* is as much a necessary part of a successful professional life as is *learning to do*; and that to remain unidimensional is to become boringly predictable.

This book is about a new mode of seeing, doing, and being *in the world*; it is a way of thinking through chaos and complexity. It is not another "*how-to*" book, nor an alternative to what is already available. It is not a variation on the tired theme of offering the latest version of the common characteristics of the winners.

It also violates the golden rule of best sellers. I am told the experience of dealing with too many ideas in a single book is way out of the comfort zone of most readers.

However, the ideas in this book, although many, converge and create a whole that is profoundly more beautiful than any one concept in isolation. The real beauty, therefore, lies in experiencing the whole, seeing them all come together fusing into one.

As for the choice between breaking the message or breaking the norm, it was obvious which one had to go. If that meant being a minority of one, so be it.

This book, nevertheless, speaks to everyone for whom the joy of thinking is still alive and kicking and whose enthusiasm to entertain exciting but unfamiliar conceptions is not yet exhausted.

In a nutshell, the book is about systems. The imperatives of interdependency, the necessity of reducing endless complexities, and the need to produce manageable simplicities require a workable systems methodology, a holistic frame of reference that would allow us to focus on the relevant issues and avoid the endless search for more details while drowning in proliferating useless information.

Contrary to a widely held belief, the popular notion of a multidisciplinary approach is not a systems approach. The ability to synthesize separate findings into a coherent whole seems far more critical than the ability to generate information from different perspectives.

This book, with a practical orientation and yet a profound theoretical depth, goes beyond the simple declaration of desirability of systems thinking. It deals with challenges of interdependency, chaos, and choice using an elaborate scheme called *iterative design*.

The iterative design explicitly recognizes that choice is at the heart of human development. Development is the capacity to choose; design is a vehicle for enhancement of choice and holistic thinking. Designers, in this book, seek to choose rather than predict the future. They try to understand rational, emotional, and cultural dimensions of choice and to produce a design that satisfies a multitude of functions. They learn how to use what they already know, learn how to realize what they do not know, and learn how to learn what they need to know.

This book is divided into four parts. Part One identifies where systems thinking fits into the overall scheme of things. It provides an overview, a total picture of major theoretical traditions in management and systems thinking and their relationship.

Parts Two and Three are the guts of the book. Part Two discusses the five systems principles as the building blocks of the mental model used to generate the initial set of assumptions about the system. It also identifies the comprehensive set of variables that collectively describe the organization in its totality. Part Three deals extensively with the development of iterative design and its practical implications in defining problems and designing solutions.

Part Four reviews five actual cases of designing a business architecture. The Oneida Nation, Butterworth Health System, Commonwealth Energy System, Marriott Corporation, and Carrier Corporation represent a diverse group of challenging social organizations. I call them "the gutsy few" because they were willing to experiment with unconventional solutions without worrying about who had done it first. I am grateful for their trust and permission to share synopses of their designs with others.

Acknowledgment

A lifetime of teaching and consulting involves indebtedness to innumerable sources of wisdom. I have learned from my students and clients far more than I ever taught them. Looking back, I can hardly even begin to recall the fires by which I was warmed, the lights by which I found my way. And yet there are faces that vividly stand out.

Russel L. Ackoff has been my mentor, business partner, and a great friend. He was there, as always, with his infinite wisdom and uncompromising critique to examine every line and dissect every concept of this manuscript. I welcomed his measured views and took all of his recommendations.

Reza Niazmand was the first who found my strange way of thinking interesting enough to trust me to convert The Industrial Management Institute, the entity he had spent all of his professional life to create, into a consulting research and training firm based on systems thinking. Unyielding support of this giant man during my exciting years of tenure as the head of the Industrial Management Institute set the stage for initial development and gutsy practice of many of the ideas presented in this work.

Bijan Khorram, as a friend and colleague of over four decades, the infusion of his thinking on me knows no bounds. He acted as the sounding board to examine the soundness of ideas and the potency of their configurations. He directly collaborated in the redesigns and write-ups of the cases presented in Part Four: Systems Practice. Stylistically, his influence permeated the entire exercise.

Johnny Pourdehnad's insatiable love to search was a blessing. With him around access to valuable resources was fun rather than obstruction.

Jason Magidson helped with graphics. Pat Egner did the editing; the Anglicized version is indebted to her efforts.

Then there were the special clients whose patronage, courage, and intellectual challenge in bringing the conceptual ideas to concrete fruition proved invaluable indeed. Reza Ghotbi, Akbar Etemad, Nader Hakimi, Charlie Ligon, Karl J. Krapek, Len Devanna and Artley Skenandore, Gerry Wilson, Tommy Lee, Pat Stocker, and Kathy Dannemiller with their unfailing trust turned out to be the difference that made the difference.

Last but not least is Karen Speerstra, Publishing Director of Butterworth Heinemann, who, with remarkable decisiveness, got the project rolling. March Jacques proved to be a fantastic matchmaker.

So my gratitude to them will remain a debt I can never repay.

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PART | ONE

SYSTEM PHILOSOPHY

The Name of the Devil

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How the Game Is Evolving

The most stubborn habits, which resist change with the greatest tenacity, are those that worked well for a space of time and led to the practitioner being rewarded for those behaviors. If you suddenly tell such persons that their recipe for success is no longer viable, their personal experience belies your diagnosis. The road to convincing them is hard. It is the stuff of classic tragedy. [1]

The Dow Jones Industrial Average recently marked its 100th anniversary. Of the original companies listed in 1896 only GE had survived to join in the celebration. In the mid-1960s, Jean-Jacques Shreiber, in his best-selling book, *American Challenge* (1967), told his fellow Europeans: "Swallow your pride, imitate America, or accept her dominance forever." But in late 1970s, it was "Japan Inc." that somehow posed the greatest competitive challenge to corporate America. It took 300% devaluation of the dollar to ward off this challenge.

Fourteen of the 47 companies exemplified in Tom Peters' much-acclaimed book of the 1980s, *In Search of Excellence* (1982), lost their luster in less than four years, at least in the sense that they had suffered serious profit erosion.

The collapse of savings and loans and real estate, along with the fall of the defense industry in the late 1980s, could have led to a disastrous 1990s, but counterintuitively, these phenomena resulted in a restructuring of the financial and intellectual resources in America, which may very well have been a coproducer of one of the longest periods of economic expansion and prosperity in America. Ironically, in mid-1998, worries about Japan's economy were the nagging concerns of American investors. Collapse of the dotcom bonanza (late 1999 and early 2000) and the housing bubble and the subprime and financial systems fiasco led to the troubling question: What is going on?

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[1]Charles Hampden-Turner and Linda Arc, *The Raveled Knot: An Examination of the Time-to-Market Issue at Analog's Semi-conductor Division*, unpublished internal report.

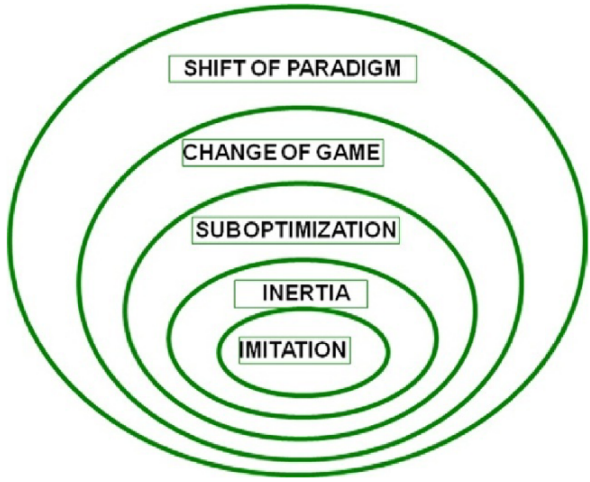

FIGURE 1.1 Hierarchy of forces that erode competitive advantage.

The game keeps changing, but this is hardly news. By now it is a well-known and even a tired secret that what contributes to the fall of so many great enterprises is that somehow their recipe for success becomes ineffective. There seems to be a devil at work here, and the name of this devil is success.

Each one of us can recall cases of great powers, nations, organizations, or personalities rising and falling. This phenomenon occurs all too frequently to be dismissed as coincidental. So what underlying forces convert success to failure? Let us start with the following observation. The forces that make a failure out of success form a five level hierarchy (see Figure 1.1). Each level represents a distinct tendency, but together they form an interactive whole in which higher levels provide the context for the lower levels. At each level success plays a critical but different role.

1.1 IMITATION

Operating at the first level, imitation is the most basic force. Competitive advantage is by definition a distinction. Successful distinctions, in time, are eroded by imitation. At that point, exceptions become norms and lose their advantage.

Although imitation has been present at all times, today its significance for American business has changed by an order of magnitude. Advances in information technology, communication, and reverse engineering have increased the product technology's vulnerability to imitation. Any technological distinction in a given product is now fair game for potential imitators who can learn, copy, and reproduce it in practically no time. Such easy imitation has been significant for American industry. While product

technology has traditionally been the cornerstone of the American competitive game, countries with an advantage in process technology have gained a dual advantage.

First, it is difficult to copy a distinction in process technology because its critical elements are knowledge workers. Second, competency in a process technology makes it simpler to transfer knowledge from one context to another, easing the operationalization of new knowledge. The results are dramatic: much faster time-to-market performance, a lower break-even point, better product variety, and faster response to change.

In the late 1970s, a well-known equipment company in America realized it had a 40% cost disadvantage in comparison with its direct Japanese competitor. The company, ironically, was the technological leader in the lift truck industry. Its cost structure was 40% raw material, 15% direct labor, and 45% overhead. Overhead (transformation cost) was simply calculated as 300% of direct labor.

The company decided to reduce the cost by 20%. It was assumed that a 5% reduction in direct labor would automatically reduce overhead by another 15%, resulting in a 20% cost reduction. After a whole year of struggle, direct labor was reduced to 10% without any reduction in the overhead. When we were asked to deal with the situation, this was our first reaction: Why does anyone want to reduce the cost by 20% when there is a 40% cost disadvantage? Where did the 40% cost advantage come from? It was obvious that even if the workers gave up all of their wages the company would not survive.

Then we realized that the competitive product only used 1,800 parts while our product employed 2,800. The difference in the number of the parts perfectly explained the difference in cost. The surprising element in all of this was that a lower number of parts was achieved by the competition by utilizing technologies that were developed by our client over the last 10 years. The problem was that our client had patched each one of its newly developed technologies into an old platform, which resulted in a complex and inefficient product, whereas the competition started from a clean slate and took full advantage of the potentials that each technology offered.

The moral of this story is that once in a while one should pause and reflect on oneself and begin anew.

1.2 INERTIA

Inertia is responsible for all of the second level tendencies and behaviors that delay reactions to technological breakthroughs. For example, sheer inertia by the Continental Can Company provided the opportunity for two-piece can technology to replace the three-piece can technology and destroy the once mighty Continental Can. Five hundred factories all over the United States and 45% share of the three-piece can market could not prevent a delayed reaction to two-piece technology from destroying Continental Can in fewer than three years.

Ironically, the likelihood that an organization will fail to respond to a critical technological break is directly proportional to the level of success it had achieved in a previously dominant technology. In other words, the more success an organization has with a particular technology, the higher its resistance to the prospect of change. The initial reaction is always denial. We do have an amazing capacity for denial in the face of undeniable events, but the real danger arises when the organization finally decides to patch things up. Patching wastes critical time. It provides the competition with a window of opportunity to disseminate the new technology and dominate the market. Patching, moreover, increases the cost of the operation and reduces the quality of the output, producing a double jeopardy.

1.3 SUBOPTIMIZATION

Exaggeration — the fallacy that if "X" is good more "X" is even better — is at the core of the third level processes that effectively destroy a proven competitive advantage. A tendency to push one's strength to its limits transforms the strength into a destructive weakness. Unfortunately, many stories follow the same line: a winning formula gains adulation, and the heroes or heroines who shaped it become the sole authorities. One right answer prevails. An increasingly monolithic culture produces an ever-decreasing set of alternatives and a narrow path to victory. This limited set redefines the corporate culture, the assumptions, the premises, and the common wisdom that bounds or frames a company's understanding of itself and its industry and drive its competitive strategy.

An interesting treatment of this phenomenon can be found in Danny Miller's book, *The Icarus Paradox* (1990). Miller refers to Icarus of Greek mythology who became emboldened to fly higher and higher until he came so close to the sun that his wax wings melted and he plunged to his death. Miller explains how craftsmanship and productive attention to detail by the Digital Equipment Corporation turned into an obsession with minutia and technical tinkering. Exaggeration was also at work when the innovative capability of CDC and Polaroid escalated into high-tech escapism and technical utopia. Miller's list of firms that have been trapped by this phenomenon includes IBM, Texas Instruments, Apple Computer, General Motors, Sears, and many of the most acclaimed American corporations.

1.4 CHANGE OF THE GAME

Change of the game, or transformation of the problem, is at the heart of a counterintuitive process that converts success into failure. In other words, the act of playing a game successfully changes the game itself. Failure to appreciate the consequences of one's success and tenacity in playing the good old game are what create tragedies. Once success is

achieved, or a problem is effectively dissolved, the concerns associated with that problem are irreversibly affected. Dissolving a problem transforms it and generates a whole new set of concerns. That is why the basis for competition changes and a new competitive game emerges as soon as a competitive challenge is met.

The role of success is quite different in the third and fourth level processes. When it is exaggerated (third level), success works against the nature of the solution and diminishes its effectiveness. By contrast, success in handling a challenge (fourth level) transforms the nature of the problem. In other words, it changes the game. Henry Ford's success in creating a mass production machine effectively dissolved the production problem. A familiar concern for production was replaced with an unfamiliar concern for markets. The once unique ability to mass-produce lost its advantage through widespread imitation. This event changed the competitive game from concern for production to concern for markets, which required an ability to manage diversity and growth.

Henry Ford's refusal to appreciate the implication of his own success and his unwillingness to play the new game ("they can have any color as long as it is black") gave Alfred Sloan of GM the opportunity to dominate the automotive industry. Sloan's concept of product-based divisional structure turned out to be an effective design for managing growth and diversity. The new game, artfully learned and played by corporate America, became the benchmark for the rest of the world to copy (Womack, 1990).

In an attempt to duplicate the American system, Ohno, the chief engineer of Toyota, came up with yet another new design. His introduction of the lean production system changed the performance measures by more than an order of magnitude. While it took the American auto industry three days to change a die, Toyota could do it in only three minutes. Once again, success transformed the game. This time the differentiating factors were flexibility and control.

But corporate America was too overwhelmed and overjoyed by its own success to even notice the emergence of the new game. This inattentiveness provided Japan with an opportunity to launch a slow but effective challenge. The insidious manner in which the new game evolved underscores another important principle of systems dynamics, which is exemplified by the story of the frog that boiled to death by sitting happily in water that gradually grew hotter.

Examples of the change of the game can also be found in politics. Although the success of the Persian Gulf War boosted the approval rating of President Bush to an unprecedented level, it inadvertently cost him the election. The triumph of his foreign policy caused the nation to shift its concern from national security to domestic economy. Failure to understand the implication of this change converted the success to failure.

Recognizing that success changes the game, think what the phenomenal success of information technology means. Success marks the beginning

of the end of the Information Era. Competitive advantage is increasingly shifting away from having access to information to generating knowledge and, finally, toward gaining understanding.

1.5 SHIFT OF PARADIGM

The cumulative effects of imitation, inertia, suboptimization, and change of the game ultimately manifest themselves in the fifth force — a shift of paradigm.

A shift of paradigm can happen purposefully by an active process of learning and unlearning. It is more common that it is a reaction to frustration produced by a march of events that nullify conventional wisdom. Faced with a series of contradictions that can no longer be ignored or denied and/or an increasing number of dilemmas for which prevailing mental models can no longer provide convincing explanations, most people accept that the prevailing paradigm has ceased to be valid and that it has exhausted its potential capacity.

This is a twilight zone where Stafford Beer's (1975) aphorism rings true: "Acceptable ideas are competent no more and competent ideas are not yet acceptable." It is where powerful threats and opportunities emerge; where the great organizations rise and fall.

Eventually, it takes the exceptional courage of a few to question the conventional wisdom and point to the first crack in it. Thus begins a painful struggle whose end result is reconceptualization of critical variables into a new ensemble with a new logic of its own.

Shifts of paradigm can happen in two categories: a change in the nature of reality or a change in the method of inquiry. Also possible, however, is a dual shift involving both dimensions. The significance and impact of any paradigm shift cannot be overestimated, but facing a dual shift is an even more formidable challenge. It tests the outer limits of human capacity to comprehend, communicate, and confront the problematic. For example, the shift of paradigm from a mechanical to a biological model, despite its huge impact, represented a unidimensional shift in our understanding of the nature of organization. It happened in the context of analytical inquiry (Figure 1.2).

We are now facing the challenge of a dual shift. Not only has there been a shift of paradigm in our understanding of the nature of the beast — from our conception of an organization as a biological model to a sociocultural model — but there has also been a profound shift in our assumption regarding the method of inquiry, the means of knowing, from *analytical thinking* (the science of dealing with *independent* sets of variables) to *holistic thinking* (the art and science of handling *interdependent* sets of variables). The complementary nature of these two dimensions is at the core of both understanding how the game is evolving and identifying the drivers for change.

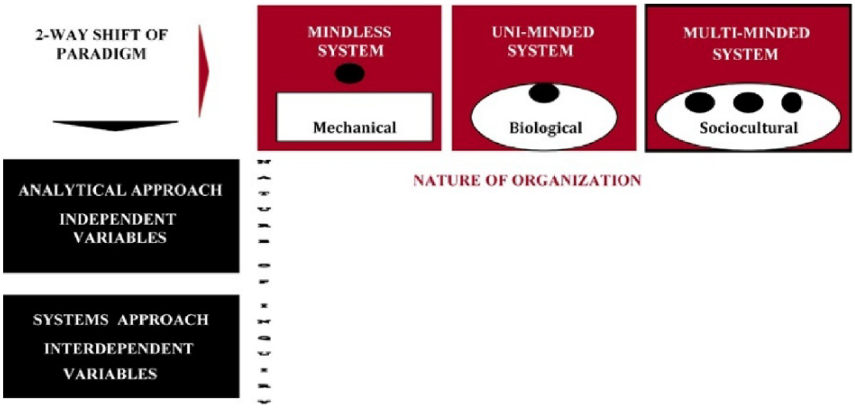

FIGURE 1.2 Shifts of paradigm.

1.6 INTERDEPENDENCY AND CHOICE

While the organization as a whole is becoming more and more *interdependent*, the parts increasingly display choice and behave *independently.* The resolution of this dilemma requires a dual shift of paradigm.

The first shift results in the ability to see the organization as a multi-minded, sociocultural system, a voluntary association of purposeful members who have come together to serve themselves by serving a need in the environment.

