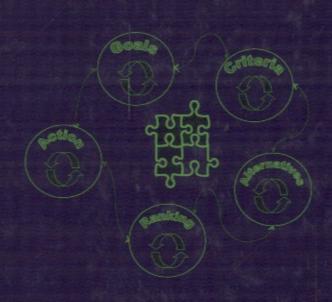


## How to Do Systems Analysis



JOHN E. GIBSON WILLIAM T. SCHERER WILLIAM F. GIBSON

## **Contents**

Preface A Personal Note from William T. Scherer			xi
			xv
A P	A Personal Note from William F. Gibson		
A Personal Note from Scott F. Ferber			xix
Ori	ginal F	Preface from Jack Gibson	xxi
Ack	cnowle	edgments	xxiii
1	Intro	duction	1
	1.1	What Is a System?	2
	1.2	Terminology Confusion	4
	1.3	Systems Analysis Equals Operations Research Plus Policy	
		Analysis	6
	1.4	Attributes of Large-Scale Systems	7
	1.5	Intelligent Transportation Systems (ITS): An Example of	
		a Large-Scale System	8
	1.6	Systems Integration	11
	1.7	What Makes a "Systems Analysis" Different?	12
	1.8	Distant Roots of Systems Analysis	14
	1.9	Immediate Precursors to Systems Analysis	15
	1.10	Development of Systems Analysis As a Distinct Discipline:	
		The Influence of RAND	17

$\mathbf{v}_{\mathbf{i}} = (7)$	NTENTS

	Histori	ical Case Study: IIASA (A)	20
	Exerci	ses	24
	Case Study: Fun at Six Flags? Historical Case Study: IIASA (B)		
2	Six Major Phases of Systems Analysis		
	2.1	The Systems Analysis Method: Six Major Phases	29
	2.2	The Goal-centered or Top-Down Approach	35
	2.3	The Index of Performance Concept	40
	2.4	Developing Alternative Scenarios	44
	2.5	Ranking Alternatives	45
	2.6	Iteration and the "Error-embracing" Approach	46
	2.7	The Action Phase: The Life Cycle of a System	48
	Exerci	ises	50
	Case Study: Methodologies or Chaos? Part A		51
	Case Study: Methodologies or Chaos? Part B		52
	Case S	Case Study: Wal-Mart Crisis!	
3	Goal Development		55
	3.1	Seven Steps in Goal Development	55
	3.2	On Generalizing the Question	59
	3.3	The Descriptive Scenario	61
	3.4	The Normative Scenario	62
	3.5	The Axiological Component	63
	3.6	Developing an Objectives Tree	66
	3.7	Fitch's Goals for an Urbanizing America: An Example	
		of Objectives Tree Construction	73
	3.8	Content Analysis of Fitch's Goals	79
	3.9	Validate	82
	3.10	Iterate	83
		Study: Distance Learning in the Future?	84
	Histo	rical Case Study: Goals of 4C, Inc.	85
4	The Index of Performance		89
	4.1	Introduction	89
	4.2	Desirable Characteristics for an Index of Performance	91
	4.3	Economic Criteria	95
	11	Compound Interest	96

4.4 Compound Interest

		CON	NTENTS	vii
	4.5	Four Common Criteria of Economic Efficiency		98
	4.6	Is There a Problem with Multiple Criteria?		100
	4.7	What Is Wrong with the <b>B-C</b> Ratio?		105
	4.8	Can IRR Be Fixed?		107
	4.9	Expected Monetary Value		109
	4.10	Nonmonetary Performance Indices		111
	Exerc	rises		114
	Case	Study: Sky High Airlines		116
	Case	Study: Bridges—Where to Spend the Security Dollars?		122
	Case	Study: Measuring the Process and Outcomes of Regional		
	Trans	portation Collaboration		122
	Case	Study: Baseball Free Agent Draft		123
5	Deve	elop Alternative Candidate Solutions		129
	5.1	Introduction		129
	5.2	The Classical Approach to Creativity		129
	5.3	Concepts in Creativity		131
	5.4	Brainstorming		132
	5.5	Brainwriting		135
	5.6	Dynamic Confrontation		137
	5.7	Zwicky's Morphological Box		137
	5.8	The Options Field/Options Profile Approach		139
	5.9	Computer Creativity		143
	5.10	Computer Simulation: a Tool in Option Development		144
	5.11	Why a Dynamic Simulation for Creating Options?		145
	5.12	Context-Free Simulation Models?		147
	5.13	Bottom-Up Simulation or Top-Down?		148
	5.14	Lessons from the Susquehanna River Basin Model		151
	5.15	The Forrester Urban Model (FUM) and Societal Values		153
	5.16	Extensions and Variations		157
	5.17	Where to go from Here?		159
	Exerc	cises		159
	Case	Study: Winnebago		160
	Case	Study: Distance Learning in the Future?		160
		orical Case Study: Real-Time Television Link		
	with	Mars Orbiter		160
		orical Case Study: A Highway Vehicle Simulator		• • • •
	RFP From DOT			180

