Contents

Preface xvii
Introduction xxv

Part I Systems Thinking in the Disciplines 1

1 Philosophy 3
1.1 Introduction 3
1.2 Kant 4
1.3 Hegel 8
1.4 Pragmatism 9
1.5 Husserl and Phenomenology 10
1.6 Radical Constructivism 11
1.7 Conclusion 12

2 The Physical Sciences and the Scientific Method 15
2.1 Introduction 15
2.2 The Scientific Method and the Scientific Revolution 16
2.3 The Physical Sciences in the Modern Era 19
2.4 The Scientific Method in the Modern Era 21
2.5 Extending the Scientific Method to Other Disciplines 24
2.6 Conclusion 25

3 The Life Sciences 27
3.1 Introduction 27
3.2 Biology 27
3.3 Ecology 35
3.4 Conclusion 40

4 The Social Sciences 43
4.1 Introduction 43
4.2 Functionalism 44
4.3 Interpretive Social Theory 49
4.4 The Sociology of Radical Change 52
4.5 Postmodernism and Poststructuralism 56
## Contents

### Part I Integrationist Social Theory

4.6 Integrationist Social Theory 59
4.7 Luhmann’s Social Systems Theory 62
4.8 Action Research 67
4.9 Conclusion 68

### Part II The Systems Sciences 71

5 General Systems Theory 75
5.1 Introduction 75
5.2 von Bertalanffy and General System Theory 75
5.3 von Bertalanffy’s Collaborators and the Society for General Systems Research 79
5.4 Miller and the Search for Isomorphisms at Different System Levels 80
5.5 Boulding, Emergence and the Centrality of “The Image” 82
5.6 The Influence of General Systems Theory 85
5.7 Conclusion 86

6 Cybernetics 89
6.1 Introduction 89
6.2 First-Order Cybernetics 91
6.3 British Cybernetics 95
6.4 Second-Order Cybernetics 102
6.5 Conclusion 108

7 Complexity Theory 111
7.1 Introduction 111
7.2 Chaos Theory 112
7.3 Dissipative Structures 117
7.4 Complex Adaptive Systems 119
7.5 Complexity Theory and Management 125
7.6 Complexity Theory and Systems Thinking 136
7.7 Conclusion 144

### Part III Systems Practice 147

8 A System of Systems Methodologies 151
8.1 Introduction 151
8.2 Critical or “Second-Order” Systems Thinking 152
8.3 Toward a System of Systems Methodologies 155
8.3.1 Preliminary Considerations 155
8.3.2 Beer’s Classification of Systems 155
8.3.3 The Original “System of Systems Methodologies” 157
8.3.4 Snowden’s Cynefin Framework 160
8.3.5 A Revised “System of Systems Methodologies” 162
8.4 The Development of Applied Systems Thinking 166
## Contents

11.2.2 Philosophy and Theory 233  
11.2.3 Methodology 241  
11.2.4 Methods 244  
11.3 System Dynamics in Action 247  
11.4 Critique of System Dynamics 249  
11.5 Comments 258  
11.6 The Value of System Dynamics to Managers 258  
11.7 Conclusion 259  

### Type D  Systems Approaches for Organizational Complexity 261

12 Socio‐Technical Systems Thinking 263  
12.1 Prologue 263  
12.2 Description of Socio-Technical Systems Thinking 264  
12.2.1 Historical Development 264  
12.2.2 Philosophy and Theory 268  
12.2.3 Methodology 276  
12.2.4 Methods 279  
12.3 Socio-Technical Systems Thinking in Action 280  
12.4 Critique of Socio-Technical Systems Thinking 281  
12.5 Comments 288  
12.6 The Value of Socio-Technical Systems Thinking to Managers 289  
12.7 Conclusion 289  

13 Organizational Cybernetics and the Viable System Model 291  
13.1 Prologue 291  
13.2 Description of Organizational Cybernetics 296  
13.2.1 Historical Development 296  
13.2.2 Philosophy and Theory 299  
13.2.3 Methodology 311  
13.2.4 Methods 317  
13.3 Organizational Cybernetics in Action 320  
13.4 Critique of Organizational Cybernetics and the Viable System Model 325  
13.5 Comments 337  
13.6 The Value of Organizational Cybernetics to Managers 339  
13.7 Conclusion 340  

### Type E  Systems Approaches for People Complexity 341

14 Strategic Assumption Surfacing and Testing 343  
14.1 Prologue 343  
14.2 Description of Strategic Assumption Surfacing and Testing 346  
14.2.1 Historical Development 346  
14.2.2 Philosophy and Theory 348
21  Critical Systems Practice  577
21.1  Prologue  577
21.2  Description of Critical Systems Practice  579
21.2.1  Historical Development  579
21.2.2  Philosophy and Theory  581
21.2.3  Multimethodology  593
21.2.4  Methodologies  601
21.2.5  Methods  604
21.3  Critical Systems Practice in Action  607
21.3.1  North Yorkshire Police  607
21.3.2  Kingston Gas Turbines  617
21.3.3  Hull University Business School  621
21.4  Critique of Critical Systems Practice  632
21.5  Comments  637
21.6  The Value of Critical Systems Practice To Managers  638
21.7  Conclusion  638

Conclusion  641
References  645
Index  679