

Contents

Part I A Frame of Reference for Systemic Decision Making

1	Introduction	3
1.1	The TAO Approach	3
1.2	Systems Errors	4
1.2.1	Type III Error	5
1.2.2	Type IV Error	6
1.2.3	Type V Error	7
1.2.4	Type VIII Error	8
1.2.5	Type I and Type II Errors	9
1.2.6	Type VI Error	9
1.2.7	Type VII Error	10
1.2.8	Analysis of Errors	11
1.3	Summary	14
	References	15
2	Problems and Messes	17
2.1	A Brief Introduction to Complexity	17
2.1.1	Understanding Complexity	17
2.1.2	The Machine Age and the Systems Age	19
2.2	Dealing with Systems Age Messes	21
2.2.1	Scientific Approaches to Complex Problems	21
2.2.2	Perspectives in Complex Problems	22
2.3	Holistic Understanding	24
2.4	What's the Problem?	26
2.5	Problem Structuring	29
2.6	Summary	32
	References	32

3	Systemic Thinking	35
3.1	A Brief Background of Systems Approaches	35
3.2	What Is Systemic Thinking?	40
3.2.1	Age or Era	41
3.2.2	Unit of Analysis	41
3.2.3	Mathematical Formulation	42
3.2.4	Goal	43
3.2.5	Underlying Philosophy	44
3.2.6	Epistemology	46
3.2.7	Ontology	46
3.2.8	Disciplinary Scope	47
3.2.9	Participants	48
3.3	A Multimethodology for Systemic Decision Making	48
3.4	Summary	51
	References	52
4	Systems Theory	55
4.1	Overview	55
4.2	Historical Roots of Systems Theory	56
4.2.1	General Systems Theory	56
4.2.2	Living Systems Theory	57
4.2.3	Mathematical Systems Theory	57
4.2.4	Cybernetics	58
4.2.5	Social Systems Theory	59
4.2.6	Philosophical Systems Theory	59
4.2.7	Historical Roots of Systems Theory Summary	60
4.3	Systems Theory	60
4.4	Centrality Axiom	63
4.4.1	Emergence	63
4.4.2	Hierarchy	64
4.4.3	Communications	65
4.4.4	Control	67
4.5	The Contextual Axiom	68
4.5.1	Holism	68
4.5.2	Darkness	69
4.5.3	Complementarity	70
4.6	The Goal Axiom	70
4.6.1	Equifinality and Multifinality	70
4.6.2	Purposive Behavior	71
4.6.3	Satisficing	72
4.7	The Operational Axiom	73
4.7.1	Dynamic Equilibrium	73
4.7.2	Relaxation Time	73

4.7.3	Basins of Stability	74
4.7.4	Self-organization	75
4.7.5	Homeostasis and Homeorhesis	75
4.7.6	Suboptimization.	76
4.7.7	Redundancy.	77
4.8	The Viability Axiom.	77
4.8.1	Viability Principle	78
4.8.2	Requisite Variety	84
4.8.3	Requisite Hierarchy	84
4.8.4	Circular Causality	85
4.8.5	Recursion	85
4.9	The Design Axiom	87
4.9.1	Requisite Parsimony	87
4.9.2	Requisite Saliency	87
4.9.3	Minimum Critical Specification	88
4.9.4	Power Laws.	88
4.10	The Information Axiom	90
4.10.1	Information Redundancy	90
4.10.2	Principle of Information Channel Capacity	91
4.10.3	Principle of Information Entropy	91
4.10.4	Redundancy of Potential Command.	92
4.10.5	Information Inaccessibility.	93
4.11	Summary	93
	References.	94
5	Complex Systems Modeling	101
5.1	Introduction	101
5.2	The Role of Modeling	102
5.3	Method Comparison	103
5.4	Fuzzy Cognitive Mapping.	107
5.5	A Framework for FCM Development.	111
5.5.1	Step 1: Clarification of Project Objectives and Information Needs	112
5.5.2	Step 2: Plans for Knowledge Elicitation	113
5.5.3	Step 3: Knowledge Capture.	113
5.5.4	Step 4: FCM Calibration and Step 5: Testing (Step 5).	116
5.5.5	Step 6: Model Use and Interpretation	117
5.6	Example FCM Application	118
5.7	Summary	123
	References.	124

