CONTENTS

Preface	хi
Acknowledgments	xix
Chapter 1 INTRODUCTION	1
1.1 Do Scientists Need Epistemology?	2
1.2 Towards a Philosophy of Applied Science	6
1.3 Management Science and the Philosophy of Applied Science 1.4 Conclusion	10 12
Chapter 2	
SYSTEMS ANALYSIS AS A TOOL OF PHILOSOPHICAL INVESTIGATION	17
2.1 In Need of an Expanded Analytical Superstructure	18
2.2 The Essence of the Systems Approach	24
2.21 Alternative and Complementary Attempts	24
2.22 General Characteristics	26
2.23 The System Boundaries	32
2.3 Incorporating and Externalizing Value Judgements	37
2.4 The Method of Neutralizing Systems	39
2.5 Management Science as a System: Normative or Positive?	42
2.6 Reduction of Value Judgements	46
2.7 Institutionalized Facts as Values	48
2.8 Institutions as Systems	51
Chapter 3	
PHILOSOPHY AND EVOLUTION OF LOGIC FROM A SYSTEMS POINT OF VIEW	53
3.1 Some Ontological Considerations	53
3.2 On the Nature of Logic	55
3.21 Relation to the Mind-Body Problem	58
3.22 Analytical and Normative Aspects of Logic	60

viii	CONTENTS
------	----------

	3.23 The Origin of Formal Logic	62		
	3.24 The Hierarchy of Semantics and Logic	6 9		
	3.25 Naming and Meaning	72		
3.3	Historical Development of Modern Logic	74		
	3.31 The Advent of Boolean Algebra	74		
	3.32 Mathematicians' Contributions to Logic	75		
	3.33 The Logistic Thesis of Mathematics	79		
	3.34 Principia Mathematica	82		
	3.35 Paradoxes and the Axiom of Choice	84		
	3.36 Consistency and Gödel's Proof	88		
3.4	Some Highlights in the Evolution of Semantics	89		
	3.41 From Ancient Times to the Twentieth Century	89		
	3.42 Carnap's and Tarski's Major Contributions	92		
	3.43 Wittgenstein's Two Philosophies	95		
	3.44 Recent Developments	97		
	pter 4			
MO:	DERN DEDUCTIVE LOGIC	104		
4.1	Sentence Logic or the Theory of Truth Functions	104		
	4.11 Sentence Connectives	104		
	4.12 Conditional Form versus Argument Form	106		
	4.13 Decidability and Formalization	108		
	4.14 Formalization of Sentence Logic: Sentence Calculi	110		
4.2	Predicate Logic	111		
	4.21 Quantification	113		
	4.22 Valid Formulas	115		
	4.23 Russell's Theory of Description and Recent Reactions	117		
4.3	Multivalued and Modal Logic	121		
	4.31 Lukasiewicz' Many Valued Logic	121		
	4.32 Modal Logic	124		
4.4	Imperative Arguments and Deontic Modalities	128		
	4.41 Imperative Inferences	130		
	4.42 Arguments with Mixed Premises	132		
	4.43 Deontic Inferences	135		
Cha	apter 5			
THE CONTROVERSY AROUND INDUCTIVE LOGIC				
		141		
5.1	Essence and Early Evolution of Induction	143		

CONTENTS ix

5.2 Modern Views on Induction	147
5.21 Hume and the Sceptics	147
5.22 The Hypothetico-Deductive Approach and Popper's Falsificationism	149
5.23 Von Wright and Mill's Methods of Induction	157
5.24 Carnap and Theories of Confirmation	161
5.25 Von Mises, Reichenbach and others: the Fred	_
Approach to Induction	170
5.26 Russell and the Postulational Approach	176
5.27 Uniformity of the Universe and Goodman's Paradox	
5.3 Probability and Its Interpretation	183
5.31 Relative Frequency	185
5.32 Degree of Confirmation	187
5.33 Subjective Probability	189
5.4 Conclusion	191
Chapter 6	
DECISION THEORY AND THE ECONOMISTS' METHODOI ENDEAVORS	LOGICAL 197
6.1 An Appraisal of Camap's Inductive Logic	197
6.2 Formal Decision Theory and Its Evolution	198
6.21 Early Beginnings and the Probabilistic Utility Notion	n 198
6.22 The Statisticians' Contributions	203
6.23 Principles of Rational Choice	208
6.24 Further Contributions by Philosophers and Econom	ists 215
6.3 Information Economics as an Extension of Decision Theo	ry 219
6.4 Epistemo-Economics	224
6.41 On the Attitude of the Epistemologists	225
6.42 On the Attitude of Economists	226
6.43 What is the Essence of Epistemo-Economics?	227
6.44 Epistemo-Economics as an Extension of the Philo	
Science	228
6.45 Information as Raw Material of Knowledge	230
6.5 Other Methodological Explorations by Economists	233
6.51 Positive versus Normative Economics	234
6.52 The Modern Dispute on Methodology	240
6.53 Stochastic and Holistic Aspects of Economics	245

X CONTENTS

Cha	pter 7	
PHI	LOSOPHY OF SCIENCE AND THE SYSTEMS APPROACH	249
7.1	Introduction	249
7.2	Epistemology: The Received View	250
	7.21 The Principles of Uncritical Empiricism	251
	7.22 Refinements and Ultimate Version of Uncritical Empiricism	256
7.3	Reaction and Alternatives	260
	7.31 The Normativistic Outlook	261
	7.32 The Sneed-Stegmüller Synthesis	265
7.4	The Systems Approach, Its Criticism, and Its Potential	272
	7.41 Normativists and System Theorists	272
	7.42 Systems Research versus General System Theory	276
	7.43 The Father of Systems Theory: Bogdanov or von Bertalanffy?	283
	7.44 Ackoff's and Churchman's Contributions	286
	7.45 Herbert Simon's Science of Design and Artificial Intelligence	293
7.5	Systems Approach as a Methodology	299
	7.51 Georgescu-Roegen's New Version of Dialectics	301
	7.52 A Modern Version of the Conflagration Hypothesis	304
	7.53 Five Ontological Assumptions of Systems Methodology	306
	7.54 Relevance to Instrumental Reasoning	307
Bib	liography	324
Dic	tionaries, Encyclopedias, and Indices	348
Son	ne Journals of Philosophy, Applied and Social Sciences	349
Ind	ex of Names	353
Ind	ex of Subjects	362