
Contents

Preface	ix
Dedication	xi
Chapter 1. Complexity and Systems Thinking	1
1.1. Introduction: complexity as a problem	1
1.2. Complexity in perspective.	3
1.2.1. Etymology and semantics	3
1.2.2. Methods proposed for dealing with complexity from the Middle Ages to the 17th Century and their current outfalls.	4
1.3. System-based current methods proposed for dealing with complexity.	9
1.3.1. Evolution of system-based methods in the 20th Century	9
1.3.2. The emergence of a new science of mind	20
1.4. Systems thinking and structuralism	24
1.4.1. Systems thinking.	25
1.4.2. Structuralism	30
1.4.3. Systems modeling	32
1.5. Biodata of two figureheads in the development of cybernetics	45
1.5.1. Ludwig von Bertalanffy (1901–1972)	45
1.5.2. Heinz von Förster (1911–2002)	47
1.6. References	51

Chapter 2. Agent-based Modeling of Human Organizations	55
2.1. Introduction	55
2.2. Concept of agenthood in the technical world	56
2.2.1. Some words about agents explained	56
2.2.2. Some implementations of the agenthood paradigm	58
2.3. Concept of agenthood in the social world	62
2.3.1. Cursory perspective of agenthood in the social world	62
2.3.2. Organization as a collection of agents	67
2.4. BDI agents as models of organization agents	69
2.4.1. Description of BDI agents	69
2.4.2. Comments on the structural components of BDI agents	72
2.5. Patterns of agent coordination	86
2.5.1. Organizational coordination	86
2.5.2. Contracting for coordination	86
2.5.3. Coordination by multi-agent planning	87
2.6. Negotiation patterns	92
2.7. Theories behind the organization theory	94
2.7.1. Structural and functional theories	95
2.7.2. Cognitive and behavioral theories	96
2.7.3. Organization theory and German culture	97
2.8. Organizations and complexity	101
2.8.1. Structural complexity	101
2.8.2. Behavioral complexity in group decision-making	102
2.8.3. Autonomous agents and complexity in organization operations: inexorable stretch to artificial organization	106
2.9. References	114
Chapter 3. Complexity and Chaos	119
3.1. Introduction	119
3.2. Complexity and chaos in physics and chemistry	121
3.2.1. Introductory considerations	121
3.2.2. Quadratic iterator modeling the dynamic behavior of animal and plant populations	127
3.2.3. Traces of chaotic behavior in different contexts	133

3.3. Order out of chaos	142
3.3.1. Determinism out of an apparent random algorithm	142
3.3.2. Chaos game and MRCM (Multiple Reduction Copy Machine)	144
3.3.3. Randomness and its foolery	145
3.4. Chaos in organizations – the certainty of uncertainty	148
3.4.1. Chaos and big data: what is data deluge?	148
3.4.2. Change management and adaptation of information systems	159
3.5. References	188
Conclusion	191
Appendices	203
Appendix 1. Notions of Graph Theory for Analyzing Social Networks	205
Appendix 2. Time Series Analysis with a View to Deterministic Chaos	211
Index	215