The second shift helps us see through chaos and complexity and learn how to deal with an interdependent set of variables. Failure to appreciate the significance of this dual change results in excessive structural conflict, anxiety, a feeling of impotency, and resistance to change. Unfortunately, prevailing organizational structures, despite all the rhetoric to the contrary, are designed to prevent change. Dominant cultures by default keep reproducing the same non-solutions all over again. This is why the experience with corporate transformation is so fraught with frustration. The implicitness of the organizing assumptions, residing at the core of the organization's collective memory, is overpowering. Accepted on faith, these assumptions are transformed into unquestioned practices that may obstruct the future. Unless the content and implications of these implicit, cultural codes are made explicit and dismantled, the nature of the beast will outlive the temporary effects of interventions, no matter how well intended.

1.6.1 On the Nature of Organization: The First Paradigm Shift

To think about any thing requires an image or a concept of it. To think about a thing as complex as an organization requires models of something similar, something simpler, and something more familiar. The three models

represent the successive shift in our understanding of the nature of the organization, from a mindless mechanical tool, to a uni-minded biological being and, finally, to a multi-minded organized complexity.

1.6.1.1 MINDLESS SYSTEM — A MECHANISTIC VIEW

The mechanistic view of the world that evolved in France after the Renaissance maintains that the universe is a machine that works with a regularity dictated by its internal structure and the causal laws of nature. This worldview provided the basis not only for the Industrial Revolution but also for the development of the machine mode of organization (Gharajedaghi and Ackoff, 1984).

In the early stages of industrialization, machines replaced agricultural workers by the thousands. The reservoir of an unemployable army of unskilled agricultural workers threatened the fabric of Western societies. Then came a miracle, the ingenious notion of organizations. It was argued that in the same way a complicated tractor is built by parts, each performing only a simple task of horizontal, vertical, and circular motions, an organization could be created in such a manner that each person performs only a simple task. The mechanistic mode of organization was born as a logical extension of this conception and became instrumental in converting the army of unskilled agricultural laborers to semi-skilled industrial workers (Figure 1.3).

The impact of this simple notion of organizations was so great that in one generation it created a capacity for the production of goods and services that surpassed the cumulative capacity of mankind. The essence of

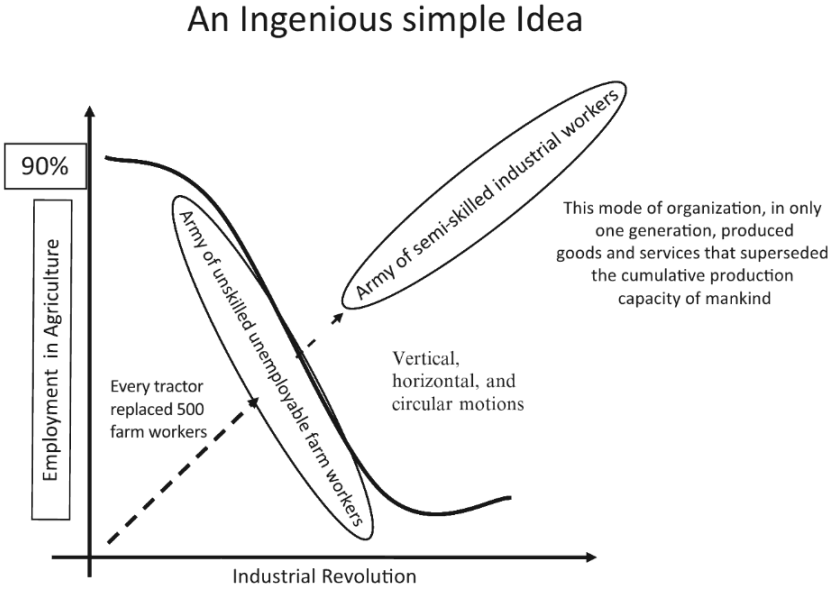

FIGURE 1.3 Machine mode of organization.

the machine mode of organization is simple and elegant. An organization is a mindless system; it has no purpose of its own. It is a tool with a function defined by the user, an instrument for the owner to use to achieve his goal of making profit. The important attribute of this tool is its reliability, and its performance criterion is simply efficiency. The principle that parts should not deviate is at the core of the glamour of tidiness, efficiency, controllability, and predictability of its operation. The parts of a mindless mechanical system, just like the whole, have no choice. Its structure is designed into it, leaving it with no ability to restructure itself. The system functions reactively and can operate effectively only if its environment remains stable or has little effect on it.

1.6.1.2 UNI-MINDED SYSTEMS — A BIOLOGICAL VIEW

The biological thinking or living systems paradigm, which led to the concept of the organization as a uni-minded system, emerged mainly in Germany and Britain, but then caught fire in the United States. The underlying assumptions and principles of the biological mode of organizations are also simple and elegant: an organization is considered a uni-minded living system, just like a human being, with a purpose of its own. This purpose, in view of the inherent vulnerability and unstable structure of open systems, is survival. To survive, according to conventional wisdom, biological beings have to grow. To do so they should exploit their environment to achieve a positive metabolism.

In organizational language, this means that growth is the measure of success, the single most important performance criterion, and that profit is the means to achieve it. Therefore, in contrast to the machine mode, in which profit is an end in itself, profit, for the biological mode, is only a means to an end. The association of profit with growth, considered a social good, gives profit the much needed social acceptability and status compatible with the American way of life.

Although uni-minded systems have a choice, their parts do not. They operate based on cybernetics principles as a homeostatic system, reacting to information in the same way as a thermostat. As a matter of fact, the beauty of a uni-minded system is that the parts do not have a choice and react only in a predefined manner to the events in their environment.

For example, my heart cannot decide on its own that it does not want to work for me. My stomach will not get suspicious, thinking "the liver is out to get me." No consciousness, no choice, no conflict. The operation of a uni-minded system is totally under the control of a single brain, the executive function, which, by means of a communication network, receives information from a variety of sensing parts and issues directions that activate relevant parts of the system. It is assumed that a malfunctioning of any normal uni-minded system is due to a lack of information or noise in the communication channel. Therefore, the perceived answer for most of the problems is more information and better communication. However, if

parts of a system develop consciousness and display choice, the system will be in real trouble. Imagine for a moment that the thermostat in your room suddenly develops a mind of its own — when it receives information about the temperature in the room it decides it does not like it and wants to sleep on it. The undeniable result is a chaotic air conditioning system.

When parts display choice, the central issues become conflict and the ability to deal with it. However, as long as paternalism is the dominant culture, the imperatives of "father knows best" or "give the apple to your sister" become an effective way to handle conflict. Paternalism best approximates the essential characteristics of a uni-minded system, and it creates powerful organizations. Corporate giants such as Ford, DuPont, General Motors, and IBM owe much to their paternalistic founding fathers.

1.6.1.3 MULTI-MINDED SYSTEM — A SOCIOCULTURAL VIEW

Multi-minded systems are exemplified by social organizations. A sociocultural view considers the organization a voluntary association of purposeful members who manifest a choice of both ends and means. This is a whole new ball game. Behavior of a system whose parts display a choice cannot be explained by mechanical or biological models. A social system has to be understood on its own terms.

The critical variable here is *purpose*. According to Ackoff (1972), an entity is purposeful if it can produce (1) the same outcome in different ways in the same environment and (2) different outcomes in the same or a different environment. Although the ability to make a choice is necessary for purposefulness, it is not sufficient. An entity that can behave differently but produce only one outcome in all environments is goal-seeking, not purposeful. Servo-mechanisms are goal-seeking, but people are purposeful. As a purposeful system, an organization is part of a larger purposeful whole — the society. At the same time, it has purposeful individuals as its own members. The result is a hierarchy of purposeful systems of three distinct levels. These three levels are so interconnected that an optimal solution cannot be found at one level independent of the other two. Aligning the interest of the purposeful parts with each other and that of the whole is the main challenge of the system.

In contrast to machines, in which integrating of the parts into a cohesive whole is a one-time proposition, for social organizations the problem of integration is a constant struggle and a continuous process. Effective integration of multilevel purposeful systems requires that the fulfillment of a purposeful part's desires depends on fulfillment of the larger system's requirements, and vice versa. In this context, the purpose of an organization is to serve the purposes of its members while also serving the purposes of its environment.

The elements of mechanical systems are *energy-bonded*, but those of sociocultural systems are *information-bonded*. In energy-bonded systems, laws of classical physics govern the relationships among the elements.

Passive and predictable functioning of parts is a must, until a part breaks down. An automobile yields to its driver regardless of his expertise and dexterity. If a driver decides to run a car into a solid wall, the car will hit the wall without objection. Riding a horse, however, presents a different perspective. It matters to the horse who the rider is, and a proper ride can be achieved only after a series of information exchanges between the horse and the rider. Horse and rider form an information-bonded system in which guidance and control are achieved by a second degree agreement (agreement based on a common perception) preceded by a psychological contract.

The members of a sociocultural organization are held together by one or more common objectives and collectively acceptable ways of pursuing them. The members share values that are embedded in their culture. The culture is the cement that integrates the parts into a cohesive whole. Nevertheless, since the parts have a lot to say about the organization of the whole, consensus is essential to the alignment of a multiminded system.

1.7 ON THE NATURE OF INQUIRY

1.7.1 The Second Paradigm Shift

Classical science is preoccupied with *independent variables.* It assumes that the whole is nothing but the sum of the parts. Accordingly, to understand the behavior of a system we need only to address the impact that each independent variable has on that system (Figure 1.4).

Handling independent variables is the essence of analytical thinking, which has remained intact in all three contexts: physical, biological, and social. To share in the glory of classical science, both biological and social sciences opted to use the analytical method with no deviation. This might help explain why a whole set of phenomena, known as type II (emergent) property, has been conveniently ignored. Properties like love, success, and happiness do not yield to analytical treatment.

However, increasingly we are finding out that our independent variables are no longer independent and that the neat and simple construct that served us so beautifully in the past is no longer effective. The following experience illustrates this point.

Ford Motor Company was one of the first American corporations to embark on the quality movement. "Quality is job one" was the theme, and the operating units were encouraged to use continuous improvement to

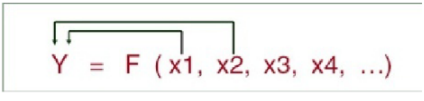

FIGURE 1.4 Independent variables.

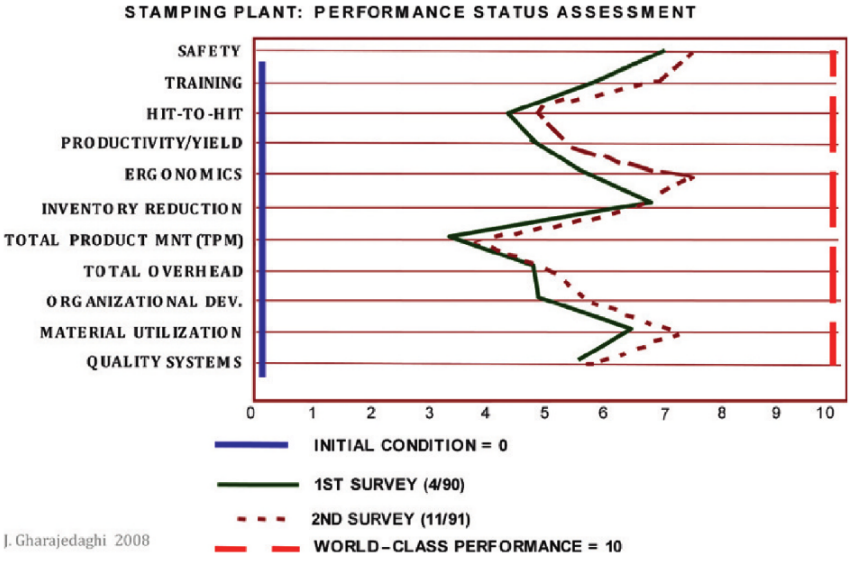

FIGURE 1.5 Woodhaven stamping plant's quality variables.

achieve world-class performance. Following the lead was Ford's Woodhaven stamping operations, which identified eleven areas of improvement (Figure 1.5).

Initial (or baseline) measures in each area were designated as 0 and world-class performance as 10. The company established a detailed and comprehensive program to go from 0 to 10 in three years. Initially, significant improvement was recorded, but the operation reached a plateau after only 18 months.

Even doubling the efforts to improve the selected variables' performance failed to produce any further change. After 36 months of intense effort, the operation remained at the midway point of its goals, well short of the benchmark, world-class performance (Figure 1.6).

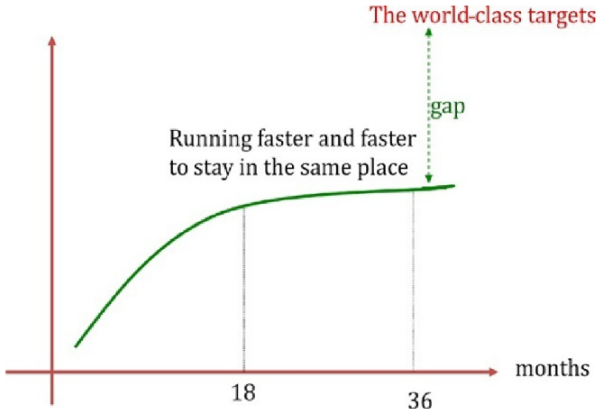

FIGURE 1.6 Reaching a plateau before getting to the target.

At the time I was teaching in the Ford Executive Development Program. Mr. Vic Leo, Program Director, introduced me to Mr. E.C. Galinis, Plant Manager of the Woodhaven operation, who shared his frustration with me. After spending a few days in the plant, I concluded that the Woodhaven operation had used up all of its slack and was now faced with a set of interdependent variables that could be improved only with a redesign of the total operation (Figure 1.7).

As Figure 1.7 demonstrates, a given design may contain some slack between variables. This permits us to deal with each variable separately as though it were an independent variable. The performance of each variable can be improved independently until the slack among them is used up. Then the perceived set of independent variables changes to a formidable set of interdependent variables. Improvement in one variable would come only at the expense of the others.

Using the conventional approach to deal with this type of situation would be like riding a treadmill. One needs to keep running faster and faster to stay in the same place. In Ford's case, the existing design of Woodhaven operations had reached its highest potential, unfortunately far below the world-class performance. To reach the performance goals, the operation would have to be redesigned, and this was done. A new design helped the operation not only to reach the target goal, but also to surpass it by a wide margin in six months.

An independent set of variables is, therefore, a special case of a more general scheme of *interdependency*. As systems become more and more sophisticated, the reality of interdependency becomes more and more pronounced (see Figure 1.8).

Understanding interdependency requires a way of thinking different from analysis. It requires systems thinking. And analytical thinking and systems thinking are quite distinct.

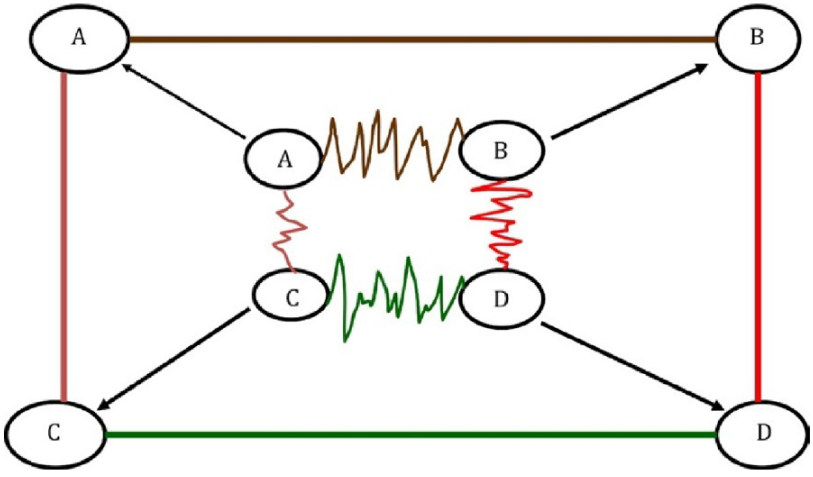

FIGURE 1.7 Using up the slack among interdependent variables.

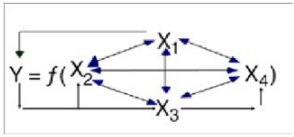

FIGURE 1.8 Interdependent variables.

Analysis is a three-step thought process. First, it takes apart that which it seeks to understand. Then it attempts to explain the behavior of the parts taken separately. Finally, it tries to aggregate understanding of the parts into an explanation of the whole. Systems thinking uses a different process. It puts the system in the context of the larger environment of which it is a part and studies the role it plays in the larger whole.

Analytical approach has remained essentially intact for nearly four hundred years, but systems thinking has already gone through three distinct generations of change:

- The first generation of systems thinking (operations research) dealt with the challenge of *interdependency* in the context of mechanical (deterministic) systems.
- The second generation of systems thinking (cybernetics and open systems) dealt with the dual challenge of *interdependency* and *self-organization* (neg-entropy) in the context of living systems.
- The third generation of systems thinking (design) responds to the triple challenge of *interdependency, self-organization,* and *choice* in the context of sociocultural systems.

In addition to being purposeful, social organizations are living systems; therefore, like all living systems, they are neg-entropic and capable of self-organization. They create order out of chaos. Biological systems primarily self-organize through genetic codes, and social systems self-organize through cultural codes. The DNA of social systems is their culture.

Social systems, however, can be organized either by default or by design. In default, the beliefs, assumptions, and expectations that underlie the system go unexamined. In design, the beliefs, assumptions, and expectations are made explicit, being constantly examined and monitored. The third generation of systems thinking therefore has to deal not only with the challenge of interdependency and choice, but also with the implications of cultural prints reproducing the mess, or the existing order, all over again by default. This is why design, along with participation, iteration, and second-order learning, is at the core of the emerging concept of systems methodology.

Details of this exciting concept are explored in Part Three of this book, which develops an operational definition of systems thinking. The remainder of this chapter explores implications of the dual paradigm shift in the context of six distinct competitive games.

1.8 THE COMPETITIVE GAMES

Each of the competitive games discussed in this section corresponds to a given paradigm in the following matrix (Figure 1.9). Together, these games have dominated the management scene for the better part of the past century. Each has produced an order-of-magnitude change in performance measures, and each has had a profound effect on our lives.

Each paradigm has its own unique mode of organization, and every mode of organization, by virtue of its requirement for specific talents, creates its own clique and privileged members. These members often translate their privileges into power and influence. The higher the level of success, the greater the stake in continuing an existing order and the higher the resistance to change. Unfortunately, the inability to change an outdated mode of organization is as tragic for the viability of a corporation as the consequence of missing a technological break is for the viability of a product line.

1.8.1 Mass Production — Interchangeability of Parts and Labor

Mass production resulted directly from the machine mode of organization. Henry Ford's success in designing a production machine by making both parts and labor interchangeable led to a mass-production system and a whole new competitive game. He could produce 6,000 cars a day, while his closest competitor in France could muster only 700 cars a year. The ability to produce increased by more than an order of magnitude. In one generation we produced goods and services that surpassed the cumulative capacity of mankind.

