

Contents

Preface	v
Part 1: The Theories and Why	1
1 The Emergence of Holistic Thinking	3
The scholastic paradigm	5
The Renaissance paradigm	8
The mechanistic world and determinism	12
The hegemony of determinism	14
The age of relativity and quantum mechanics	23
The systems age	36
Review questions and problems	47
2 Basic Ideas of General Systems Theory	49
GST and concepts defining systems properties	56
Cybernetics and concepts defining systems processes	75
General scientific and systemic concepts	95
Widely-known laws, principles, theorems and hypotheses	99
Some generic facts of systems behaviour	105
Review questions and problems	108
3 A Selection of Systems Theories	110
Boulding and the Hierarchy of Systems Complexity	111
Miller and the General Living Systems Theory	118
Beer and the Viable System Model	132
Lovelock and the Gaia Hypothesis	140
Teilhard de Chardin and the nōosphere	152
Taylor and the Geopolitic Systems Model	156
Klir and the General Systems Problem Solver	162
Laszlo and the Natural Systems	165
Cook and the Quantal System	170
Checkland and the Systems Typology	175
Jordan and the Systems Taxonomy	178

Salk and the categories of nature	180
Powers and the Control Theory	185
Namilov and the organismic view of science	189
Bowen and Family Systems Theory	192
Jaques and the Stratified Systems Theory	197
Review questions and problems	203
4 Communication and Information Theory	204
Basic concepts of communication theory	207
Interrelations between time, place and channel	213
Shannon's classical theory	219
Basic concepts of information theory	227
Information, exformation and entropy	230
How to measure information	238
Entropy and redundancy	246
Channels, noise and coding	250
Review questions and problems	254
5 Some Theories of Brain and Mind	256
The need for consciousness	259
A hierarchy of memory	273
Brain models	278
A model perspective	292
Review questions and problems	293
6 Self-Organization and Evolution	294
Evolution as self-organization	297
Basic principles of self-organization	301
Some rules of the game	307
The city	309
Climate and weather	311
The economy	314
Review questions and problems	315
Part 2: The Applications and How	317
7 Artificial Intelligence and Life	319
The Turing test	326
Parallel processing and neural networks	329

Expert systems	332
Some other applications	336
Artificial life	339
Computer viruses	346
A gloomy future	348
Review questions and problems	351
8 Organizational Theory and Management Cybernetics	352
The origin of modern trading corporations	355
The development of organizational theory	358
The non-avoidable hierarchy	367
Organizational design	368
Multiple perspectives of management cybernetics	379
A systems approach in ten points	387
Review questions and problems	389
9 Decision-Making and Decision Aids	390
Some concepts and distinctions of the area	393
Basic decision aids	401
Managerial problems and needs	405
Four generations of computer support	408
C ³ I systems	413
Some psychological aspects of decision-making	423
The future of managerial decision support	428
Review questions and problems	429
10 Informatics	430
Electronic networks	432
Fibre optics, communication and navigation satellites, cellular radio	437
Internet	440
Virtual reality	450
Cyberspace and cyberpunk	453
Review questions and problems	455
11 Some of the Systems Methodologies	457
Large-scale, soft and intertwined problems	459
Systems design	462
Breakthrough thinking	464

Systems analysis	470
Systems engineering	472
GLS simulation	475
Method versus problem	481
Review questions and problems	484
12 The Future of Systems Theory	485
Science of today	486
The world we live in	487
The need for change	492
Systems thinking as alternate and criticized paradigm	496
Systems thinking and the academic environment	500
How to write the instruction manual	502
Review questions and problems	504
References	505
Name Index	513
Subject Index	517