

# **Systems Thinking: Managing Chaos and Complexity**



# **Systems Thinking: Managing Chaos and Complexity**

A Platform for Designing  
Business Architecture

THIRD EDITION

**Jamshid Gharajedaghi**



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# Contents

Foreword to the Third Edition		xi
Foreword to the Second Edition		xvii
Preface		xix
Acknowledgment		xxi
<b>PART 1</b>	● System Philosophy: The Name of the Devil	
Chapter 1	How the Game Is Evolving	3
	1.1 Imitation	4
	1.2 Inertia	5
	1.3 Suboptimization	6
	1.4 Change of the Game	6
	1.5 Shift of Paradigm	8
	1.6 Interdependency and Choice	9
	1.6.1 On the Nature of Organization: The First Paradigm Shift	9
	1.7 On the Nature of Inquiry	13
	1.7.1 The Second Paradigm Shift	13
	1.8 The Competitive Games	17
	1.8.1 Mass Production — Interchangeability of Parts and Labor	17
	1.8.2 Divisional Structure — Managing Growth and Diversity	18
	1.8.3 Participative Management	20
	1.8.4 Operations Research — Joint Optimization	21
	1.8.5 Lean Production System — Flexibility and Control	22
	1.8.6 Interactive Management — Design Approach	22
<b>PART 2</b>	● Systems Theory: The Nature of the Beast	
Chapter 2	Systems Principles	29
	2.1 Openness	29
	2.2 Purposefulness	33
	2.2.1 Recap	37
	2.3 Multidimensionality	38
	2.3.1 Plurality of Function, Structure, and Process	42
	2.3.2 Recap	44
	2.4 Emergent Property	45
	2.4.1 Recap	47
	2.5 Counterintuitive Behavior	48
	2.5.1 Recap	54
Chapter 3	Sociocultural System	57
	3.1 Self-Organization: Movement Toward a Predefined Order	57
	3.2 Information-Bonded Systems	59
	3.3 Culture	60
	3.4 Social Learning	62
	3.5 Culture as an Operating System	64
Chapter 4	Development	69
	4.1 Schematic View of Theoretical Traditions	70
	4.2 Systems View of Development	73

	4.3	Obstruction to Development	77
	4.3.1	Alienation	78
	4.3.2	Polarization	79
	4.3.3	Corruption	81
	4.3.4	Terrorism	82
	4.3.5	Recap	85
<b>PART 3 ● Systems Methodology: The Logic of the Madness</b>			
Chapter 5		Holistic Thinking	89
	5.1	Iterative Process of Inquiry	89
	5.2	Systems Dimensions	93
	5.2.1	Generation and Dissemination of Wealth	96
	5.2.2	Generation and Dissemination of Power (Centralization and Decentralization Happen at the Same Time)	97
	5.2.3	Generation and Dissemination of Beauty: Social Integration	101
	5.2.4	Generation and Dissemination of Knowledge	103
	5.2.5	Generation and Dissemination of the Value: Conflict Management	104
Chapter 6		Operational Thinking	109
	6.1	Complexity	110
	6.1.1	Open Loop or Closed Loop Systems	111
	6.1.2	Linear or Nonlinear Systems	111
	6.2	Operational Thinking, the iThink Language	119
	6.2.1	Connectors	120
	6.2.2	Modeling Interdependency	121
	6.3	Dynamics of Throughput Systems	124
	6.3.1	Critical Properties of the Process	126
	6.3.2	Model of the Process	126
	6.3.3	Measurement and Learning	130
Chapter 7		Design Thinking	133
	7.1	Design Thinking, as the Systems Methodology	134
	7.2	Operating Principles of Design Thinking	137
	7.3	Modular Design	138
	7.4	Design and Process of Social Change	141
	7.5	Interactive Design	142
	7.5.1	Idealization	144
	7.5.2	Realization — Successive Approximation	147
	7.5.3	Dissolving the Second-Order Machine	150
	7.6	Critical Design Elements	150
	7.6.1	Measurement and Reward System (A Social Calculus)	150
	7.6.2	Vertical Compatibility	151
	7.6.3	Horizontal Compatibility	153
	7.6.4	Temporal Compatibility	155
	7.6.5	Target Costing	156
Chapter 8		Formulating the Mess	159
	8.1	Searching	160
	8.1.1	Systems Analysis	161
	8.1.2	Obstruction Analysis	161
	8.1.3	System Dynamics	161
	8.2	Mapping the Mess	163
	8.3	Telling the Story	166
	8.3.1	Formulating the Mess: A Case Review (Story of Utility Industry)	166
	8.3.2	Success Changes the Game, Lack of Explicit Vision	169

