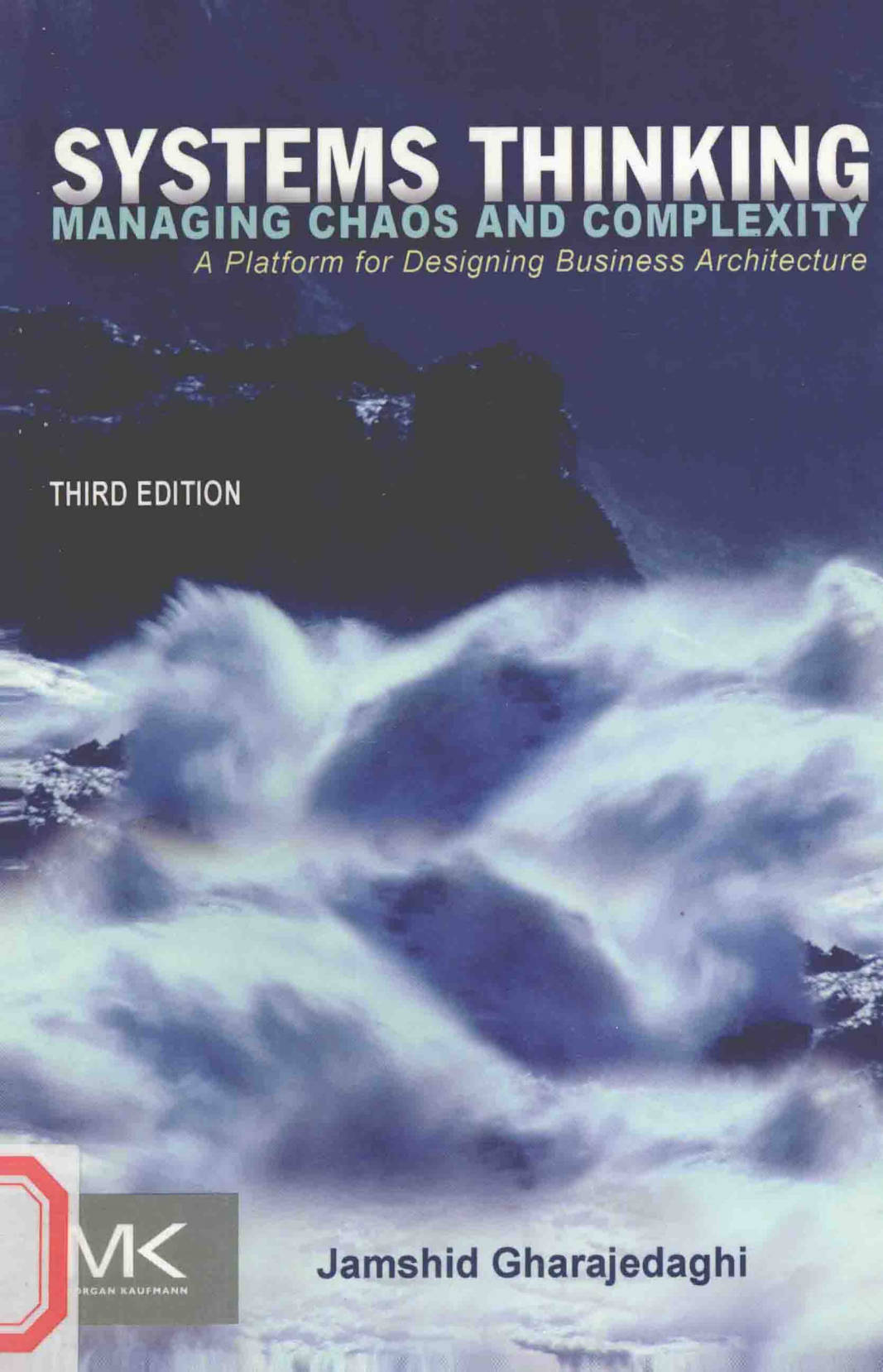
SYSTEMS THINKING

MANAGING CHAOS AND COMPLEXITY

A Platform for Designing Business Architecture

THIRD EDITION



Jamshid Gharajedaghi

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Sy inking: Managing Chaos and Complexity

A Platform for Designing Business Architecture

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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

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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

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*.

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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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