Part II Thinking Systemically

6	The <i>Who</i> of Systemic Thinking	131
6.1	Stakeholder Analysis	131
6.2	Brainstorm Stakeholders	134
6.3	Classify Stakeholders	136
6.4	Evaluate Stakeholder Attitudes	138
6.5	Map Stakeholder Objectives	143
6.6	Determine Stakeholder Engagement Priority	144
6.7	Develop a Stakeholder Management Plan	148
6.8	Manage Stakeholders	149
6.9	Framework for Addressing <i>Who</i> in Messes and Problems	150
6.10	Example Problem	150
6.10.1	Example Stakeholder Brainstorming	151
6.10.2	Example Stakeholder Classification	151
6.10.3	Example Stakeholder Attitude Evaluation	152
6.10.4	Example Stakeholder Objective Mapping	152
6.10.5	Example Stakeholder Engagement Priority	153
6.10.6	Example Stakeholder Management Plan	154
6.11	Summary	155
	References	155
7	The <i>What</i> of Systemic Thinking	157
7.1	Anatomy of a Problem	157
7.2	The Importance of Objectives	159
7.3	Objective Identification	159
7.4	Objective Organization	161
7.5	Fundamental Objectives Hierarchy	164
7.6	Means-Ends Network	166
7.7	Framework for Addressing <i>What</i> in Messes and Problems	167
7.7.1	Articulate Objectives	168
7.7.2	Fundamental Objectives Hierarchy	168
7.7.3	Means-Ends Network	168
7.7.4	FCM Update	169
7.8	Summary	171
	References	171
8	The <i>Why</i> of Systemic Thinking	173
8.1	Overview	173
8.2	Motivation	174
8.3	Categorizing Theories of Motivation	175
8.4	Theories of Motivation	176
8.4.1	Instinct Theory of Motivation	176
8.4.2	Drive Reduction Theory of Motivation	178
8.4.3	Hierarchy of Needs	179

8.4.4	Attribution Theory of Motivation	179
8.4.5	Reinforcement Theory of Motivation.	180
8.4.6	Social Comparison Theory of Motivation	181
8.4.7	Path-Goal Theory of Motivation	182
8.4.8	Social Exchange Theory of Motivation	183
8.4.9	Theory X and Theory Y	183
8.4.10	Cognitive Dissonance Theory of Motivation	184
8.4.11	Equity Theory of Motivation.	186
8.4.12	Social Learning Theory of Motivation.	187
8.4.13	Expectancy Theory of Motivation	188
8.4.14	Motivator-Hygiene Theory of Motivation	189
8.4.15	Acquired Needs Theory of Motivation	190
8.4.16	ERG Theory of Motivation	190
8.4.17	Self-determination Theory of Motivation.	191
8.4.18	Opponent Process Theory of Motivation	192
8.4.19	Goal-Setting Theory of Motivation	192
8.4.20	Reversal Theory of Motivation	193
8.5	Applying Theories of Motivation	195
8.5.1	Cybernetics and Control Theory	195
8.5.2	Klein's Integrated Control Theory Model of Work Motivation.	196
8.6	Framework for Addressing <i>Why</i> in Messes and Problems	199
8.7	Example Problem	199
8.7.1	Motivation/Feedback Analysis.	200
8.7.2	FCM Update	201
8.7.3	Proposed Changes During Act Stage.	201
8.8	Summary	201
	References.	202
9	The <i>Where</i> of Systemic Thinking	207
9.1	Introduction	207
9.2	Context.	207
9.2.1	Perspectives and Context.	208
9.2.2	Description and Definitions for Context	209
9.2.3	Elements of Context	211
9.2.4	Temporal Aspects of Context	212
9.2.5	Cultural Values and Their Impact on the Development of Context.	213
9.2.6	Data, Information, and Knowledge	214
9.2.7	Inclusion of Context	216
9.3	Boundaries and the Environment	218
9.3.1	Definitions for Boundary and Environment	218
9.3.2	The Significance of Boundary Establishment.	219
9.3.3	Boundary Classification.	220

9.3.4	Ulrich's Framework of Twelve Critically Heuristic Boundary Categories	221
9.3.5	Force Field Diagrams	222
9.4	Framework for Addressing <i>Where</i> in Messes and Problems . . .	224
9.5	Example Problem	224
9.5.1	Boundary Articulation	224
9.5.2	Context	225
9.5.3	Force Field Diagram	226
9.5.4	Updated FCM	226
9.5.5	Proposed Ought-to-Be Changes	226
9.6	Summary	228
	References	228
10	The <i>How</i> of Systemic Thinking	231
10.1	Overview	231
10.2	Mechanisms	231
10.2.1	Physical Classification for Mechanisms	232
10.2.2	Human Classification for Mechanisms	233
10.2.3	Abstract Classification of Mechanisms	238
10.3	Methods as Mechanisms for Messes and Constituent Problems	239
10.3.1	Sensemaking	239
10.3.2	Pragmatic Intersection of Knowledge and Information	240
10.3.3	Framework for Sensemaking	241
10.4	Cynefin Domain and Mechanism Types	245
10.4.1	Cynefin and the Strategic Decision Making Pyramid	245
10.5	Framework for Addressing <i>How</i> in Messes and Problems	248
10.6	Example Problem	249
10.6.1	Cynefin Analysis	249
10.6.2	Mechanism Analysis	249
10.6.3	Updated FCM	250
10.7	Summary	250
	References	251
11	The <i>When</i> of Systemic Thinking	253
11.1	Life Cycles and Maturity	253
11.2	Evolution	259
11.3	Entropy	262
11.4	Another View of Sensemaking	266
11.5	Decision Flowchart for Addressing <i>When</i> in Messes and Problems	268

