



PUTTING SYSTEMS TO WORK

DEREK K. HITCHINS



WILEY

Publishers Since 1807

Contents

About the Book	x1
-----------------------------	-----------

Part A—Foundation and Theory

Chapter 1—Understanding Systems	3
An Introduction to Systems	3
Gestalt and Gestalten	6
Hard and Soft, Open and Closed	6
Emergence and Hierarchy	10
Cybernetics	11
Machine Age versus Systems Age	13
Present Limitations in Systems Engineering Methods	14
Enquiring Systems	18
Chaos	23
Chaos and Self-organized Criticality	24
Conclusion	26
Chapter 2—The Human Element in Systems	27
Human 'Design'	27
Human Predictability	29
Personality	31
Social Interactions	32
Making Decisions	33
Decision Centres	39
Human-analogous Systems	40
Design Analogues	44
Conclusion	45
Assignment	46
Chapter 3—A Unified Systems Hypothesis	47
Introduction	47
USH System Images	52
USH Definitions of System, Environment and Equilibrium	55
USH Principles	60
USH Principles as a Set	67
USH Principles as One	68
Conclusion	70
Assignment	71

Part B—System Building Blocks

Chapter 4—The Generic Reference Model	75
Introduction.....	75
The GR (Function) Model.....	75
The GR (Form) Model.....	79
A GR (Behaviour) Model.....	81
Using the GRM.....	82
Conclusion.....	84
Assignment.....	84
Chapter 5.1—Efficiency, Effectiveness and Net Contribution—Assessing the Worth of Projects and Systems	86
Introduction.....	86
Efficiency.....	86
Effectiveness.....	92
Cost-effectiveness.....	95
Net Contribution.....	98
Net Contribution—Delving Deeper.....	102
Conclusion.....	108
Chapter 5.2—Efficiency, Effectiveness and Net Contribution—Comparative Analysis of a Marketing Department	110
Introduction.....	110
Efficiency.....	110
Effectiveness.....	111
Cost-effectiveness.....	112
Net Contribution.....	112
Summary and Conclusions.....	117
Chapter 6—Process and Structure Models	119
Introduction.....	119
The Structure of a Process Model.....	119
Developing a Process Model.....	120
Illustration.....	122
Presentation of Process Models.....	130
Structure Model.....	131
Assignment A.....	133
Assignment B.....	134
Chapter 7—Systems Architecture	135
Architecture.....	135
Worked Examples.....	143
Conclusion.....	147
Assignment.....	147

Part C—System Synthesis

Chapter 8.1—Addressing Issues	151
Introduction	151
What is an “Issue”?	153
Addressing Issues	155
Issue Hierarchies and Symptom Aggregation	159
Prospects for Issue Resolution	162
Evoking Change in a Complex Interacting System Set	165
Conclusion	167
Chapter 8.2—Hierarchical Issue Method—Case Studies	168
Introduction	168
Case Study 1	168
Case Study 2	182
Conclusion	191
Assignment	191
Chapter 9—Creativity	193
Creativity and Innovation	193
Creative Methods	195
Structure Development	204
Creative Environments	210
Summary and Conclusions	211
Assignments	213
Chapter 10.1—Conceiving Technique	214
The Purpose and Role of a Conceiving System	214
Planks in the Bridge	215
Bridging Concepts	215
Summary	223
Chapter 10.2—Conceiving Systems—The Seven-step Continuum	224
Attributes of a Good Methodology	224
Developing the Continuum	224
Conclusion	230
Chapter 10.3—Conceiving Cases	234
The Seven-step Progress	234
Summary	239
Chapter 11—Classic Systems Engineering	240
Introduction	240
The Role of Systems Engineering	242
System Partitioning	244
Traditional Systems Engineering Creativity	246

Systems Engineering—Process and Tools	248
Systems Engineering—Organization and Methods	251
Summary	263
Chapter 12.1—A New Systems Engineering (NSE)	264
So, What's Wrong with Classic Systems Engineering?	264
Closed Systems versus Open Systems Philosophies	265
Designing Open Systems	269
A New Systems Engineering Method	272
Conclusion	281
Chapter 12.2—A Case for New Systems Engineering (NSE)	282
NSE Design Example	282
Conclusion	293
Assignment	293

Part D—Future Vision?

Chapter 13—Building Future systems Naturally	297
Issues	297
Nature's approach	297
Mutual Self-reward	298
Computer-based Survival of the Fittest	299
On-line Adaptive Systems	300
Generic Systems	302
Generic Multi-system Organization	303
Nature's Economy	306
Evolving Socio-technical Systems	307
Conclusion	311
Glossary of Terms	313
Aim, Objectives and Activities of Systems Engineering—A Guide to Proper Practice	314
References and Bibliography	317
Index	322