	8.3.3 Monopolistic, Cost Plus, Regulated Environment	170
	8.3.4 The Non-Competitive Culture	171
	8.3.5 The Input-Based Personnel Policy	172
	8.3.6 Mediocrity, Tolerance of Incompetence	173
	8.3.7 Structural Incompatibility	174
	8.3.8 Uncertainty About the Future	176
8.4	The Present Mess	177
	8.4.1 Drivers Defining the Behavior of the Present State of the Economy	177
	8.4.2 How the Game Is Evolving	177
8.5	Current Crisis and Future Challenges	178
<b>Chapter 9</b>	<b>Business Architecture</b>	<b>181</b>
	9.1 The System's Boundary and Business Environment	182
	9.2 Purpose	184
	9.3 Functions	189
	9.4 Structure	190
	9.4.1 Output Dimension	192
	9.4.2 Input Dimension	194
	9.4.3 Market Dimension	196
	9.4.4 Internal Market Economy	197
	9.5 Processes	201
	9.5.1 Planning, Learning, and Control System	202
	9.5.2 Measurement System	202
	9.5.3 Recap	207
<b>PART 4</b>	<b>Systems Practice: The Gutsy Few</b>	
<b>Chapter 10</b>	<b>The Oneida Nation</b>	<b>211</b>
	10.1 Desired Specifications	211
	10.2 Systems Architecture	213
	10.3 Governance	214
	10.3.1 Governing Body	215
	10.3.2 Chief of Staff	215
	10.3.3 Planning, Learning, and Control System	216
	10.3.4 Planning, Learning, and Control Board	217
	10.4 Membership Systems	218
	10.4.1 Empowerment	218
	10.4.2 The Tie That Bonds	219
	10.4.3 Membership Network	220
	10.4.4 Consensus-Building Process	221
	10.4.5 Back to the Future	224
	10.4.6 Performance Criteria and Measures	225
	10.5 Learning Systems	226
	10.5.1 Learning to Learn (Formal Education)	227
	10.5.2 Learning to Be (Cultural Education)	228
	10.5.3 Learning to Do (Professional Education)	229
	10.5.4 Support Functions	229
	10.5.5 Advocacy Functions	230
	10.5.6 Oneida Multiversity	230
	10.5.7 Performance Criteria and Measures	232
	10.6 Business Systems	233
	10.6.1 Services Sector	234
	10.6.2 Industry Sector	235
	10.6.3 Leisure Sector	235
	10.6.4 Land and Agriculture Sector	235
	10.6.5 Marketing Sector	236
	10.6.6 Governance and Intersystem Relationships	236