11.6	Framework for Addressing <i>When</i> in Messes and Problems. . . .	270
11.7	Example Problem	270
11.7.1	Timescale Assessment	270
11.7.2	Intervention Timing	272
11.8	Summary and Implications for Systemic Thinking	273
	References.	273

Part III Acting Systemically

12	Systemic Action	277
12.1	Mess Reconstruction.	277
12.2	The <i>What Is</i> Meta-Perspective	278
12.3	The <i>What Ought-to-Be</i> Meta-Perspective	279
12.4	Example Analysis	280
12.5	Iteration	281
12.6	Summary	281
	References.	281
13	Anatomy of a Decision	283
13.1	Introduction	283
13.2	Roles	284
13.3	Decision Analysis	285
13.4	Decision Science.	287
13.5	The Decision Process	288
13.5.1	Measuring Performance	290
13.6	Framework for <i>Action</i> in Messes and Problems	293
13.7	Example Action Analysis	293
13.8	Additional Concerns	296
13.8.1	Decision Robustness	296
13.8.2	Decision Optimality.	299
13.9	Summary	302
	References.	302
14	Decision Implementation.	303
14.1	Introduction	303
14.2	Human Error Classification.	303
14.3	Classification and Performance Levels	307
14.4	Human Error Management	307
14.5	Latent and Active Failures	309
14.6	Human Error Prevention.	311
14.7	Summary	314
	References.	314

Part IV Observing Systemically

15 Observation	317
15.1 Introduction	317
15.2 Avoiding the Type I and Type II Errors	318
15.3 Observation	319
15.3.1 A Model for the Process of Observation	319
15.3.2 Theory-Laden Observation	321
15.3.3 Data, Information, Knowledge and Observation	322
15.4 Observation and Situated Cognition	324
15.4.1 Technological System in the DMSC	325
15.4.2 Cognitive System in the DMSC	326
15.4.3 Cybernetic Nature of the DMSC	326
15.5 Measurement and Observation	326
15.6 Bias and Heuristics in Observation	327
15.6.1 Availability Heuristic	328
15.6.2 Representativeness Heuristic	328
15.6.3 Conjunction Fallacy	329
15.6.4 Anchoring and Adjustment Heuristic	330
15.6.5 Recognition Heuristic	330
15.6.6 Confirmation Bias	330
15.7 Summary	332
References	332
16 Systemic Learning	335
16.1 Introduction	335
16.2 Learning Theory	336
16.2.1 Gregory Bateson and Early Learning Theory	336
16.2.2 Cybernetics and Learning Theory	337
16.2.3 Chris Argyris, Donald Schön, and Learning Theory	338
16.3 Relating Performance to First-order, Second-order, and Deutero-Learning	339
16.4 Learning in Organizations	340
16.4.1 Strategy and Competitive Advantage	341
16.4.2 Competitive Advantage and Organizational Learning	341
16.4.3 Leaders and the Learning Organization	343
16.4.4 Workers in the Learning Organization	343
16.4.5 Leadership Challenges in the Learning Organization	343
16.5 Avoiding the Type VI Error	346
16.6 Summary	348
References	348

17 Ford Pinto Case Study	351
17.1 Introduction	351
17.2 Problem Structuring	351
17.3 Problem 1: Ford Problem	352
17.3.1 Who Perspective	352
17.3.2 What Perspective	356
17.3.3 Why Perspective	359
17.3.4 Where Perspective	359
17.3.5 How Perspective	362
17.3.6 When Perspective	364
17.4 Problem 2: NHTSA Problem	366
17.4.1 Who Perspective	366
17.4.2 What Perspective	370
17.4.3 Why Perspective	372
17.4.4 Where Perspective	373
17.4.5 How Perspective	376
17.4.6 When Perspective	377
17.5 Ford Pinto Mess	379
17.6 Conclusions	384
Reference	384
18 Conclusion	385
18.1 Part I: A Frame of Reference for Systemic Thinking	385
18.2 Part II: Thinking Systemically	386
18.3 Part III: Acting Systemically	387
18.4 Part IV: Observing Systemically	388
18.5 Summary	388
Reference	389
Appendix A: Real Estate Problem 2	391
Index	407

Systemic Decision Making

Fundamentals for Addressing Problems and Messes

Hester, P.T.; Adams, K.

2017, XXVIII, 414 p. 162 illus., 67 illus. in color.,

Hardcover

ISBN: 978-3-319-54671-1