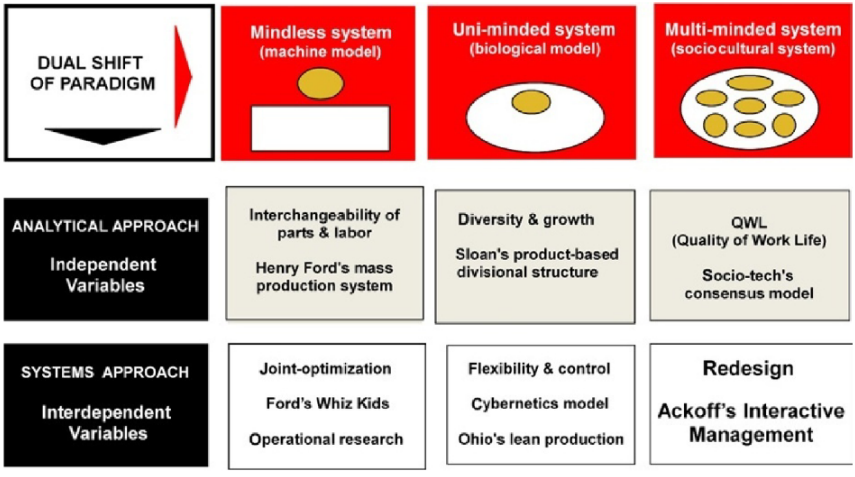

FIGURE 1.9 Six competitive games.

The effectiveness of this mode of organization in the production of goods and services created not just a quantitative change but also a qualitative change in the nature of the problem itself. The question was no longer how to produce, but how to sell. And so dawned the marketing era. What emerged was an environment with an entirely new set of challenges. Foremost among them was how to respond to increasing demand for variety and diversity, and how to manage growth in size and complexity.

This challenge was too great for even the best that a machine mode of organization could offer. The requirement for no deviation, in view of the assumption that human nature is essentially deviant, places high emphasis on tight supervision to ensure conformity, predictability, and reliability of individual behavior within the organization. This emphasis undermines the organization's creative ability and limits its response to meeting the increasing demand for variety and diversity. A defensive reaction to consumer dissatisfaction calls for greater adherence to the rules and more rigidity, resulting in a vicious circle.

On the other hand, growth in size tends to reduce efficiency and organizational effectiveness. Because of an inverse relationship between an organization's size and the effectiveness of its control system, large organizations are forced toward decentralization. But this result is inconsistent with the principle of no deviation and unity of command.

No driver in his or her right mind would drive a car with decentralized front wheels. In an organization that demands a passive functioning of parts with a high degree of compatibility and predictability, decentralization leads to chaos and suboptimization. The best answer for production may be in conflict with the best answer for marketing, and may not necessarily agree with the best answer for finance or personnel. Could this be why most large organizations constantly oscillate between centralization and decentralization?

1.8.2 Divisional Structure — Managing Growth and Diversity

Unlike Ford, Sloan recognized that the basis for competition had changed from an ability to produce to an ability to manage growth and diversity. He not only used public financing to generate the necessary capital to sustain growth, but also capitalized on the emerging biological model to provide a structural vehicle for control that made it possible to manage growth and diversity.

Sloan's model, with small variations, constitutes the foundation of the MBA programs taught in all prominent schools of management, including Harvard, Wharton, Stanford, and MIT. Operationally, this model is built around two concepts: *divisional structure* and *predict-and-prepare mode of planning* (Figure 1.10).

Corporations, in their simplest form, are divided into two distinct types: corporate office and operating unit. A corporate office with a traditional functional structure is the "brain of the firm," with an algorithm, which is

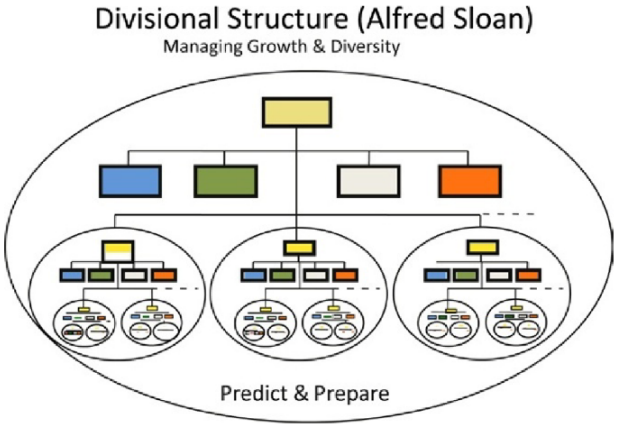

FIGURE 1.10 The divisional structure.

a procedure for producing a desired outcome and for monitoring its implementation. The operating unit, on the other hand, is the body, which, despite a semi-autonomous structure, has no choice and no consciousness. It can only react to the command signal from the brain and/or events in its environment. Ideally, an operating unit is a robot programmed to carry out, with no deviation, a set of procedures predefined by the functional units of the corporate office.

Replicas of this operating model — each a product division — are created as needed to produce a given product and/or service and sell it in a specified market. Operating product divisions are usually not authorized to redesign their products or redefine their markets. The main responsibility of the groups is to "stay the course." However, they are required to forecast the demand for their product and adjust their capacity to produce it accordingly. Therefore, the core concept of "predict and prepare" dominates the management process and complements the divisional structure in the pursuit of the essential functions: growth and viability.

The post-World War II environment, with its stability and predictability, provided an ideal condition for product-based divisional organizations. However, their very success in playing the game once again changed the game.

The divisional mode of organization, despite its unquestionable successes, found itself up against two unprecedented challenges:

1. The operationalization of new knowledge, in response to an overall shortening of product life cycles.
2. The reality of multi-mindedness, or understanding the implication of choice, and thus conflict, among the organization's members.

As a result of the research and development era, knowledge was generated at a faster rate, which called for periodically redesigning the product and redefining the markets. This capability, however, was incompatible with

the mode of organization artfully designed to prevent change and stay the course. Successful divisional structure had tied the fate of product divisions to the life cycle of a single, predefined product. The division, then, like the product, experienced periods of uncertainty, growth, maturity, and decline. A popular solution for this concern, called *strategic planning*, dominated the practice of management in the United States for more than a decade. It simply called for identifying and assigning product divisions such designations as "question mark," "star," "cash cow," or "dog" and issuing imperatives to "drop the dog," "milk the cow," "watch the question mark," and "invest in the star." By default, it created the strategy of giving up on difficult challenges by simply tagging them dogs.

The divisional structure, finally, was challenged from two different directions: participative management and the lean production system. Both were emerging in tandem as alternative bases for new competitive games.

1.8.3 Participative Management

The unprecedented generation and distribution of wealth and knowledge resulted in ever higher levels of choice, which changed the nature of social settings and individual behavior in America. But the enhancement of choice, which resulted in higher levels of sophistication in social interactions, proved a double jeopardy for the biological mode of thinking. Not only did organizations conceived as uni-minded systems become more difficult to manage, but they also became more vulnerable to the actions of a few. Members of an organization, unlike the parts of a biological being, do not react passively to the information they receive.

In this regard, advances in information technology and communication as a means of control did not produce the panacea once expected. Even the ultimate in this mode of thinking, Stafford Beer's famous *Brain of the Firm* (1967), despite its elegance, in my experience, is unable to deal with the complexities of emerging social interactions. Nevertheless, the model was successful in the context of paternalistic cultures, where loyalty, conformity, and commitment are considered core virtues. These virtues are reinforced by the security of belonging to a group, which in turn protects and provides for its members. For example, Japan, an industrialized society, with a relatively strong paternalistic culture, closely approximates a uni-minded system. Therefore, it has been able to capitalize more effectively on the strength of the biological mode of organization.

In a strong paternalistic culture, conflict can be resolved by the intervention of a strong father figure, but the realities of highly developed multi-minded social systems are fundamentally different. Members of societies that have outgrown the secure, unifying web of a paternalistic culture display real choice. But a price must be paid for this transformation, especially in terms of insecurity and the level of conflict. The purposeful actors, individually or in groups, generate unprecedented levels of conflict

by disagreeing with each other on the compatibility of their chosen ends and means.

Corporate America, yet ill-equipped to deal effectively with the consequences of its members' purposeful behavior, is finding itself increasingly paralyzed. It is not surprising that a significant part of its energy is lost to the conflict. Frustration associated with excessive levels of conflict reinforces the organizational inability to change. Members increasingly behave independently, and management, on the pretext of empowerment, abdicates its authority and responsibility. Nobody seems to have a handle on integration. Feelings of impotency and alienation are commonplace.

Pursuing the ideal of a conflict-free organization has proved problematic. Creating a conflict-free organization means less choice, reducing members to the level of robots. Such a situation, even if feasible, may not be desirable.

Unable to uncook eggs already half-cooked, we have rejected the paternalistic culture, but have not yet found an effective replacement for it. Unfortunately, quality of work life (QWL), participative management, multifunctional teams, and the other concepts that socio-tech had to offer have yet to show us how to manage a multi-minded complexity and effectively dissolve conflict. We are still oscillating between centralization and decentralization, collectivity and individuality, and integration and differentiation, without appreciating the complementary nature of these tendencies. We will deal with these issues in more detail in Part Two of this book.

The next three games represent the other dimension of the dual paradigm shift, dealing with the challenge of interdependency. They actually map the evolution of systems thinking in the context of mechanical, biological, and sociocultural models of organization.

1.8.4 Operations Research — Joint Optimization

The success of the first Operations Research (OR) group, created by Ackoff and Churchman at the Case Institute of Technology, which dealt with the challenge of interdependency, resulted in the spread of OR programs to most American universities. But the first full application of OR in corporate America came with Ford's whiz kids, when McNamara and his associates moved from the Defense Department to the Ford Corporation.

The essence of this effort was to use models, basically mathematical, to find optimal solutions to a series of interdependent variables. However, the assumptions regarding the nature of the organization remained mechanical. The other significant contribution to this version of systems thinking was the concept of systems dynamics developed by J. Forrester of MIT.

Operations Research dominated the field of systems thinking for the better part of the 1960s until it was challenged, ironically, by one of its founding fathers. In a famous article, Ackoff (1979) declared, "The future of Operations Research is past." Instantaneously, he converted an army of

devoted followers into staunch enemies. He blasted his own creation on the grounds that OR assumes passive or reactive parts and does not appreciate the vital implications of parts having choice.

By the assertion that parts in a social system have a choice, he left his contemporaries behind by a quarter of a century. His concept of multi-minded purposeful systems effectively bypassed the next generation of the systems models, most importantly Beer's *viable systems*, which in its own right is a masterful thinking in the biological context.

1.8.5 Lean Production System — Flexibility and Control

Effective commercial use of organized research, which evolved during World War II, accelerated the role of product development, giving rise to a new era marked by rapid change. Unpredictability associated with the high rate of change undermined the usefulness of the core concept of *predict* and *prepare*. Both the Chase and Wharton Econometric models, which had brought fame and fortune to their respective organizations, even a Nobel Prize for the Wharton School, were sold quietly.

The research and development era had generated explosions of new knowledge. This knowledge, when successfully operationalized, radically changed the competitive game. The new generation of winners were those players with the ability to create their own future by interactively influencing their environment. The name of the game became flexibility and control, which shortened the time to market of a new product, increased product/market differentiation, and improved price/quality performance of the outputs, doing more and more with less and less.

This game emerged slowly but effectively in Japan, when Ohno, Chief Engineer of Toyota, created the lean production system by applying systems thinking in the biological context. Using cybernetic principles, he was able to lower the break-even point by an order of magnitude and elevated the competitive game to an incredibly higher level. In this game, flexibility and control became the basis for competition.

1.8.6 Interactive Management — Design Approach

Design is the operational manifestation of the purposeful systems paradigm developed by Ackoff (1972) in response to the challenge of managing interactions between purposeful members of a highly interdependent social organization.

Systems design, at present, represents the latest chapter of the evolution of systems thinking. In *Redesigning the Future,* Ackoff (1974) argued that purposeful social systems are capable of recreating their future; they do so by redesigning themselves. Ackoff then proposed a design methodology by which stakeholders of a multi-minded system participatively design a future they collectively desire and realize it through successive approximation.

In *The Design of Inquiring Systems,* Churchman (1971) demonstrated that the best way to learn a system is to design it. Later, in *A Prologue to National Development Planning,* Gharajedaghi and Ackoff (1986) used design as the main vehicle of social development. The design model explicitly recognized that choice is at the heart of human development. Development is the enhancement of the capacity to choose; design is a vehicle for enhancement of choice and holistic thinking.

Designers seek to choose rather than predict the future. They try to understand rational, emotional, and cultural dimensions of choice and to produce a design that satisfies a multitude of functions. The design methodology requires that designers learn how to use what they already know, learn how to realize what they do not know, and learn how to learn what they need to know. Finally, producing a design requires an awareness of how activities of one part of a system affect and are affected by other parts. This awareness requires understanding the nature of interactions among the parts.

Unfortunately, despite all the rhetoric to the contrary, our risk models developed on the assumption of independency have failed to protect us against recurring events that have long been considered highly improbable. Nassim Taleb (2007), in his eye-opening book *The Black Swan,* demonstrated how in hindsight one could find a reasonable explanation for all of the following catastrophic events by appreciating interactions and powerful reinforcing effects of small interdependent deviations.

- 1982 recession (large American banks lost close to all their cumulative earnings)
- Real state collapse of early 1990s (savings and loans were wiped out at the cost of $500 billion).
- 1998 collapse of stock market (dotcom bubble)
- 2009 financial crisis (housing bubble and mortgage fiasco, possibly trillions of dollars)

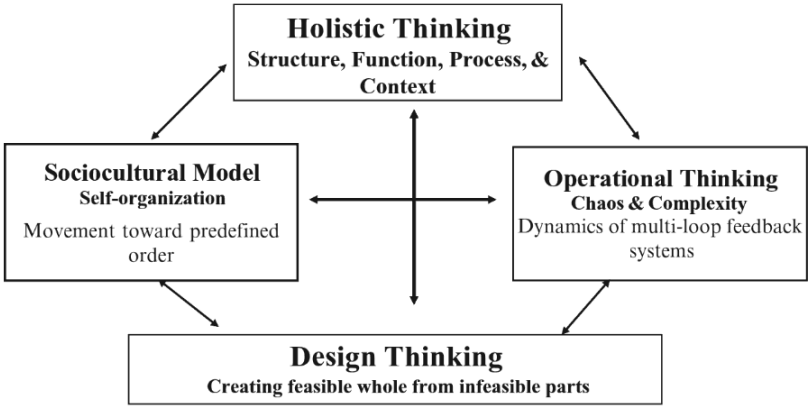

FIGURE 1.11 Foundations of systems thinking.

Unfortunately the task is not just an academic discourse; it demands enormous emotional struggles and a huge cultural challenge. Engagement in this process, in addition to competence, requires courage.

The remainder of this book attempts to explore the operational meaning of systems thinking and demonstrate the interaction of the four foundations of systems thinking seen in Figure 1.11. The task is also to create a comprehensive methodology that can meet the challenges of the emerging chaotic and complex environment.

SYSTEMS THEORY
The Nature of the Beast

"GOD IS DEAD," says graffiti on a notice board in Oxford University, England. "NO!" it says underneath, "HE IS JUST WORKING ON A LESS AMBITIOUS PROJECT."

Maybe God has given up the idea of an orderly and deterministic world. Maybe he/she has playfully decided to mix it up with some degree of randomness and choice, or maybe this has been the state of affairs all along. Zoroaster, the ancient Persian prophet, proclaimed this some 3,000 years ago:

> There are elements of *chance*, *choice*, and *certainty* in every aspect of our lives.

Maybe having choice is not an illusion, after all. Nevertheless, choice is but one of the three elements. The interaction of choice with chance (randomness) and certainty (laws of nature) can indeed produce some counterintuitive outcomes.

Natural science has discovered "chaos." Social science has encountered "complexity." But chaos and complexity are not characteristics of our new reality; they are features of our perceptions and understanding. We see the world as increasingly more complex and chaotic because we use inadequate concepts to explain it. When we understand something, we no longer see it as chaotic or complex. Maybe playing the new game requires learning a new language.

We have used a multitude of languages to express the different ways in which we exist in the world. We first told the story of our lives as myth. We sang it, danced it, and expressed it in rituals that defined the parameters of our cultures and so gave us a degree of security in a threatening environment. As our proficiency increased, so did our learning and creative capacity. We started writing in the languages of poetry, mathematics, philosophy, and science. There were times when music, along with literature and art, produced our most beautiful texts.

But during the past century, we increasingly specialized in one language, the language of analytical science. As we emphasized one language to the exclusion of all others, we became unidimensional — and boringly predictable.

Today the analytical language has penetrated every facet of our lives. Our system of production, organization, interaction, communication — even our choice of recreation, sport, and foods —is done in terms of the assumptions and applications

of analytical tools. Finding a correlation is the order of the day. Best sellers, in all areas, are those that simply identity a few common attributes of the winners. No one can deny the success of this language, but it has acquired an importance disproportionate to its position as only one method of inquiry. When one game states the rules for all games, it does not matter how many new games you create, they are all the same kind.

History, unfortunately, has not been too kind to those who have capitalized so extensively on a single winning strategy. The price on selecting only one pattern of existence has been very high.

Alienation, lust for power, frustration, insecurity, and boredom are only a few symptoms of the emerging culture where ready-made intellectual goods are making the formation of mass opinion a matter of mass production.

The tendency to simplify everything to a level not requiring serious thinking has turned the political system into a voting industry, which assumes that people are ensured choice over their lives when they elect the decision makers. We have let the default values of an analytical culture define what is good, proper, and beautiful.

But, somehow, something is missing with the way we think about our lives. What has become the dominant language of our time produces only a partial understanding of our reality and relates only to parts of our being, not the whole of it. We need a holistic language, a language of systems, which will allow us to see through chaos and understand complexity. A language of interaction and design will help us learn a new mode of living by considering various ways of seeing, doing, and being in the world.

We can then design new methods of inquiry, new modes of organization, and a way of life that will allow the rational, emotional, and ethical choices for interdependent yet autonomous social beings.

The systems language, by necessity, will have two dimensions. The first will be a framework for understanding the nature of the beast, or the behavioral characteristics of multi-minded systems. The second will be an operational systems methodology, which goes beyond simply declaring the desirability of the systems approach and provides a practical way to define problems and design solutions.

To build the first dimension of this language, we need to develop a system of systems concepts. In this context, Ackoff's *On Purposeful Systems* (1972) is a Herculean work, a must-read book, which cannot be reproduced here. What I intend to do is share the principles and concepts that I believe are critical for developing a systems view of sociocultural systems. These principles have evolved with me during years of struggling to get a handle on systems. Details of these exciting concepts, which have been tested in a variety of contexts and cultures, are so rich that each could be the subject of a separate book. To fit my purpose here they had to be simplified at the risk of considerable distortion.