## viii Contents

10.7	Core Services	237
10.7.1	Government Services Division	237
10.7.2	Infrastructure Development Division	238
10.7.3	Ordinance Division	238
10.7.4	Performance Criteria and Measures	238
10.7.5	Governance and Oversight	238
10.8	External Environment	239
10.9	Judicial System	240
10.9.1	Contextual Analysis	240
10.9.2	Contextual Challenge	241
10.9.3	Democratic Challenge	242
Chapter 11	Butterworth Health System	245
11.1	Issues, Concerns, and Expectations	246
11.2	Design Specifications	248
11.3	The Architecture	249
11.4	Market Dimension	250
11.4.1	Market Access	250
11.5	Care System	251
11.5.1	Contextual Background	251
11.5.2	Desired Specifications	252
11.5.3	Common Features	253
11.5.4	Preventive Care	255
11.5.5	Interventional Care	256
11.5.6	Viability Care	257
11.5.7	Terminal Care	258
11.6	Output Dimension	258
11.6.1	Alternative One: Traditional Functional Structure	259
11.6.2	Alternative Two: Modular Structure	259
11.6.3	Health Delivery System Design: The Makeup	261
11.6.4	Community-Based Health Delivery System	261
11.6.5	Specialized Health Delivery System	263
11.6.6	Shared Services	264
11.7	Core Knowledge	265
11.8	Shared Services	270
11.8.1	Need for Centralization	270
11.8.2	Control Versus Service	271
11.8.3	Customer Orientation	272
11.9	Health Delivery System, Core Knowledge, and Care System Interactions	273
11.10	The Executive Office	277
11.11	Recap	278
Chapter 12	The Marriott Corporation	281
12.1	The Environment: How the Game Is Evolving	282
12.1.1	Bases for Competition	282
12.2	Purpose	282
12.2.1	Principles and Desired Characteristics	282
12.2.2	Mission	283
12.3	The Architecture	283
12.3.1	Product/Market Mix	285
12.3.2	Region/Market Operation	285
12.3.3	Brand Management	286
12.3.4	Core Components	287
12.3.5	Core Knowledge	287
12.3.6	Critical Processes	288
12.4	Recap	289



Chapter 13	Commonwealth Energy System	291
	13.1 Stakeholders' Expectations	292
	13.1.1 Shareholders' Expectations	292
	13.1.2 Regulators' Expectations	293
	13.1.3 Employees' Expectations	293
	13.1.4 Customers' Expectations	293
	13.1.5 Suppliers' Expectations	294
	13.1.6 Public's Expectations	294
	13.2 Business Environment	294
	13.2.1 The Changing Game: The Energy Industry	294
	13.2.2 The Changing Game: COM/Energy	296
	13.3 Design	296
	13.3.1 Purpose and Strategic Intent	297
	13.3.2 Core Values and Desired Specifications	298
	13.4 General Architecture	299
	13.5 Core Business Units: Gas and Electricity Distribution	301
	13.5.1 Customer-Oriented Business Units: Energy Supply Systems and Management Services	302
	13.5.2 Cogeneration and Packages of Energy Supply (Industrial and Commercial)	302
	13.5.3 Energy Efficiency and Electrotechnologies (Residential and Commercial)	304
	13.6 Technology/Supply-Oriented Business Units: Energy Generation and Supply	305
	13.6.1 Energy Generation (Canal)	306
	13.6.2 Gas Storage (LNG)	307
	13.6.3 Steam Services	307
	13.7 Energy Brokerage and International Operations	307
	13.7.1 Energy Brokerage	308
	13.7.2 International Operations	308
	13.8 Shared Services (Performance Centers)	309
	13.8.1 Service Company	310
	13.8.2 Financial Systems	311
	13.9 Executive Office	311
	13.9.1 Core Knowledge Pool	312
	13.9.2 Learning and Control System	313
Chapter 14	Carrier Corporation	317
	14.1 Expectations, Assumptions, and Specifications	318
	14.1.1 The Changing Game: In General	318
	14.1.2 The Changing Game: The HVAC Industry	319
	14.1.3 Drivers for Change	319
	14.1.4 Bases for Competition	319
	14.2 Core Values	319
	14.2.1 Products and Services	320
	14.2.2 Core Technology and Know-How	321
	14.2.3 Sales and Distribution System	322
	14.3 Systems Architecture	323
	14.3.1 Desired Characteristics	323
	14.3.2 A Multidimensional Framework	323
	14.4 Markets	324
	14.4.1 Regional Units	324
	14.4.2 Area Units	326
	14.5 Output Units	326
	14.6 Components	327

## **x** Contents

14.7	Inputs	328
14.7.1	The Technology	328
14.7.2	Operational Support (Process Design)	329
14.7.3	Management Support Services	330
14.8	Business Processes	330
14.8.1	Decision System	330
14.8.2	Performance Measurement and Reward System	331
14.8.3	Target Costing and Variable Budgeting System	331
	Author Biography	333
	Conclusion	335
	References	339
	Index	343

# 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<sup>3</sup> 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 Gharajedghi**





# 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.

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