6	Rank	Alternative Candidates	185
	6.1	Introduction	185
	6.2	Rating and Ranking Methods	186
	6.3	Condorcet and Arrow Voting Paradoxes	188
	6.4	A MultiStage Rating Process	192
	6.5	Decision Analysis	197
	6.6	Basic Axioms of Decision Theory	199
	6.7	Properties of Utility Functions	203
	6.8	Constructing a Utility Curve	205
	6.9	Some Decision Analysis Classic Examples	207
	6.10	Estimation Theory in Decision Analysis	210
	6.11	Some Practical Problems with Decision Analysis	22
	6.12	Practical Trade Studies	224
	Exerc	rises	23
	Case	Case Study: Training Center Location	
	Case Study: Corporate Headquarters Location		23:
	Case Study: Business School Selection		230
7	Iteration and Transition		239
	7.1	Iteration	23
	7.2	Segment and Focus	24
	7.3	The Transition Scenario	24
	7.4	The Gantt Chart	24:
	7.5	Interaction Matrices	24.
	7.6	The Delta Chart	24
	7.7	The Audit Trail	25
	7.8	Cost of Failure to Stay on Schedule	25
	7.9	Responsibilities of Major Actors	25
	7.10	Sign-Offs by Cooperating Groups	25
	Exer	cises	25
8	Management of the Systems Team		25
	8.1	Introduction	25
	8.2	Personal Style in an Interdisciplinary Team	25
	8.3	"Out-Scoping" and "In-Scoping" in a System Study	26
	8.4	Building the Systems Team	26
	8.5	Tips on Managing the Team	26
	8.6	Functional or Project Management?	26

		CONTENTS	ix
	8.7	How to Make an Effective Oral Presentation	266
	8.8	How to Write a Report	273
9	Project	t Management	277
	9.1	Introduction	277
	9.2	Project Management Versus Process Management	279
	9.3	The Hersey-Blanchard Four-Mode Theory	281
	9.4	Relation of Management Style to Project Management	285
	9.5	Preliminary Project Planning	286
	9.6	Dealing with Conflict in Project Management	287
	9.7	Life-Cycle Planning and Design	288
	9.8	PERT/CPM Program Planning Method: An Example	292
	9.9	Quality Control in Systems Projects	297
	Case	Study: Project Management	298
10	The 10	Golden Rules of Systems Analysis	301
	10.1	Introduction	301
	10.2	Rule 1: There Always Is a Client	302
	10.3	Rule 2: Your Client Does Not Understand His Own Problem	303
	10.4	Rule 3: The Original Problem Statement is too Specific: You Must Generalize the Problem to Give it Contextual Integrity	304
	10.5	Rule 4: The Client Does Not Understand the Concept of the	
		Index of Performance	306
	10.6	Rule 5: You are the Analyst, Not the Decision-Maker	309
	10.7	Rule 6: Meet the Time Deadline and the Cost Budget	310
	10.8	Rule 7: Take a Goal-Centered Approach to the Problem, Not a Technology-Centered or Chronological Approach	311
	10.9	Rule 8: Nonusers Must be Considered in the Analysis and in the Final Recommendations	312
	10.10	Rule 9: The Universal Computer Model is a Fantasy	314
	10.11	Rule 10: The Role of Decision-Maker in Public Systems is Often a Confused One	314
Refe	erences		319
Inde	Index		