Five systems principles will be discussed in Chapter 2. The information-bonded systems and the notion of shared image and culture and the essence of self-organization will be the topic of Chapter 3. Theory of development and obstructions to development will be discussed in Chapter 4. Finally this notion of a sociocultural system (the subject of Part Two), combined with systems methodology — holistic thinking,

operational thinking, and design thinking — (the subject of Part Three), constitute an interactive whole that, in my view, defines the essence of systems thinking.

A note of caution to those readers with a strong background in total quality management (TQM). There is a fundamental difference between TQM and systems thinking. TQM operates within an existing paradigm; it could be learned and applied as an independent set of tools and methods. But systems methodology cannot be separated from systems principles. Systems tools and methods are impotent if isolated from the paradigm of which they are an integral part.

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Systems Principles

The five principles of openness, purposefulness, multidimensionality, emergent property, and counterintuitive behavior, acting together as an interactive whole, define the essential characteristics and assumptions about the behavior of an organization viewed as a purposeful, multi-minded system (Figure 2.1).

These principles are an integral part of the third-generation systems view. Their implications will be present in every aspect and in all of the subsequent parts of this work, from defining problems to designing solutions. Please read them carefully, more than once. Make them your own. Use them in different contexts so you can internalize them. They are the building blocks of the mental model you will need to construct to become a systems thinker and systems designer.

2.1 OPENNESS

Openness means that the behavior of living (open) systems can be understood only in the context of their environment. The world is, indeed, a complex whole in interaction. Therefore, even genuine inquiries regarding human nature, such as the love of liberty, lust for power, and search for happiness, are abstractions that cannot be meaningfully entertained when separated from the context, or the culture of which they are a part.

We can observe, somewhat helplessly, that "everything" depends on "everything else," concluding that we should not mess around with "the natural order of things" and that we may be better off leaving everything in the hands of the "One" who has control over all.

But if there are elements of *chance*, *choice*, and *certainty* in everything we do, we need to know which elements are certain and which ones offer the opportunity for choice. And how do we deal with the randomness of chance? Remember that appreciation of *drag*, a law of nature, as a certainty made it possible to convert the so-called obstruction into an opportunity and use it as an instrument of flying.

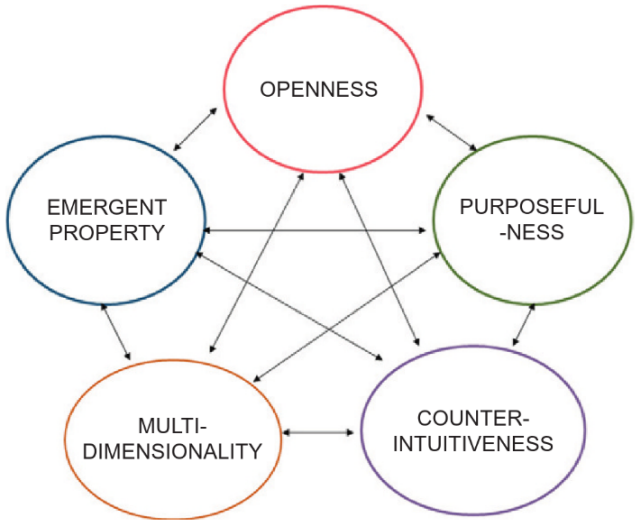

FIGURE 2.1 Systems principles.

Our first break came by recognizing that although everything depends on everything else, this "everything" can be grouped into two categories: those elements that somehow can be controlled and those that cannot. This distinction gave us an operational definition of the system, environment, and system boundary.

The system therefore consists of all of the interactive sets of variables that could be controlled by participating actors. Meanwhile, the environment consists of all those variables that, although affecting the system's behavior, could not be controlled by it. The system boundary thus becomes an arbitrary, subjective construct defined by the interest and the level of the ability and/or authority of the participating actors.

Then a second break came along. We discovered that the behavior of the variables in the environment, although uncontrollable, is more or less predictable. In most cases, the less controllable a contextual variable, the more predictable it becomes.

This led to the formulation of the first rule for getting a handle on open systems: the imperatives of *predict* and *prepare*. Predicting the environment and preparing the system for it became the foundation of the neoclassical school of management. Developing the econometric model and winning the Nobel Prize brought fame and fortune to Wharton. Chase followed suit with its own model, and soon thousands of organizations were each specializing in forecasting different industries. The new game was learned and played artfully by almost all entities — large and small, business and governmental (Figure 2.2).

But success somehow changed the game. Something went wrong. In the last 10 years we have observed, with much apprehension, that all the predictions made by our prize-winning models were wrong. So much so

OPENNESS

No problem or solution is valid free of context.

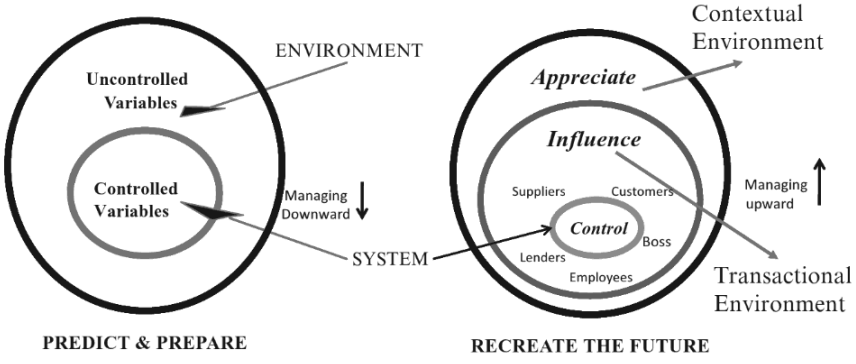

FIGURE 2.2 System boundary.

that those who never used them were much better off than those who did. We went back to the drawing board again and this time rediscovered a whole new category of variables that we had missed the first time: those variables that we do not control but instead *influence.*

To control means that an action is both necessary and sufficient to produce the intended outcome. To influence means that the action is not sufficient; it is only a coproducer.

As our knowledge about the environment increased, however, so did our ability to convert the uncontrollable variables to those that could be influenced. As we increased our ability to influence a variable, we decreased our ability to predict it. If a rain dance had any influence on the weather, we would not be able to predict the weather. Ironically, the extent to which we are able to predict the weather is an indication that we might not be performing the rain dance properly.

The new category of variables, those that could be influenced, form a new region called the *transactional environment.* The transactional environment is becoming significant to understanding the behavior of an open purposeful system. It includes all the critical stakeholders of a system: customers, suppliers, shareholders, the boss, and, ironically, the members themselves.

Customers used to be predictable, but uncontrollable. We were told they were always right. Increasingly, they are becoming more and more susceptible to influence and therefore are less and less predictable. It seems that the nerds are taking over. The boss has become weird and unpredictable as well.

Suppliers used to be the most agreeable group. They did what they were told. Today they claim to house the core technology. Who is in control of the computer industry? It is not the big system houses like IBM that

are in charge; it is the component builders, the Microsofts and Intels of the world, that have much more to say and are, in all likelihood, the ones in control.

Slowly, we are realizing that we do not actually control much of anything, but do have the ability to influence many things. I do not really know how much of me is me and how much is those I love. Managing a system is therefore more and more about managing its transactional environment, that is, managing upward. Leadership is therefore defined as the ability to influence those whom we do not control.

Open (living) systems display certain characteristics that are most significant to our understanding of their behavior. Open (living) systems not only preserve their common properties but also jealously guard their individualities. At the biological level, living systems achieve this durability through *genetic coding* (DNA), a blueprint for self-reproduction. Unless their genetic coding is altered, living systems go on replicating themselves almost indefinitely. The continuity of the individual and collective identities owes itself to a similar phenomenon — a tendency to create a predefined order based on an internal blueprint.

As open (living) systems, social groups such as organizations exhibit the same tendency, a movement toward a predefined order. Therefore, the cultural code becomes the social equivalent of biological DNA, those hidden assumptions deeply anchored at the very core of our collective memory. Left to be self-organized, these internal codes, by default, act as organizing principles that invariably reproduce the existing order.

In an earlier work, *Theory and Management of Systems* (1972), I devoted a whole chapter to the subject of chaos and order, articulating how living systems are able to reverse the formidable second law of thermodynamics and move toward complexity and order.

The second law states that a general tendency in the universe (as a closed system) is toward elimination of all differences. Thus, the ultimate state is sameness and randomness, a *chaotic simplicity.* Entropy (S), the measure of randomness, will therefore always increase. However, we know that living systems are neg-entropic (–S). They are able not only to negate this formidable process by differentiation, but also to move toward a predefined order, an *organized complexity*. Using the formula $I = -S$, which indicates that a neg-entropic system must have information, one might conclude that movement toward complexity and order is only possible if the system has a means of knowing and an internal image of what it wants to be. This result provided the first clue for constructing the sociocultural model, which is the subject of Chapter 3.

To summarize the major points, I have argued the following:

- Open systems can be understood only in the *context* of their environments.
- Leadership is managing upward; it is about influencing what one cannot control and appreciating what one cannot influence.

- Open systems, by default, are guided by an internal code of conduct (DNA or culture). If left alone, open systems tend to reproduce themselves.

2.2 PURPOSEFULNESS

To influence the actors in our transactional environment we have to *understand why they do what they do*.

Understanding is different from both *information* and *knowledge*. Information deals with the *what* questions, knowledge with the *how* questions, and understanding with the *why* questions (Figure 2.3). There once was a time when having information about clients was a competitive advantage, but this is not the way it is today. To maintain a competitive position one must move to a new plateau, the knowledge level, and learn *how they do what they do*.

Thereafter, to be an effective player, one has to move yet higher, to the level of understanding, and learn *why they do what they do*.

The *why* question is the matter of purpose, that of choice. The choice is the product of the interactions among the three dimensions: rational, emotional, and cultural (Figure 2.4).

Rational choice is the domain of self-interest, or the interest of the decision maker, not the observer. A rational choice is not necessarily a wise choice. It reflects only the perceived interest of the decision maker at the time. Meanwhile, wisdom has ethical implications and considers the consequence of an action in the context of a collectivity.

The following examples explains this notion of choice with much more clarity. My daughter Jeyran was only five and jumping up and down on our bed. I said to her, "Jeyran, I would not do that if I were you." Giving me an innocent look, she replied, "No, I don't think so. If you were me, you would be doing exactly what I'm doing. You don't know how exciting this is."

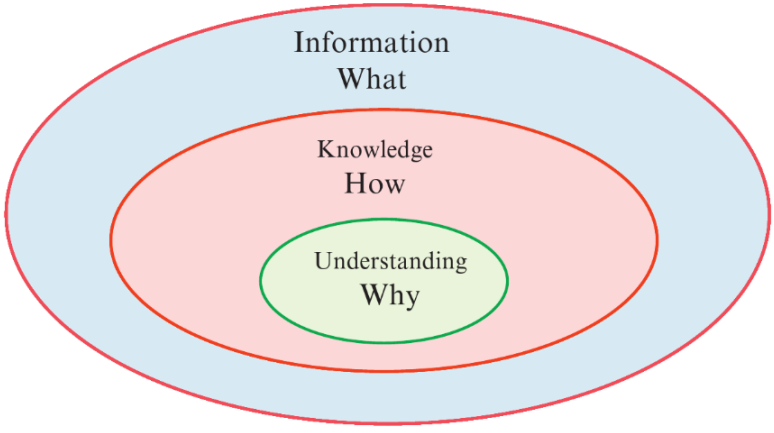

FIGURE 2.3 Hierarchy of influence.

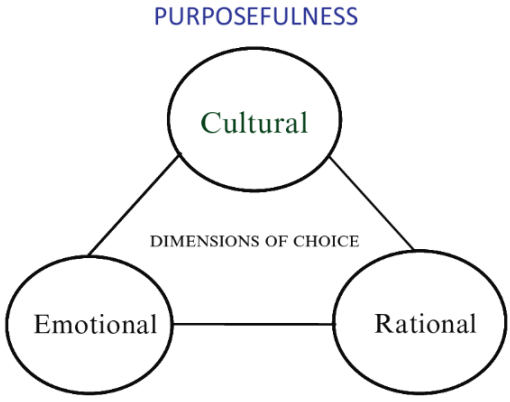

FIGURE 2.4 Rational, emotional, and cultural choice.

When I worked for IBM, we were told, "The customer is right, *always* right. If you don't believe this, you will not work here. We know he's right even if we don't know why; your job is to find his rationale, and learn why he's doing what he's doing."

Actually, in trying to find this rationale, I learned the most important lesson of my professional life: market economies, like democracies, make only rational choices. The winners are not necessarily the best, but those who are most compatible with the existing order. Being ahead of your time is sometimes more tragic than falling behind.

The story of the Ford Foundation's birth control project in India was another eye-opener for me. During a working visit to India, my senior partner, Russ Ackoff, met a number of Americans trying to teach family planning and birth control to Indians. They were not succeeding and were frustrated over the program's failure to produce any results. "Indians are irrational," the project manager told Russ. "They know population is their number-one enemy, and here we are teaching them control, giving them all the contraceptives they need, plus a transistor radio as a reward. But look what happens. They go home, turn the radio on, and with music make a new baby." Russ suggested that they simply could not dismiss this behavior as irrational and should be looking for other explanations. The project manager then produced a newspaper clipping in which it was reported that an Indian woman had given birth to her 27th child, adding "If this isn't irrational then I don't know what irrational is!"

Russ then posed the following: "If a woman can have 27 children, then why do Indians, on average, have only 4.6? This means they know how to practice control, but aren't willing to do so. Maybe you are solving the wrong problem." When the issue was put in this context it was discovered that at the time, there was no social security, no retirement, and no unemployment benefits. Therefore having *three sons*, by default, was considered the retirement system. The first priority for each couple was to put

their retirement in place. Statistically, to have three sons requires an average of 4.6 children. Not surprisingly, those who had three sons had stopped having children. Perhaps the lady in the news clipping was trying to establish her retirement as well.

Now who was irrational? The Indian couple who got a free transistor radio by attending a lecture? Or the Ford Foundation guy who thought he could get a couple to give up their retirement by giving them a transistor radio?

The *emotional* choice is the domain of beauty and excitement. We do lots of things because they are exciting or, more precisely, because they are challenging. If you happen to beat me 10 times in a tennis game, I do not think you will look forward to playing me again. You will probably want to play someone who can challenge you — the one, ironically, who might have a chance of beating you.

A colleague and friend at the Wharton School, Professor Aron Katselenenboigen, liked to use episodes in chess to explain interesting social phenomena. I once asked him why a majority of chess players like to play with those who are much better at the game than themselves. "It's the challenge," he replied. "Winning is fun if it's associated with a real challenge."

I tested this theory with 10 of my graduate students at Wharton. We had a computer program that could play chess at nine different levels. Level one was very simple. Anyone with a basic knowledge of chess could win with no difficulty. However, the higher levels posed a much greater challenge. Winning at level six, for example, required considerable mastery. Each student was told that he/she could play 10 games at any level he/she wanted; for every game won he/she would receive a dollar, and for every game lost he/she would have to give back a dollar.

All the students started at level one, but after winning a few dollars all moved to higher levels. By the finishing time most were playing at level five, and two were even at level six.

If the excitement of a good challenge were not part of our decision criteria, life would be a bore. In other words, setting and seeking attainable goals is a banal existence. This may come as a surprise to many "human resource managers," but for sure it explains the boredom and meaninglessness associated with huge segments of corporate life.

In contrast to rational choice, which reflects on instrumental (extrinsic) values, the emotional dimension deals with stylistic (intrinsic) values. It is the enjoyment and satisfaction derived from the emotional state in and of itself. While rational choice is risk aversive, emotional choice is not. Risk is an important attribute of excitement and challenge.

Culture defines the ethical norms of the collectivity, of which the decision maker is a member. The ethical values are the constraining elements of the decision process. However, by dictating the default values, culture has a profound impact on the decision process. Just like a

high-level computer language that provides default parameters when the programmer fails to choose one, the culture provides default values when actors fail to choose one explicitly.

Purposeful systems are value-guided systems; in other words, values are what purposeful behaviors strive to achieve. More often than not, these values are implicit in the culture, and the decision maker is not even aware that she/he has a choice. Default values are usually treated as realities out there; and they will remain out there as long as no one is willing to challenge them.

Finally, the essence of purposefulness can be appreciated only by understanding the distinctions that Ackoff makes between the three types of system behavior: reaction, response, and action. A *reaction* is a system behavior for which an event in the environment is both necessary and sufficient. Thus a reaction is an event that is (deterministically) caused by another event. A *response* is a system behavior for which an event in the environment is necessary but not sufficient. Thus a response is an event of which the system itself is a coproducer. An *action* is a system behavior for which a change in the environment is neither necessary nor sufficient. Actions, therefore, are self-determined *events*, or autonomous behavior.

Reactive, responsive, and active systems are, in turn, correlated with *state-maintaining*, *goal-seeking*, and *purposeful* systems (Table 2.1).

A state-maintaining system is one that reacts to changes to maintain its state under different environmental conditions. Such a system can react (not respond) because what is done is determined entirely by the change in its environment, given the structure of the system. Nevertheless, it performs an intrinsic function by maintaining its state in a different way under different conditions. For example, many heating systems are state-maintaining. An internal controller turns the system on when the room temperature goes below a desired level, then turns it off when the

Table 2.1 Behavioral Classification of Systems

Behavior Process	Means Structure	End Function
Passive Tools	No choice, One **structure** in all environments	No choice, One **function** in all environments
Reactive State Maintaining	No choice Variable but Determined	No choice, One **function** in all Different environments
Responsive Goal seeking	Choice of means Variable and Chosen	No choice of ends Variable but Determined
Active Purposeful	Choice of means Variable and Chosen	Choice of ends Variable and Chosen

temperature goes above this level. The state maintained is the room temperature. Such a system is able to adapt to change but is not capable of learning, because it cannot choose its behavior. It cannot improve with experience.

A goal-seeking system is one that can respond differently to different events in the same or a different environment until it produces a particular outcome (state). Production of this state is its goal. Such a system has a choice of means but not of ends; hence it is responsive rather than reactive. Response is voluntary; reaction is not. For example, lower level animals can seek food in different ways in the same or a different environment. If a goal-seeking system has memory it can learn to pursue its goal more efficiently over time.

A purposeful system is one that can produce not only the same outcomes in different ways in the same environment but also different outcomes in both the same and different environments. It can change its ends under constant conditions. This ability to change ends under constant conditions is what exemplifies free will. Such systems not only learn and adapt; they can also create. Human beings are examples of such systems.

Purposeful systems have all the capabilities of goal-seeking and state-maintaining systems. Meanwhile, goal-seeking systems have the capabilities of state-maintaining systems, although the converse is not true.

Finally, it is reasonable to assume that decision implies *power*. And power is a concept of many meanings and dimensions. However, according to Boulding (1968), it may be defined as the amount of change created in a future state by a decision. Since doing nothing is always an option, the power of a decision maker can be measured by the difference in the future state between doing something and doing nothing.

A concept closely related to that of power is *freedom*, which also has many meanings and dimensions. One meaning is that of an alternative, or a range of choices. If I have no alternatives, I am clearly not free to choose; therefore I have no power to change the future state.

This brings us to the next discussion: the principle of multidimensionality.

2.2.1 Recap

- The world is not run by those who are right. It is run by those who can convince others they are right.
- Choice has three aspects: rational (self-interest), emotional (excitement), and cultural (default).
- While rational choice is risk averse, emotional choice is not. Risk is an important attribute of excitement and challenge.
- Realities out there will remain out there as long as no one is willing to challenge them.
- Choice is a matter of competence; it implies power-to-do. Liberty without competence is an empty proposition.

2.3 MULTIDIMENSIONALITY

Multidimensionality[1] is probably one of the most potent principles of systems thinking. It is the ability to see complementary relations in opposing tendencies and to create feasible wholes with infeasible parts.

For the majority of cultures, a fallacy has dominated the treatment of opposing tendencies as a duality in a zero-sum game. Everything seems to come in a pair of opposites: security/freedom, order/complexity, collectivity/individuality, modernity/tradition, art/science, and so on. They are cast in such a way that a win for one is invariably associated with a loss for the other.

In the context of a zero-sum game, opposing tendencies are formulated in two distinct ways. First, conflicting tendencies are conceptualized as two mutually exclusive, discrete entities. The conflicts are treated as dichotomies that are usually expressed as X or NX (Figure 2.5). If X is right then NX has to be wrong. This represents an *or* relationship, a win/lose struggle with a moral obligation to win. The loser, usually declared wrong, is eliminated.

Second, opposing tendencies are formulated in such a way that they can be represented by a continuum (Figure 2.6). Between black and white are a thousand shades of gray. This calls for a compromise, or resolution of the conflict. Compromise is a frustration point, a give-and-take struggle. Depending on the relative strength of the poles of tension, the power game will come to a temporary halt. The compromise point is an unstable mixture, usually containing elements of two extremes. As the power structure changes, so does the compromised position.

The constant struggle between groups of people who see different "*clear and urgent*" necessities when dealing with social realities — the urgency

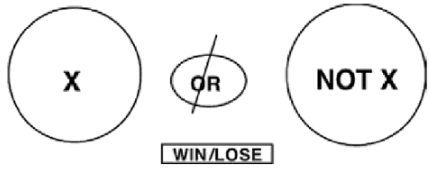

FIGURE 2.5 Dichotomy.

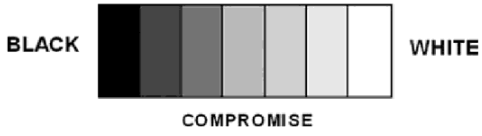

FIGURE 2.6 Continuums.

[1]Throughout this book I use *dimensions* to identify quantifiable variables and also to reflect aspects and facets of a system.

of production versus that of distribution, the desire to protect the rights of victims versus the rights of the accused, the need to protect the environment versus the individual right to make a living — is the manifestation of a need to develop new frameworks.

Churchman's (1979) concern with the "environmental fallacy," Boulding's (1968) rejection of suboptimization (1968), and Ackoff's (1978) concept of "separately infeasible parts making a feasible whole" are reflections of the same concern.

It seems as though we live in an age of paradoxes. Even time-honored values such as freedom and justice are not spared. Boulding (1953) acknowledged the dilemma with the observation that some are afraid of *freedom*, seeing always behind it the specter of anarchy, whereas some others are afraid of *justice*, seeing always behind it the specter of tyranny.

Furthermore, consider the relation between security and freedom. One cannot be free if one is not secure; one will not be secure if one is not free. Maybe freedom, justice, and security are three aspects of the same thing and were not meant to be separated in the first place. Certainly, treating them in isolation has been problematic.

A complement is that which fills out or completes a whole. The principle of *multidimensionality* maintains that the opposing tendencies not only coexist and interact, but also form a complementary relationship. The complementary relationship is not confined to pairs. More than two variables may form complementary relations as the trio of freedom, justice, and security demonstrates (see Figure 2.7).

The mutual interdependence of opposing tendencies is characterized by an *and* instead of an *or* relationship. This means that each tendency is represented by a separate dimension, resulting in a multidimensional scheme where a low/low and a high/high, in addition to low/high and high/low, are strong possibilities.

This is a non-zero-sum formulation in which a loss for one side is not necessarily a gain for the other; on the contrary, both opposing tendencies can increase or decrease simultaneously.

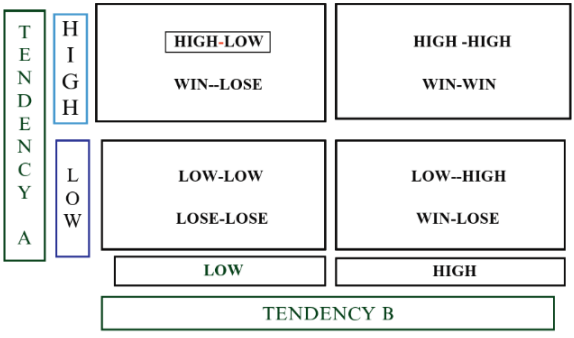

FIGURE 2.7 Complementary relationships.

Using a multidimensional representation, one can see how the tendencies previously considered as dichotomies can interact and be integrated into something quite new. The addition of new dimensions makes it possible to discover new frames of reference in which opposing sets of tendencies can be interpreted in a new ensemble with a new logic of its own.

Says Churchman (1979): "The usual dichotomy of 'x' or 'not x' never seems to display the general, because neither of the above is always so prominent an aspect of social systems."

Note that in classical logic, contradictions are relative to a domain; adding a new dimension expands the domain and converts the contradictions to complementaries.

To explain this further, let us look at a related concept: *typology.* A proper way of developing typologies, which corresponds with my intentions here, requires that the relevant variables, which together define the state of the phenomenon under study, are identified and each conceptualized as a separate dimension.

A dimension represented by an arrow is used to reflect a quantification of a variable on a given scale. It measures a characteristic specified by the operational definition of the variable involved. Segmentation of this scale into two regions of *low* and *high* is usually based on an assumption that the low or high value assigned to the variable will have a significant impact on the behavior of the system that is coproduced by the variable.

In this context, the point of distinction between low and high is not arbitrary (Figure 2.8). It signifies the level at which the behavior of the dependent system is qualitatively affected. This is a change that corresponds to the singularity or inflection point (change of phase) in physical phenomena.

In other words, if the variable *income* has an impact on an individual's behavior, there seems to be a critical level of income at which a change in lifestyle occurs, qualitatively affecting that behavior.

If I make $10 a week, I may eat one hamburger; with $20 I may have two; and with $30 I will try three. However, if I make $1,000 a week, I will not eat 100 hamburgers. I may not eat hamburgers at all. Therefore, a quantitative change in my income at some point has produced a qualitative change in my way of life. That is the point of distinction between the low and the high level of income.

Provided one is aware of their underlying assumptions and limitations, typologies can show how behavior of a multidimensional system differs significantly according to the emphasis on one or the other dimension.

FIGURE 2.8 Change of phase.

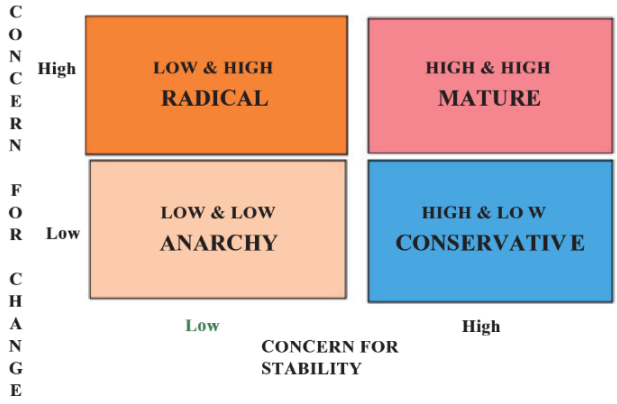

FIGURE 2.9 Behavior of a multidimensional system.

For example, the interaction of a high concern for change with a high concern for stability produces a completely different mode of behavior than the one produced either by a high concern for change coupled with a low concern for stability or the one produced by a high concern for stability coupled with a low concern for change (see Figure 2.9).

The high/high represents the behavior of a mature system, searching for stability through change. While the low/high reflects a radical system interested in change at any price, it can be reactionary or progressive, depending on the direction of the change sought. The high/low, on the other hand, represents a conservative state, preferring the status quo and, therefore, a tendency for regulation and compromise. But the low/low is anarchy with a low concern for change and a low concern for stability, opposed to government in any form.

Therefore, with different combinations of the levels of concern (low or high), different modes of behavior will emerge. Each mode represents a new system whose character can be understood only in its own right.

The typology of the management style developed by Blake and Mouton (1964) underscores the same point by demonstrating that although the "1.9" and "9.9" styles both reflect a high concern (9) for people, the manifestations of these concerns are different in both cases (Figure 2.10).

The 1.9 is a paternalistic, populist leader, whose concern for people is basically a concern for their weaknesses. Therefore, he/she assumes a protective role. Meanwhile, the 9.9 is a leader whose main concern for people stems from a respect for their ability and individuality. He/she assumes a different role — that of a motivator.

In the work of Gerald Gordon and colleagues (1974) that studies the factors conducive to innovation, we see the following two abilities as complementary to an individual's propensity to innovate: the ability to differentiate between objects that seem similar and the ability to find similarities between seemingly unrelated matters (Figure 2.11).

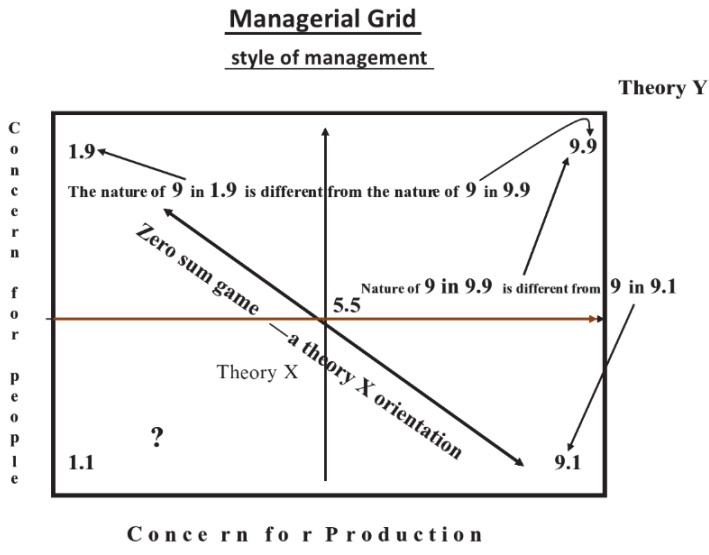

FIGURE 2.10 Style of management.

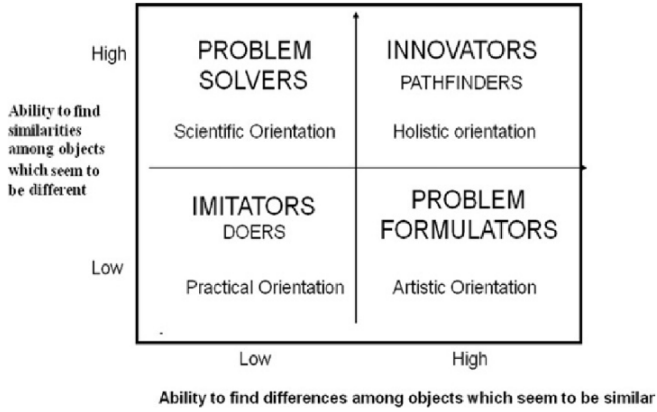

FIGURE 2.11 Innovative abilities.

Similarly, we can show how seemingly contradictory requirements for order and complexity are simultaneously achieved by an organization, and the requirement for stability and change is achieved with adaptation. In each case, the desired characteristic would not be a compromise, but a new totality with characteristics of its own.

2.3.1 Plurality of Function, Structure, and Process

Complementary to the principle of multidimensionality and parallel to it is the concept of plurality. Plurality of function, structure, and process, as we will see later on, is at the core of systems theory of development. It makes the

2.4 EMERGENT PROPERTY

I can love, but none of my parts can love. If you take me apart, the phenomenon of love will be lost. Furthermore, love does not yield itself to any one of the five senses. It does not have a color, a sound, or an aroma. It cannot be touched or tasted. Then how does one measure love? Of course one may always measure the manifestation of love. "If you love me why don't you call me?" someone may say.

Something does not seem quite right. The phenomenon of love does not fit the classical description of a property. Furthermore, it does not seem to be alone in this distinction. Similar phenomena, such as success, failure, and happiness, display the same types of characteristics. So let us give them a name, *emergent properties,* and put them in a category of their own: *type II properties,* as distinct from the more classical type, which we will call *type I properties* (Figure 2.13).

Emergent, or type II, properties are the property of the whole, not the property of the parts, and cannot be deduced from properties of the parts. However, they are a product of the interactions, not a sum of the actions of the parts, and therefore have to be understood on their own terms. Furthermore, they do not yield to any one of the five senses and cannot be measured directly. If measurement is necessary, then one can measure only their manifestation.

Emergent properties, by their nature, cannot be analyzed, they cannot be manipulated by analytical tools, and they do not yield to causal explanations. Consider the phenomenon of *life,* the most significant emergent property. No one has yet been able to identify a single cause for life. Falling into the trap of trying to find correlation, we could probably find one between life and almost everything. Unfortunately, these correlations do not explain much about the essence of life. Relying exclusively on an analytical approach, not surprisingly, fails to produce a basic understanding about emergent properties.

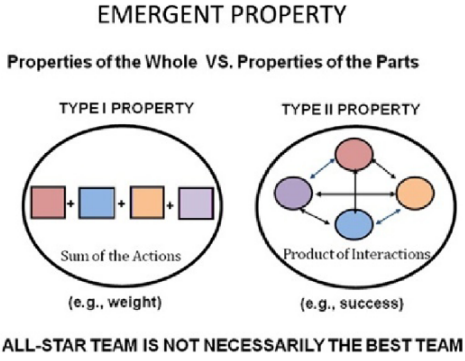

FIGURE 2.13 Emergent properties.

I have suggested that emergent properties are the product of interactions among several elements. The mere notion of interaction signifies a dynamic process producing a time-dependent state. In other words, the emergent phenomenon is reproduced continuously *online* and in *real time*.

Therefore, life, love, happiness, and success are not one-time propositions; they have to be reproduced continuously. If the processes that generate them come to an end, the phenomena cease to exist as well. They cannot even be stored or saved for future use. And for sure, none can be taken for granted. Life, love, and happiness can be there one moment and gone the next. The same is true of success; it is just as vulnerable as love and happiness.

If emergent properties are the spontaneous outcome of ongoing processes, then to understand them one has to understand the processes that generate them. Dying is very natural; staying alive is the miracle. It takes simultaneous interactions among hundreds of processes to keep someone alive. Those who try to explain the phenomenon of life as a single accident do not know what they are talking about.

If success is an emergent property, then it has to be about managing interactions rather than actions. An all-star team is not necessarily the best team in the league, and it might even lose to an average team in the same league. What characterizes a winning team is not only the quality of its players but also the quality of the interactions among them. A few years ago the New Orleans Saints football team had four defensive players in the Pro Bowl, but that did not mean the Saints had the best defense in the league. The same year, the Dallas Cowboys won the Super Bowl, without having any defensive players in the Pro Bowl.

The compatibility between the parts and their reinforcing mutual interactions creates a resonance, a force, which will be an order of magnitude higher than the sum of the forces generated by the separate parts.

On the other hand, incompatibility among the parts will result in a less potent force than what the aggregate would have been able to produce. In the same way, an organization, depending on the nature of the interactions among its members, can be a value-adding or value-reducing system.

I have argued elsewhere that an organization's success is the product of the interactions among the five basic processes of throughput, decision making, learning and control, membership, and conflict management. These processes correspond with generating and disseminating wealth, power, knowledge, beauty, and values.

For example, to understand the success of GE, one cannot simply look at its earnings and market shares. At any given time, one might win or lose for the wrong reasons. Understanding GE's organizational processes (specifically decision, learning, and measurement systems) may provide a better explanation for its continuous success.

We have said that emergent properties cannot be measured directly; one can measure only their manifestations. However, measuring the manifestation of a phenomenon has proven very problematic.

For example, if the number of phone calls is the measure of love, then one can fake it. People can call people without necessarily loving them.

Since most of the behavioral characteristics of living systems are type II properties, the art of faking has been the major preoccupation of behavioral sciences in recent decades. How one can pretend to be something that one is not has been the money-making question of our times. Consider the huge market for how-to books, which give advice on a multitude of topics such as how to come across as a caring person when one does not care at all. Remember when one could pretend to be powerful simply by wearing a red tie?

Measuring the success of an organization has not been an easy proposition, either. As the manifestation of success, growth has been considered an important performance measure of an organization. If an organization is successful, most probably it will grow; however, if an organization is growing, this does not necessarily mean that it is successful. One can easily grow by "faking," or making lousy acquisitions. But unfortunately, two turkeys will not make an eagle. And that is exactly how many organizations have grown, only to destroy themselves.

To avoid pitfalls in measuring an emergent property, one has to measure more than one manifestation. In this context, economic value added (EVA) is a much more reliable measure of past success than simple growth.

$$\text{EVA} = \text{Investment} \times (\text{rate of return} - \text{cast of capital})$$

EVA is based on two important manifestations of success. It is the product of both growth and value generation over and above the cost of capital. A positive EVA indicates a value-adding growth, while a negative EVA shows a value-reducing one.

Finally, manifestation of a phenomenon in its totality can be assessed only by picturing the future implicit in the present behavior of a given system. To map this future, we need a handle on social dynamics.

2.4.1 Recap

- Instead of trying to describe a property only in terms of *being*, we can also try to understand it as a process of *becoming*.
- An all-star team is not necessarily the best team in the league, and it might even lose to an average team in the same league. What characterizes a winning team is not only the quality of its players but also the quality of the interactions among them.

- The compatibility between the parts and their reinforcing mutual interactions creates a resonance, or force, which may be an order of magnitude higher than the sum of the forces generated by the parts separately.
- Emergent properties are the spontaneous outcome of ongoing processes. Life, love, happiness, and success are not one-time propositions; they have to be reproduced continuously. If the processes that generate them end, the phenomena will also cease to exist.

2.5 COUNTERINTUITIVE BEHAVIOR

Social dynamics is fraught with counterintuitive behavior. It stands on a level of complexity beyond the reach of analytical approach.

Counterintuitive behavior means that actions intended to produce a desired outcome may generate opposite results. It has been said that the path to hell is paved with good intentions. Things can get worse before getting better, or vice versa. One can win or lose for the wrong reason.

Making drugs illegal, while costing the nation a fortune, was meant to curb abuse and save the society from its ills. Counterintuitively, it has produced a multi-billion-dollar crime industry, higher consumption, and an overburdened criminal justice system.

To appreciate the nature of counterintuitive behavior, one needs to understand the practical consequences of the following assertions:

- Cause and effect may be separated in time and space. An event happening at a given time and place may have a delayed effect, producing an impact at a different time and a different place.
- Cause and effect can replace one another, displaying circular relations.
- An event may have multiple effects. The order of importance may shift in time.
- A set of variables that initially played a key role in producing an effect may be replaced by a different set of variables at a different time. Removing the initial cause will not necessarily remove the effect.

Expanding the welfare system to reduce the number of poor families in a community may, counterintuitively, increase their numbers. Improvement of welfare usually requires additional resources, which means an increase in taxes. Excessive taxation may push the wealthy and many businesses to move out of the region, diluting the tax base and reducing revenues.

Moreover, a more attractive welfare system will attract higher numbers of the needy to the region. It may also reduce the incentive to work, adding the burden of unemployment to an already overloaded system. Increased cost, coupled with reduced revenue, becomes a recipe for disaster (Figure 2.14).

For example, to examine the total effects of smoking on the heart, we should consider its multiple outcomes. Smoking might reduce anxiety and therefore, in the *short term*, be beneficial to the heart. In addition, smoking, by reducing excessive desire to eat, helps maintain body weight, also

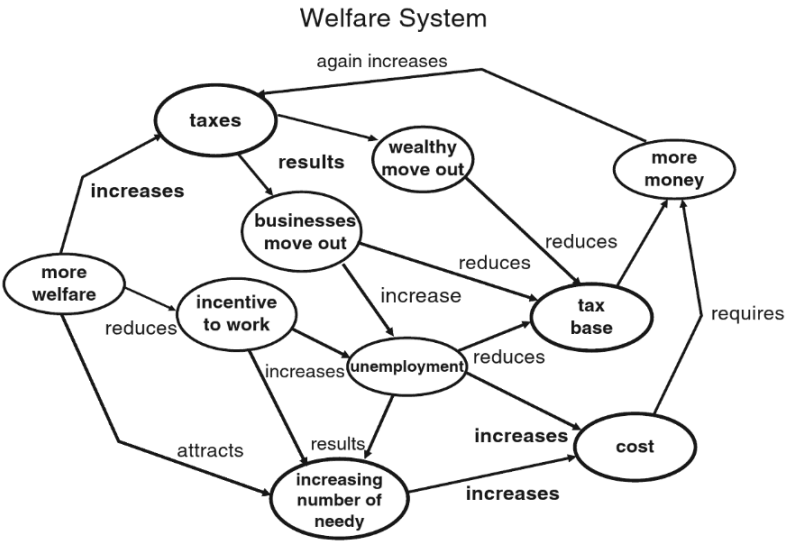

FIGURE 2.14 Dynamics of a welfare system.

helping the heart. But the pleasure associated with reduced anxiety is habit-forming and results in a desire to repeat the act. However, in the *long run*, smoking has a negative effect on the arteries. Combined with genetic dispositions and/or other oxidizing processes, smoking results in rigidity, roughness, and hardening of the heart's arteries. The natural defenses of the body react with multiple layers of cholesterol coatings to smooth things out, which ultimately results in a blockage and heart attacks.

Furthermore, smoking negatively affects the functioning of the lungs, resulting in a less-than-optimum supply of oxygen to the heart (Figure 2.15). In this context, it seems that developing a simple correlation between variables does not mean much; it might even be misleading. Is cholesterol the real villain or just an element of an overprotective defensive mechanism?

We have said that *multifinality* negates the classical principle of causality, suggesting that process, using different combinations of certainty, chance, and choice rather than the initial condition, is mostly responsible for future states.

All this means that understanding the short- and long-term consequences of an action, in its totality, requires building a dynamic model to simulate the multi-loop, nonlinear nature of the system. The model should capture the critical time lags and relevant interactions among major variables.

This approach is distinctly different from the conventional one, where the fallacy of generating simple correlation is responsible for proliferating misinformation that is floated around continuously. Considering the level of confusion that exists around counterintuitive outcomes, it is not difficult to see how one might attribute them to the chaotic nature of the universe.

attractors (multifinal/self-organizing/purposeful) reflect the behavior of sociocultural systems with choices of ends and means; unpredictable patterns emerge out of stylistic preferences of purposeful actors.

Note that self-organization is not always a conscious act. More often than not, it happens by default or through a random iterative process of deviation amplification (evolution). Therefore, self-organization, if it happens by default using implicit cultural codes, would be more like the patterns produced by a torus attractor. However, redesign would be the type of self-organization created by a strange attractor.

Ackoff's (1972) description of passive, reactive, responsive, and active systems corresponds beautifully to the behavioral patterns attributed to the four attractors previously listed. (See Section 2.2 earlier in this chapter.)

With attractors, it is the iteration that makes it possible for order to appear from chaos. Nature automatically creates the iteration, but social beings can return to zero only by choice to start a new iteration. Designing from a clean slate is a reflection of this imperative.

Counterintuitive behavior of social systems is further exemplified by the following observations:

1. Social systems display a tendency to repeat themselves and reproduce the same set of non-solutions all over again.

   One can never overestimate the resistance to change. "Conventional wisdom is like an old guard; it would rather die than surrender." A comfort level with the familiar, combined with fear of the unknown, creates a formidable force that may even override potential self-interest. People may genuinely become excited by a beautiful idea and even support it wholeheartedly. But as the idea moves closer to implementation, insecurity and self-doubt set in. The supporters of the idea may then subconsciously sabotage their own efforts and prevent the change. Along with this comes pathological behavior, which is produced when those in charge of removing an obstruction benefit from it. Absent the support of a courageous, charismatic leader who enjoys the confidence of his/her people, any suggestions for a fundamental change become potentially self-destructive propositions. The fool who chooses to take on this role should be aware of his/her eventual loneliness.
2. A difference in degree may become a difference in kind.

   A commonly accepted principle of systems dynamics is that a quantitative change, beyond a critical point, results in a qualitative change. Accordingly, a difference in degree may become a difference in kind. This doesn't mean that an increased quantity of a given variable will bring a qualitative change in the variable itself. However, when the state of a system depends on a set of variables, a quantitative change in one variable beyond the inflection point will result in a *change of phase* in the *state of the system*. This change is a qualitative one, representing a

whole new set of relationships among the variables involved. Suppose my style of life (state of a system) depends on my income. If my income were to suddenly change from $1,000 a month to $100,000 a month, it would certainly change my style of life. The change, of course, would be a qualitative one, representing a new mode of being. The income level that brings a qualitative change in lifestyle may be different for different people; however, it defines a critical juncture called the *inflection point* as defined above.

Catastrophe theory (Zeeman, 1976), which deals with the same phenomena but in a physical context, reveals that at the inflection point, systems display catastrophic behavior (a cusp). In the social context, an inflection point will usually occur when one of the critical variables changes by an order of magnitude, that is, when something can be done 10 times faster, cheaper, and/or better than would have been possible before.

In his book *Only the Paranoid Survive* (1996), Andrew S. Grove, President and CEO of Intel Corporation, dealt beautifully with the change of phase in a modern, technology-driven corporation. He explains, with great insight, how a "10X" change in certain variables (such as technology, markets, and regulations) resulted in a "strategic inflection point" and a change in the nature of the business, where the known facts of the business become invalid and a whole new set of emotions — denial, fear, insecurity, and feeling of betrayal — sets in.

3. I have mentioned before that market economies, like democracies, do not usually select the best solutions. They choose the most compatible, *satisficing* solution. Being ahead of your time is sometimes more tragic than falling behind.

The following episode, used by Grove to indicate the impact of a 10X change in the marketplace, demonstrates, in my opinion, the essence of market economies' counterintuitive behavior as well.

> Steve Jobs, co-founder of Apple, is arguably the founding genius of the personal computing industry. He left Apple in 1985 to create the "Next" generation of superbly engineered hardware, a graphical user interface that was even better than Apple's Macintosh interface, and an operating system much more advanced than Mac. The software would be built in such a way that customers could tailor applications to their own uses by rearranging chunks of existing software rather than having to write it from the ground up. He wanted to create a computing system that would be in a class by itself. Jobs did not like PCs. He thought them inelegant and poorly engineered. The irony is that he was right. It took him a few years, but the Next computer and operating system delivered basically on all its objectives.

> Yet while Jobs was working on his "insanely great computer," Microsoft Windows had come on the market. Windows wasn't even as good as the Mac, let alone the Next interface, and it wasn't seamlessly integrated with computers or applications. But it was cheap and it worked, most importantly, on the inexpensive personal computers that by the late 1980s were available anywhere in the world from hundreds of PC manufacturers.
>
> **Grove, 1996, pp. 59–60**

The Next machine, even with all its beauty, never took off. Despite an ongoing infusion of cash, a state-of-the-art software operation, and a fully automated factory built to produce a large volume of Next computers, Jobs could not overcome the widespread momentum generated by the combination of Microsoft Windows and Intel Pentium chips, known figuratively as "WinTel." Ironically, Microsoft owes as much of its success to Intel as Intel owes to Microsoft. Each one, by default, created a 10X market for the other.

It is also worthy to note that the Next machine and its operating system is now the basis for the popular and very successful Apple computers and Apple X Operating System.

4. Passive adaptation to a deteriorating environment is a road to disaster.

   It's been said that if a frog is suddenly dropped into boiling water it will immediately jump out. However, if you put the same frog in warm water that is heated gradually, the frog will boil to death with no objection. The same is true of social systems. The capacity to adapt gradually to a changing environment can lead to a disaster if the adaptation is to a deteriorating environment. That only one of the original companies in the Dow Jones index participated in its centennial celebration is an indication that death, even among successful organizations, is more common than we like to believe. In fact, gradual deaths are more common than sudden deaths. In what is called the "Pan Am Syndrome," organizations bleed to death by adapting to an imperceptible gradual change, always doing too little too late. Ironically, sudden change of phase with all of its ramifications is less dangerous than imperceptible, gradual change. An organization facing a sudden change may still have enough organizational strength left in it to cope. But in the case of passive adaptation, by the time an organization recognizes the severity of the problem, it may have already lost most of its strength and be unable to do anything about it.

2.5.1 Recap

- Success in playing the game changes the game, and tenacity in playing the old game converts success to failure.
- Market economies, like democracies, make only rational choices. The winners are not necessarily the best, but those most compatible with

the existing order. Being ahead of your time is sometimes more tragic than falling behind.

- Cause and effect display circular relations. Events have multiple effects, each with a different time lag and independent life of its own.
- Removing the cause will not necessarily remove the effect.
- Nature's tendency for iteration, pattern formation, and creation of order out of chaos creates expectations of predictability. It seems, however, that nature, because of varying degrees of interaction between chance and choice, and the nonlinearity of systems, escapes the boredom of predictability.

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this is *the extension of a new understanding of life to the social domain*. This brings us to the notion of self-organizing tendencies of sociocultural systems.

I have argued extensively in a previous work (Gharajedaghi, 1972) that to be self-organizing and to move toward a predefined order, a social system must possess a means of knowing — an internal image of what it wants to be. I have also suggested that the same way that DNA is the source of this image for biological systems, *culture* (shared image) is the source of the blueprints for the desired future of the sociocultural systems. The image of this future provides default values for all decisions and stands at the center of the process of change. That is why, despite all kinds of obstructions, sociocultural systems seem to pursue a predefined order with tenacity. The persistence of default values explains why it is so difficult to induce change into sociocultural systems.

To appreciate the operational meaning of this conception and the critical role implicit cultural codes play in the process of change and dynamics of social systems, we ought to enrich our understanding of the essential characteristic of the information-bonded systems and the essential functions of shared image.

3.2 INFORMATION-BONDED SYSTEMS

> Many things about the behavior of a social system refer to the interaction rather than the individuality of its members. Each social system manifests certain characteristics that it may retain even if all its individual members are replaced.
>
> **Ervin Lazlo, 1972**

The elements that characterize a social system are not only its members, but also the relationship of its members to one another and to the whole. This is implicit in the definition of a system. Some kind of linkage between the elements is presupposed if the aggregate is to be considered a system. The point of emphasis, then, is not the existence of a relationship, but the assumptions regarding the nature of the relationship. These relationships in turn depend on the nature of the bonds that link and hold the components of the system together. In this context, there are fundamental differences between the nature of the bond in mechanical systems and those in sociocultural systems.

While the elements of mechanical systems are "energy-bonded," those of sociocultural systems are "information-bonded." In energy-bonded systems, laws of classical physics govern the relationship existing between the elements. Integration of the parts is a one-time proposition. Nail two boards together, and they stay that way until the wood rots, the nails rust, or a pry bar separates them. In mechanical systems passive and predictable functioning of parts is a must, until a part breaks down or an external force of sufficient strength is applied. But the behavior of active parts of an information-bonded system is a different proposition: integration of these

parts into a cohesive whole is a lifetime struggle. Think about the challenges of maintaining a marriage, families, or any other close-knit group of human beings — each with a mind of his/her own — to appreciate the unique challenges of integrating the members in a social system. Organization of a multi-minded sociocultural system is considered a voluntary association of purposeful members in which the bonding is achieved by a second-degree agreement (an agreement based on a common perception). In first-degree agreements actors may agree on a course of action for completely different reasons. (The leftist and the Islamist in Iran agreed to topple the Shah's regime for completely opposite reasons.) Second-degree agreement, on the other hand, requires an agreement on the why question. Therefore, even agreeing to disagree, in certain situations, might be considered a second-degree agreement.

Buckley (1967) explained the structural characteristic of sociocultural systems based on the effect of information, not energy transmission such as we find in mechanical systems. The sociocultural system is viewed as a set of elements linked almost entirely by interconnection of information. It is an organization of meanings emerging from a network of interactions among individuals.

To clarify the meaning of information-bonded systems, we need to examine the concepts of culture and social learning in more detail.

3.3 CULTURE

Image building and abstraction are among the most significant characteristics of human beings, allowing them not only to form and interpret images of real things, but also to use these images to create images of things that may not exist. These images are then synthesized into a unified, meaningful mental model and eventually into a worldview. Man feels hunger, observes the fleeing prey, and realizes his inability to capture it. After discovering other related objective realities (wood, stones, etc.), he thinks about and eventually creates a subjective image of a tool, one yet to be, that would help him secure food. Transformation of this subjective image into an objective reality results in the bow and arrow, which in turn will be a reproducer of yet another image, and so on. This dialectic interaction between objective and subjective realities lies at the core of a process called *design thinking*, which is responsible for the dynamic development of human societies. We have noted several postulations that identify cognition — the process of knowing — with the process of life. We also noted that consciousness is a complex form of cognitive process and reflective consciousness involves a level of cognitive abstraction that includes the ability to form mental images. It is appreciation of this incredible ability to create a mental image that brings the new understanding of life to the social domain. It provides the clue for understanding the nature of social bonds, the process of socialization, and human development.

As a prerequisite to survival it has always been necessary for people to observe and understand events that are constantly occurring in their environment. They do so in order to use favorable opportunities and be prepared for antagonistic events. But understanding scattered phenomena in isolation, although necessary, is not sufficient for humans to relate to their environment. Therefore, an additional struggle to find a logical relationship among these isolated findings impels people to synthesize this fragmented information into a unified, meaningful mental image and eventually into a worldview. For a beautiful and in-depth discussion of image formation see Boulding (1956).

Coproduced by the environment and man's unique process of creativity, the image (itself a beautiful design) establishes a link between man and his environment. It consists of a system of implicit assumptions on the nature of spatio-temporal-causal realities, in addition to a concept of values, aesthetics, and one's perceived role in the environment.

A considerable part of this image or mental model of the universe is shared with others who live in the same social setting. The rest remains private and personal. It is the shared image that constitutes the principal bond among members of a human community and provides the necessary conditions for any meaningful interactions. The extent to which the image of an individual coincides with the "shared image" of a community determines the degree of his membership in that community. It is the "shared image" that we refer to as the culture of a people. Incorporating their experiences, beliefs, attitudes, and ideals, culture is the ultimate product and reflection of their history and the manifestation of their identity — man creates his culture and his culture creates him (Figure 3.2).

Although culture pre-exists for individuals, it can be transformed and reproduced by their purposeful actions. It is here that the key obstacles and opportunities for development are found — the collective ability and desire of a people to transform their culture and re-create the future they want. Human culture with all its complexity, ambiguity, and manifold potentialities stands at the center of the process of change. This process of

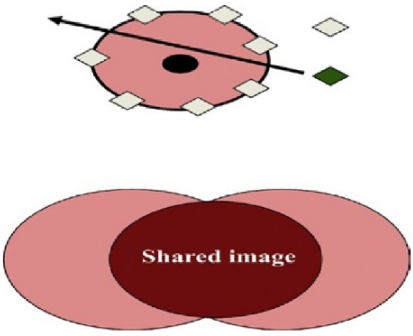


FIGURE 3.2 Shared image and culture.

change cannot be understood except against the background of the culture of which it is a part, which it builds upon and reacts against. This process is so ingrained that the success of individual actions invariably depends on the degree to which they penetrate and modify the "shared image."

Operational implications of culture lie in the fact that cultures act as default decision systems. For example, if you do not decide explicitly what kind of parent you want to be, the culture makes this decision for you. When people repeatedly use default values, they tend to forget that they have a choice. Instead, they treat such values as "realities out there," undermining the fact that those "realities" will remain "out there" as long as no one is willing to challenge them. The problem is that the implicitness of the underlying assumptions prevents actors from questioning their validity; therefore, the defaults usually remain unchallenged and become obsolete.

The potentiality and vitality of the culture lie in its creative ability to meet the challenges of continuously emerging desires and ideals. This process demands conscious and active adaptation, not a passive acceptance of events. It is a struggle for the creation of new dimensions, appreciation of new realities, and, finally, enrichment of the common image. It is a learning process that entails coordinated changes in motivation, knowledge, and understanding throughout the social system.

3.4 SOCIAL LEARNING

Social systems learn through the members who adjust their worldviews by mapping new realities and observing the actual or potential results of their actions' social learning; however, the sum of each member's learning is their collective, shared learning. Sociocultural systems manifest greater inertia and resistance to change than their individual members.

The inertia of a culture is manifested when public and private images act as filters, developing a selective mode of reception. This process tunes the receptors for particular messages. Those consistent with the image are absorbed and reinforced, while contradictory and antagonistic ones have no significant effect. This phenomenon, although an impediment to change, acts as a defense mechanism and structure-maintaining function. Looking on the positive side, inertia helps to make cultures resilient and sustainable.

Failure of a social system to learn leads to other major difficulties. For instance, as systems become more sophisticated and problems become more profound, the increasing disconnection between science and the public image becomes the dilemma of the democratic process and remains its main challenge. The disconnection happens in a dynamic process with several stages of dissociation. At the outset, since truth is commonly identified with simplicity and comprehensibility, what one does not understand is simply rejected as false. Further, a high level of

specialization in science moves it further away from the common image, creating a small, isolated subculture. Ultimately, creation of a scientific subculture that fails to communicate its insights reduces the influence of science on the behavior of the public at large at just the time when it may be needed most.

Recently involved with a community development project aimed at creating a shared vision of a desired future for all the stakeholders, I was confronted with the following statement: "Common people don't understand these fancy concepts. They would be better off sticking with tangible and familiar things they understand." My answer was "Understanding among common people is usually the end result of a developmental process, not its beginning. If understanding among common people becomes a prerequisite for introducing a 'fancy' concept, I assure you that we will fast fall to the lowest level of banality. Life would proceed with setting and seeking attainable goals that would rarely escape the limits of the familiar."

The greatest obstacle in most developmental processes is not so much a lack of understanding among common people as a lack of common understanding among the so-called experts. It has always been easier to generate required levels of understanding among common people than among experts, not only because they do not have an ego problem, but because learning is much simpler than unlearning. The patronizing myth of protecting common people from fancy concepts now borders on the art of demagoguery.

Finally, fear of rejection and a strong tendency toward conformity among members of a social system are other obstructions to social change. An example is the experience of a dry county whose constituents were to vote on the alcohol ban. A pre-vote survey indicated that 75% of the voters favored abolishing the ban; however, the individual voters thought the majority wanted a dry county. When the results were tabulated, 60% of the voters had voted to keep the county dry. Not surprisingly, after the survey results were published, the next vote on the issue produced a 65% majority in favor of abolishing the ban.

Recall that the role of knowledge in social systems is analogous to that of energy in physical systems. But unlike energy, knowledge is not subject to the "law of conservation." One does not lose knowledge by sharing it with others; the opposite is true. The ability to learn and share knowledge enables sociocultural systems to continuously increase their capacity for higher levels of organization. This is what social development is all about. It is this collective and shared learning that enables societies to redesign themselves by successively creating new modes of organization at higher levels of order and complexity. For example, at the time of the American Revolution, the thirteen colonies ceased to think of themselves as simply an aggregate or collection of discrete economic entities beholden to England and began to think of themselves as a unified group of members

an iterative process of deviation amplification begins. This is how a frustrated mass motivated by hatred and led by paternalistic/charismatic leaders can produce a phenomenal change in the structure of a less developed social system. Unfortunately, without the formation of a comprehensive shared image of a desired future, chaotic struggles may not produce transformation to a self-evolving, purposeful, sociocultural system. The reality of highly developed sociocultural systems that have outgrown the secure web of a paternalistic culture is fundamentally different from those that are still trapped within the confines of this type of culture. Unless paternalistic cultural codes are properly challenged and modified, the repeated pattern of authoritarian ruler and alienated people will continue to emerge. (The Iranian Revolution and the collapse of the Soviet Union are most recent anecdotal evidence.)

Emancipation, according to Habermas, takes place whenever people are able to overcome past restrictions that resulted from ideological distortions.

Unfortunately, ideologies in any form or type have proved to be major obstructions to the viability of a social system. The significant and common characteristic of all ideologies is a claim for ultimate truth with a predefined set of ends and means. Underlying assumptions are not to be questioned by true believers. This is incompatible with second-order learning, which requires questioning sacred assumptions and challenging implicit sets of default values.

Unfortunately, many generations of our time have witnessed with despair how competing ideologies destroyed millions of livelihoods and have undermined the viability of so many vibrant societies. In response the following provocative statements by two contemporary social scientists underline the level of our preoccupation with the menacing nature of ideologies.

Francis Fukuyama, in a famous article published in the *Foreign Affairs Journal* (1992) titled "End of History," declared: "What we are witnessing is not just the end of the Cold War but the end of history. The era of ideological battles is over. The world will be moving toward a global market economy and capitalism, democracy and human rights will be spreading all over the globe." A year later, Samuel P. Huntington, in a widely read rebuttal in the same journal (summer 1993), predicted that the end of the Cold War would be followed by "the clash of civilizations" between what he called "Islamic Civilization" and "Christian or western Civilization."

Needless to say, predicting counterintuitive behavior of complex social systems from a single ideological perspective is an oversimplification. According to Kenneth Boulding (1981, p. 18):

> The systemic vision of social dynamics is unfriendly to any monistic view of human history that seeks to explain it by a single factor, whether this is a materialistic interpretation as in the case of [classical] Marxism, a simple theistic interpretation, as in biblical Judaism, or an eschatological

> interpretation in terms of some simple denouncement. The simple rhetoric of revolution also must be regarded as an essentially minor element in the ongoing process of human and societal evolution, although it is sometimes important as a special case under particular circumstances.

For systems thinking civilization is the emergent outcome of the interaction between *culture* (the software) and *technology* (the hardware; Figure 3.3). Technology is universal, proliferating with no resistance, whereas cultures are local, resisting change with tenacity. In an open society culture evolves with technological advances, but in the closed societies incompatibility between technology and culture leads to reactionary struggles. The problem is amplified by the unfortunate fact that some cultures are producers of technology while others are only its consumers. Imported technologies that coproduce unwelcome changes in traditional ways of life are often seen as a "foreign invasion" by reactionary forces. This leads to further campaign for isolation and creation of the "us versus them" mentality.

Finally, the subject of social change and the shared image cannot end without a reference to Margaret J. Wheatley's interesting book, *Leadership and New Science* (1994). Wheatley, with simple language, reviews relevant and intriguing conceptions from the quantum world and field theory to bring additional insights to understanding sociocultural systems. In this context appreciation of a field of vision permeating the organizational space adds a new dimension for the role of culture in development of social systems.

As Wheatley points out, the field picture of a world permeated with a few active media has replaced the Newtonian picture of the world populated by many particles, each with an independent existence. Space used to be the basic ingredient of the universe. An atom is 99.999% empty. But something strange has happened to space in the quantum world. No longer is there a lonely void. Space, everywhere, is now thought to be filled with

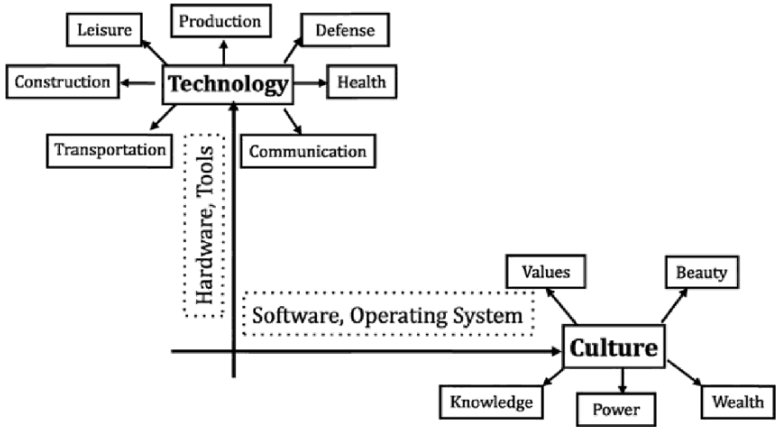


FIGURE 3.3 Two dimensions of civilization.

fields. Invisible, intangible, inaudible, tasteless, odorless fields that are unapproachable through our five senses are as real as the particles in them. In reference to field theory, Wheatley (1994) also provided the following quotes from Rupert Sheldrake, which highlight the essential message contained in his beautiful conception.

- "Some of what we know how to do comes not from our own acquired learning, but from knowledge that has been accumulated in the human species field to which we have access."
- "Whole populations of species can shift their behavior because the content of their field has changed, not because they individually have taken the time to learn new behavior."

To re-create the future by way of influencing the shared image, the cultural field, thus bringing about a more desired pattern of behavior, is what interactive design is all about. We will discuss interactive design in Chapter 7.

Development

Development is a core concept of the systems view of the world. In contrast to the mechanistic and biological views concerned, respectively, with *efficiency* and *growth*, the systems view is basically concerned with development.

A critical review of major traditional views of development suggests that they are generally characterized by problems of (1) ethnocentrism, (2) unidimensionality, and (3) deterministic perspective.

In the first place, most developmental theories have built-in ethnocentric biases. The models, as ideal types of developed societies, bear unmistakable signs of the western historical experience. Furthermore, the fragmentation of developmental theory into competing disciplinary perspectives results in a unidimensional view of development. Each discipline tends to exclude the other variables from its own unique domain of analysis — material quantities in economics, power in political science, and order in sociology.

Perhaps the most serious problem lies in the fact that most developmental theories begin with a preconceived law of social transformation. Assumed to be true at all times and in all environments, the path is charted beforehand.

Development plays a central role in the systems view of the world, therefore, it is important to clarify any misconceptions that exist about the nature of development and the properties usually identified with it.

Although it is risky to lump developmental theories together, for practical purposes we need some kind of classification scheme. Still, important differences and some significant continuity exist among them. Further, these theories do not necessarily refute each other. In most cases, they either complement or supersede one another.

The typology presented here (Figure 4.1) categorizes developmental theories into eight types depending on their underlying assumptions (explicit or implicit) regarding the singularity or plurality they attribute to function, structure, and process.

Singularity refers to theories in which a particular structure, function, or process is considered fixed and/or primary in all environments. *Plurality* refers to theories that consider structure, function, or process to be multiple and/or variable in the same or different environments.

	Singularity of Function		Plurality of Function	
	Singularity of Process	Plurality of Process	Singularity of Process	Plurality of Process
Singularity of Structure	**Classical Neo-classical**	**Behaviorism**	**Structural Functionalism**	**General Systems**
Plurality of Structure	**Orthodox Marxism**	**Radical Humanism**	**New Left**	**Purposeful Systems**

FIGURE 4.1 Typology of development theories.

Note that the theories in category 1 (singularity of function, structure, and process) are descriptive and do not deal with any means of intervention. Other categories, by assuming plurality in at least one dimension, provide for some means of intervention. Category 8 (purposeful systems, representing the systems view of development) assumes plurality in all three dimensions: function, structure, and process. Therefore, category 8 is an inclusive theory. It provides a framework to explain the other seven categories as special cases. The following scheme summarizes the assumptions and the main features of each type and their perspectives on development.

4.1 SCHEMATIC VIEW OF THEORETICAL TRADITIONS

Without explanation, the significance of the typology presented in Figure 4.1 may be lost. This section addresses each element in an attempt to differentiate them.

Singularity of Function, Structure, and Process

Model: Determined, mechanistic, and descriptive model of man in a state of nature, homo-economicus; forms social contract to increase wealth through increasing productivity and division of labor.

Theoretical Tradition: Classical and neoclassical, as exemplified by the writings of Smith, Ricardo, Malthus, Mill, Marshall, Keynes, Schumpeter, and Rostow.

Development Process: Stability and growth against major constraints of capital accumulation, population growth, and limited natural resources; automatic mechanism of adjustment. Keynes introduces the principles of conscious manipulation of productive forces (neoclassical) to maintain stability and growth. Rostow considers a stage theory, traditional, pre-take-off, take-off, self-sustaining growth, and high mass consumption.

Singularity of Function and Process with Plurality of Structure

Model: Deterministic and mechanistic model based on linear cause-and-effect relationships. Conflict, the prime producer of change, results in a stage theory and formation of a new social structure.

Development Process: Multi-final, interactive, and purposeful movement toward increased differentiation and integration. A learning and creative process to increase ability and desire to re-create the future. An ideal-seeking mode of organization to resolve conflicts at higher levels. Systemic view of development, by accepting plurality in all three dimensions of function, structure, and process; considers the other seven categories as special cases. From the systems perspective, development is not only a multifunctional phenomenon, but it involves multiple and varying concepts of *structure* and *process* as well.

4.2 SYSTEMS VIEW OF DEVELOPMENT

Development of an organization is a purposeful transformation toward higher levels of integration and differentiation at the same time (as represented in Figure 4.2). It is a collective learning process by which a social system increases its ability and desire to serve both its members and its environment. *Differentiation* represents an artistic orientation (looking for differences among things that are apparently similar) emphasizing stylistic values and signifying tendencies toward increased complexity, variety, autonomy, and morphogenesis (creation of a new structure). *Integration*, on the other hand, represents a scientific orientation (looking for similarities among things that are apparently different) emphasizing instrumental values and signifying tendencies toward increased order, uniformity, conformity, collectivity, and morphostasis (maintenance of structure).

Depending on the characteristics of a given culture, a social system can move from a state of chaotic simplicity toward organized simplicity, which is produced by emphasizing integration at the cost of differentiation. It can also move toward chaotic complexity produced by increased differentiation at the cost of integration or it can move toward organized

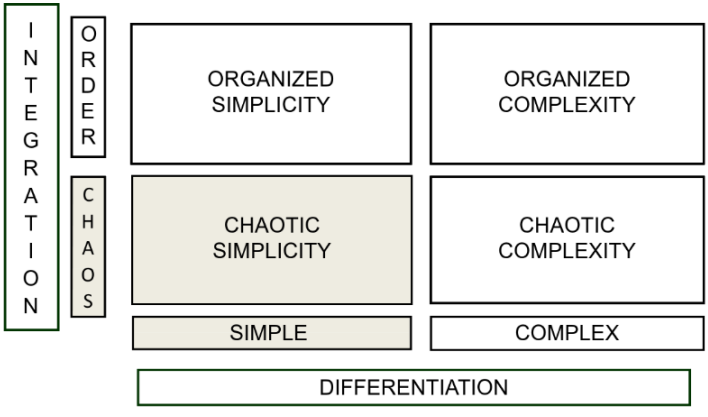


FIGURE 4.2 Levels of differentiation and integration.

complexity, signifying a higher level of organization achieved by a movement toward complexity and order concurrently. This means that for every level of differentiation there exists a minimum level of integration below which the system would disintegrate into chaos. Conversely, higher levels of integration require higher degrees of differentiation to avoid impotency.

Within the boundaries of a given culture, a variety of different orientations exist. The presence of a "left" and a "right" in every social group and political party is the manifestation of this phenomenon (Figure 4.3).

In a flexible social setting, oscillations of low amplitude occur within the cultural boundaries without disruption, as demonstrated by periodic shifts of government between the Labor and Conservative parties in the United Kingdom or the Democrats and Republicans in the United States. However, if an orientation tries to cross the limits of the cultural line, a powerful reaction will move it back to the other extreme, producing further oscillations and cusping into a change of phase. Unfortunately, in societies polarized by antagonistic and rigid ideologies, social transformation takes place by a violent change of phase (a cusp). Retrieval from such a situation is often extremely problematic, since the relationship between members is irreparably damaged, as happens in societies that are thrown into a perpetual state of civil disorder.

Development of social systems is a transformation into successive modes of organization. Each mode is a whole, characterized by higher degrees of both integration and differentiation, and is potentially capable of dissolving lower level contradictions by converting them into contraries. In contrast to physical systems whose energy level determines their mode of organization, in social systems the knowledge level defines the mode. The role of knowledge in social systems, therefore, can be said to be

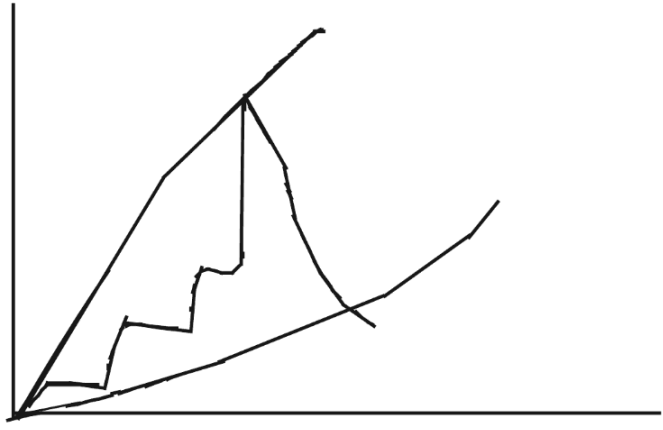


FIGURE 4.3 Cultural boundaries.

analogous to that of energy in physical systems. The significant point is that knowledge, unlike energy, is not subject to the first law of thermodynamics (the law of conservation of energy). One does not lose knowledge by sharing it with others. On the contrary, its dissemination increases the knowledge level of the social system and helps the creation of new knowledge. It is this capability that enables a social system of its own accord to constantly re-create its structure and redefine its functions.

In defining development, we identify two active agents: desire and ability. *Desire* is produced by an exciting vision of a future enhanced by the interaction of creative and recreative (joyful) processes. The creative capacity of man, along with his/her desire to share, results in a shared image of a desired future. This generates dissatisfaction with the present and motivates pursuit of more challenging and more desirable ends. Otherwise, life proceeds simply by setting and seeking attainable goals, which rarely escape the limits of the familiar.

Unfortunately, for some religions, the fundamentalist interpretation regards creation as a sole prerogative of God. Human beings are not allowed to engage in any act of creation. Art in almost any form — whether painting, sculpture, music, or drama — is prohibited. Recreation (enjoyment) is also considered sinful. This antagonistic attitude toward aesthetics militates against development, because it does not provide much opportunity to articulate and expand one's horizon beyond the immediate needs of mere existence. This self-limitation provides one explanation for cases of underdevelopment despite the availability of vast resources.

Dissatisfaction with the present, although a necessary condition for change, is not sufficient to ensure development. What seems to be necessary as well is a faith in one's ability to partly control the march of events. Those who are awed by their environment and place the shaping forces of their future outside of themselves do not think of voluntary or conscious change, no matter how miserable and frustrated they are.

Ability, therefore, is the potential for controlling, influencing, and appreciating the parameters that affect the system's existence. But ability alone cannot ensure development. Without a shared image of a more desirable future, the frustration of the powerful masses can easily be converted into a unifying agent of change — hatred — that in turn will successfully destroy the present but will not necessarily be a step toward creating a better future.

Central to this notion of development is its distinction from growth. According to Ackoff:

> They are not the same thing and are not even necessarily associated. Growth can take place with or without development, and development can take place with or without growth. A cemetery can grow without developing. On the other hand, a person may continue to develop long after he or she has stopped growing, and vice versa. A person can build a better

> house with good tools and materials than he/she can without them. On the other hand, a developed person can build a better house with whatever tools and materials he/she has than a less-developed person with the same resources. Put another way: a developed person with limited resources is likely to be able to improve his quality of life and that of others more than a less-developed person with unlimited resources. Constraints on a system's growth are found primarily in its environment, but the principal constraints on a system's development are found within the system itself.
>
> **Gharajedaghi and Ackoff (1984)**

To understand the process of development of a social system we have to deal with structures and the processes that help or limit the creation of collective desire and ability for the pursuit of its ends. The parameters that coproduce the futures are found in the interaction of the five dimensions of social systems: wealth, knowledge, beauty, power, and values. Compatibility among these five dimensions defines the effectiveness of the emerging mode of organization. This mode of organization determines the level of integration, and the collective ability of the members to create the future they want. This means that a minimum level of integration is required if the aggregate of individuals is to function as an effective system. Ironically, the prime concern of every organization theory has been to define the criteria by which the whole is to be divided into parts. Major theories have implicitly assumed that the whole is nothing but the sum of its parts and have conveniently ignored the fact that effective differentiation requires incorporation of a means that would integrate the differentiated parts into a cohesive whole. In this regard, the classical school of management depends solely on the unity of command and the imperative of no deviation. At the opposite end, advocates of free markets rely on the assumption that perfectly rational micro-decisions would automatically produce perfectly rational macro-conditions. Both approaches fall short because they fail to recognize that effective social integration requires that compatibility among the members be continuously and actively re-created. Ultimately, the level of integration and development that an organization will achieve depends on the means by which it deals with interaction among its members.

Differentiation poses little challenge because it is the very nature of social systems to become different from each other. From families to cities and nations, groups of people can usually describe with ease how "we're different or unique." Integration, however, requires skill to accomplish. To integrate one has to appreciate the systemic nature of the interactions between opposing tendencies. For example, security and freedom, usually considered dichotomous, are actually two aspects of the same phenomenon. Freedom is not possible without security and security makes no sense without freedom. But if we choose to deal with each one of these aspects separately, then we should not be surprised to find them

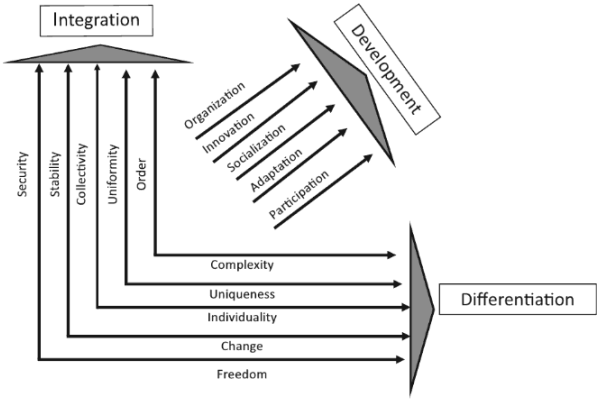


FIGURE 4.4 Developmental processes.

in conflict. The easiest solution to security, if treated in isolation, would be to limit freedom, and that of freedom would be to undermine security. Despite seemingly contradictory requirements for pursuit of opposing ends, there are processes that would make the attainment of both ends feasible. For instance, both freedom and security are attainable by a process called *participation*, stability and change by *adaptation*, and order and complexity by *organization*. Similarly, production and distribution of wealth form a complementary pair. Without an effective production system, there can never be an effective distribution system. To fail to note this important interdependency is to leave out the most important challenge of the problem. An obsession with distribution without a proper concern about production will result in nothing but an equitable distribution of poverty. Preoccupation with production without a similar concern for an equitable distribution will lead to an alienated society.

The emerging tendencies — innovation, learning and adaptation, socialization (parity), participation, and organization — cannot stand alone. Together they form the whole, and coproduce a process called *development* (Figure 4.4). The holistic view of societal development requires that all of the five social functions — the generation and dissemination of knowledge, power, wealth, value, and beauty — develop interdependently, utilizing all of the five complementary processes outlined earlier.

4.3 OBSTRUCTION TO DEVELOPMENT

Obstructions to development of a social system can be viewed as malfunctioning in any one of the five dimensions. Scarcity, maldistribution, and insecurity in any one of the five social functions (i.e., generation and dissemination of knowledge, power, wealth, values, and beauty) are considered primary or first-order obstructions. Alienation, polarization, corruption, and terrorism are among social phenomena that represent secondary or second-order obstructions (Table 4.1).

more vulnerable to sabotage on the one hand and difficult to manage on the other. Hatred of the ruling group usually becomes the unifying agent of change. Another cycle begins with opposing forces regrouping. The oscillation will not end until opposing ideologies learn to modify their dogmatic positions, give up their monopolistic claim on power, and work toward creating a shared image of a desired future through processes of integration — not at the expense of differentiation, but alongside it.

The critical issues of qualitative change and the need to deal more effectively with social pathologies demand incorporation of second-order learning in social systems. This requires the creation of a new mode of organization in the form of an ideal-seeking system, in contrast to an ideal state. This warrants further clarification.

Throughout history there have been repeated attempts to fashion human societies in accordance with some sort of idealized image. This has been done by prophets, philosophers, social reformers, and in recent times by the state apparatus in more than one country. In all cases, these ideals have been defined by human authorities that have attempted to legitimize their authority by means of an ultimate authority such as science or God. But the identification of the ideal state with an ultimate authority precludes freedom to change. This is the essence of social pathology that in a social context is defined as inability to change.

Within this framework of acceptance of an ideal state defined by ultimate authority, it is possible to distinguish between two approaches. The first approach consists of specifying a detailed and comprehensive set of rules of conduct for individual behavior which, if followed by all members of society, would automatically lead to the emergence of the ideal state. In the name of ultimate truth, the objective of this approach has been the creation of a "new man" who will better conform with their image of ideal society. Ironically the repeated failures in changing the "nature of man" into a preprogrammed robot has not reduced the commitment of "true believers" in their pursuit. On the contrary, enjoying a phenomenal capacity for denial, they blame the weakness of the man for the failures and see an urgent need for total control by establishment of a totalitarian order. The second approach is characterized by the struggle to create a new social structure based on the assumption that man is solely the product of his/her environment and that his/her behavior is basically a reaction to it. Scientific socialism, which represents the first attempt of this approach, degenerated in practice into the first type once it was realized that proper structure (Weberian bureaucracy) failed to produce the expected outcome.

The fundamental problem with both of these approaches, which despite their apparent differences result in the same practical consequences, is in their misconception of the nature of the ideal state and the processes that bring it about. They both contend that

1. There is one and only one end (ideal state) predefined by an ultimate authority (God or science).
2. The ideal state is not only attainable, but the movement toward it is also inevitable.

The inevitability of the final state, and its independence from the generating processes, leads to the notion that "the end justifies the means." It is assumed that the seizure of power by the chosen class or group is a precondition for its realization.

But, ideals, in the systems view, are regarded as dynamic and changing over time. The shared image of a desired future, defined by the members of the social system, reflects the spacio-temporal realities (here and now) of the particular historical moment, and thus is alterable even before being approached (moving target). By considering man as a purposeful system, with choice of both ends and means, the systems thinking rejects efforts aimed at degrading him to the level of a robot. The recognition of the element of choice in the behavior of social systems leads to the belief that these systems have the capability of selecting their own future and successively approximating it by choosing appropriate means. In the systems view every phenomenon is the result of chosen processes; thus, to bring about the desired end it is necessary to choose appropriate processes for its attainment. For example, means that negate the end cannot be effective in bringing it about. Creation of a hero to champion the cause against heroism is a self-defeating proposition. The means are among coproducers of the end, directly influencing the essential qualities of the resulting phenomenon.

4.3.3 Corruption

Corruption is not just malfunctioning of the value system, but a second-order obstruction. It is the result of structural defects in more than one dimension of social systems including generation and distribution of power, wealth, and knowledge. To carry out its vital functions, a social system must be organized. The way a social system is organized determines its ability to overcome the obstructions it faces. In this context a social pathology is produced when an obstruction to development benefits those who are responsible for removing it. Unfortunately, bureaucracy represents a pathological mode of organization where an organized interest group benefits from the obstructions it has created. For instance, the more complex a bureaucratic process can be made, the more staff is required to manage it and the larger and more controlling the administering agency becomes. In addition, the present level of interdependence and complexity demand a higher level of sophistication that far surpasses the known capabilities of the present bureaucratic system. Under these conditions, only a source of power outside the bureaucracy can create movement within the system. Therefore, individuals will seek out and support these external power sources. In time, the hierarchy of powerful patrons demands certain rewards in exchange for their valuable support. This reward structure allows corruption to spread throughout the entire system, ultimately becoming a justifiable way of life.

Charles Handy, in an interesting article, "What Is a Business For?" (*Harvard Business Review*, 2002) makes a serious observation regarding recent corporate practices:

> The current disease is not just a matter of dubious personal ethics or of some rouge companies fudging the odd billion. The whole business culture of our current Anglo-American version of stock market capitalism may have become distorted. We can see with hindsight, that in the boom years of the 1990s America had often been creating value where none existed, bidding up the market capitalization of companies to 64 times earning, or more.

If one takes this argument to its logical conclusion it would reveal that corporate America is facing two critical challenges. The first challenge concerns the effectiveness of corporate governance. The absentee shareholders whom Charles Handy calls "gamblers" or investors are supposed to elect the members of the board of directors. Most of these gamblers do not have any long-term commitment to the entity in which they hold shares. Today his/her interest might be in X Corporation, but no one knows where it will be tomorrow. It might even find its way in to the Y Corporation that is a direct competitor of X. In reality the boards are virtually appointed by the management they are supposed to control. They usually re-elect the CEO who has placed them on the board in the first place.

The second challenge is produced by the tremendous pressure to manage for the short term. Unless the reports of the next quarter meet the expectation of the stock market for another double-digit growth performance, the overrated stock price will tremble and the gamblers will start to sell off the stock. Under this kind of pressure devious behavior will be the norm rather than the exception.

4.3.4 Terrorism

Terrorism is perhaps the single most critical obstruction to development of a peaceful international order. It is a second-order obstruction that has most of the primary obstructions — poverty, disparity, deprivation, powerlessness, hopelessness, discrimination, ignorance, hatred, and fanaticism — as its coproducers. And yet there is no agreement on its operational definition. One person's terrorist is another person's freedom fighter.

However, irrespective of where one is coming from, there is no question that terrorism is based on the false assumption of the "zero-sum game." In a zero-sum game the total sum of winnings and losses add up to zero. If you lose I will win, and vice versa. As systems get more sophisticated they become increasingly vulnerable to the actions of the few. Making the other side lose becomes easier than trying to win. This is why terrorism becomes the favorite means of weaker sides when confronting stronger enemies. Therefore, to get a handle on terrorism I propose we look at it as a means to an end.

The ends in this context seem to fall into one of three categories: revenge, cry for help, or ideological battle. The tragedy of Oklahoma City is an example of terror as a means of *revenge*. Revenge is a random act difficult to detect. A *cry for help*, on the other hand, represents the struggle of desperate people trapped in an unfortunate, unjust politico-economic mess. This type of terrorism is a reflection of sustained frustration of a people to deal with their humiliating powerlessness through normal channels. The most effective way to stop this type of terror is to dissolve the paralyzing impasse.

The bombing of abortion clinics is an example of terrorism in an *ideological battle*. The ideological terrorism in all of its manifestations — secular left or religious fundamentalism — has used intimidation and random terror to impose their value systems or preferred way of life on the population at large. The strategy is based on the assumption that to paralyze people one should make them feel guilty and insecure. This type of terrorism usually needs a powerful enemy to hate. Hate, converted to need, becomes a way of life. It is used to produce goal-seeking robots. These robotic, true believers are capable of brutality incomprehensible to normal human beings. Unfortunately, the first and second types of terrorists become foot soldiers for the third type.

In light of the ideological vacuum created by the collapse of communism, various forms of fundamentalism have gained momentum and are growing noticeably all over the globe. Among these groups, the one that generates the most concern is the movement with an unshakable faith that a secular style of life is "corruption on the earth." This movement is against beauty, happiness, choice, pluralism, and freedom. Its followers oppose all values that have made the world a better place to live.

Unfortunately, in the late 1970s religious fundamentalism got a tremendous boost from American policy in the Middle East. After World War II, despite winning the war, America found herself losing the ideological battle. For years leftist ideology had become synonymous with intellectualism. In most of the third world, the youth were lost to the leftist movement. The U.S. administration at the time, working on the assumption that the only way to combat an ideology is with another potent one, decided to engage Islam in the ideological battle with communism. America created the Mojahedin to counter the Soviet Union's invasion of Afghanistan and supported other Islamic movements in the region. Ironically, after sensing a strong anti-American sentiment in the Middle East some of these movements, with a Machiavellian move, decided to identify their version of Islam with anti-Americanism. This tag was needed to promote their cause in the vulnerable countries of the region. Figure 4.5 captures the interaction of two reinforcing feedback loops. Note how the first loop generates radical Islamists and the second one converts them to terrorists.

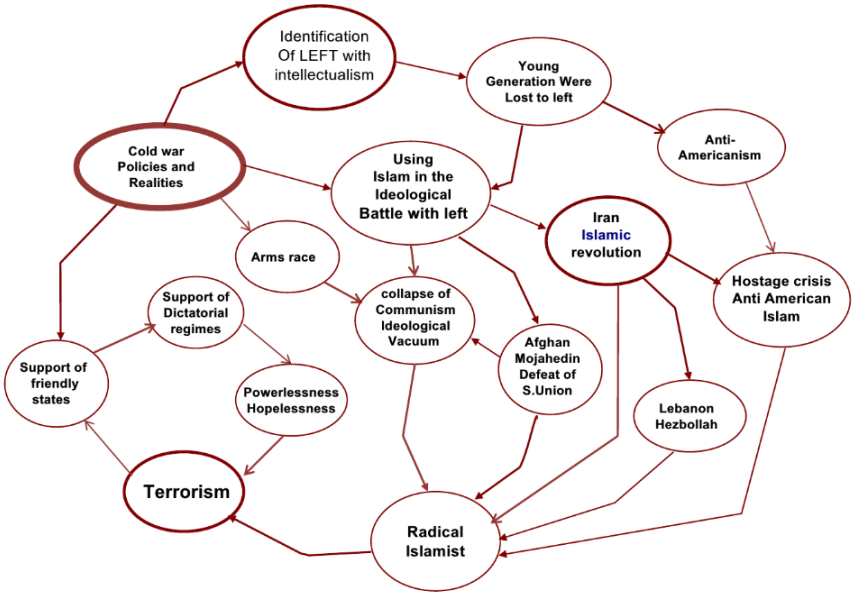


FIGURE 4.5 Islam in the ideological battle.

The network of nationless fundamentalists, unhappy about progress of women toward equality and freedom, pose a dangerous threat to all of humanity. These true believers are ready to use any kind of intimidation and brutality to keep their women subordinate and under control. To dissolve this mess is a human rights obligation. It should be treated above partisan politics and competing economic interest. Nothing short of the uncompromising commitment and determination of the whole international community to support the development and formation of civil societies will do the trick. Acceptance as a member of the world community must be contingent upon accepting and forming a civil society. In the age of globalization no nation can afford to be left out of the world community. This fact is the most practical means of dissolving this mess we now face. It provides the strongest motive for the development of civil societies.

The civil society is a secular state that cannot endorse any religion or ideology. The basis for its authority is in man-made law, not in religious doctrine, divine revelation, or a secular deity. Freedom of religion — including freedom from religion — and the freedom not to believe in any deity, are preconditions to the formation of a pluralistic order, where the majorities that are not capable of protecting the rights of minorities do not deserve to govern.

Dire as the current world situation may be, this chapter ends not in desperation, but in the belief that interactive design of sociocultural

PART | THREE

SYSTEMS METHODOLOGY

The Logic of the Madness

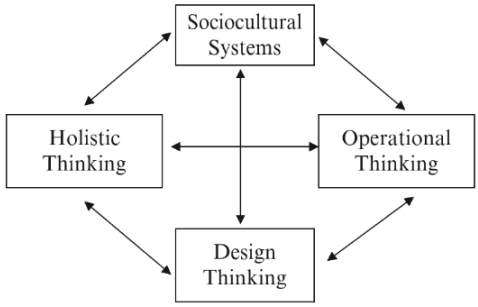
During the last 50 years, our worldview has gone through a profound transformation in two critical dimensions. Not only has there been a fundamental shift in our understanding of the nature of the organization from a mindless mechanical system to a purposeful sociocultural system, but there has also been a discriminating shift in our way of knowing from analytical thinking, the science of dealing with independent sets of variables, to systems thinking, the art and science of handling interdependent sets of variables.

Unfortunately, despite all the rhetoric to the contrary, our newly found insights have had very little influence on our choices. A dominant analytical culture, with a scientific tag, keeps reproducing the same set of non-solutions all over again. Effective use of these discriminating conceptions requires both a clear understanding of the operating principles of sociocultural systems and unambiguous recognition of the shortcomings of the analytical approach.

Years of struggle and real-life experimentation with different systems at different levels and in different cultures have led me to believe that the interactions among the following four foundations of systems thinking are the keys for development of an effective systems methodology as a complement and not a replacement for analytical thinking. The four foundations include: sociocultural systems, holistic thinking, operational thinking, and design thinking.

These four foundations, in my experience, are so interrelated and complementary that all four are necessary to effectively deal with the complexities of emerging chaotic environments. Both Ackoff's *Interactive Design* (1974) and Forrester's *Systems Dynamics* (1961) are part of this comprehensive scheme that also includes an in-depth understanding of the nature of sociocultural systems and the operational meaning of holistic thinking.

We see the world as increasingly more complex and chaotic because we use inadequate concepts to explain it. When we understand something, we no longer see it as chaotic or complex. An effective systems methodology would deal not only with the imperative of interdependency and the complexities of dynamic systems, but also with the question of purposeful behavior of multi-minded systems.



Four foundations of systems thinking.

As we saw in Chapter 3, unless we understand the implications of self-organizing behavior of sociocultural systems, the multi-minded beast will outmaneuver any attempt to tame it.

Part Two of this book contained a full discussion of the first foundation of systems thinking, the *sociocultural system*. In Part Three, we will deal with the three remaining foundations, *holistic thinking, operational thinking*, and *design thinking*, in Chapters 5 to 9.

This version of systems methodology (interaction of the above-mentioned four foundations) is intended to create a *holistic operational language of interaction and design*. It is a way to see through chaos and understand complexities and face the dilemma of systems where the whole is becoming more and more interdependent while the parts display choice and behave independently. These are critical needs of policy makers, leaders, and many others who wrestle daily with how to improve organizations at all levels so that they contribute something of worth to their members and to the communities and clientele they serve. Far from being abstract and esoteric, the four foundations of systems methodology comprise a set of thinking tools that are enormously practical.

We will attempt to explicitly and operationally define systems methodology as we practice it at INTERACT, The Institute for Interactive Management. Although this practice has its origin in the rich and colorful tradition of Ackoff, in its present form, it has also been influenced greatly by the works of Jay Forrester, Kenneth Boulding, and Stafford Beer, and my own fascination with the complexities and engaging potency of the phenomenon known as *culture*. The depth and beauty of interactive design and the magic of holistic thinking (iteration of structure, function, and process) when combined with the power of systems dynamics, create a competent and exciting methodology that goes a long way in dealing with the emerging challenges of our time by responding to the operating principles of openness, purposefulness, multidimensionality, emergent property, and counterintuitive behavior of sociocultural systems.