Contents

Preface xv

PART ONE BASIC SYSTEMS CONCEPTS

1 **Management and the Systems Concept** 3

Complex Systems and Technology 4
Managing Complex Systems 6
The Manager's Technology Base 6
The Management Concepts Base 8
The Manager's Personal Style Base 12
The Manager's Systems Base 14
The Systems Approach to Management 15
Systems and Planning 16
Systems and Implementation 18
An Operational Systems Approach 19
Summary 23
Recommended Readings 23

PART TWO PLANNING AND SYSTEMS ANALYSIS

2 Strategic Systems Planning 27

The Systems Approach to Strategic Systems Planning (SSP) 28
A Conceptual Strategic Systems-Planning Model 30
The "Horizontal" Dimension of SSP 30
The "Vertical" Dimension of SSP 31
The "Time and Causality" Dimension of SSP 32
The "Action" Dimension of SSP 33
The Basis for the Systems Approach to SSP 33
The Objectives of Strategic Systems Planning 34
The Inherent Complexity of Social Systems 35
Conducting Effective Strategic Systems Planning 38
Using Systems Perceptions in Planning 38
Systems for Strategic Systems Planning 40
Summary 48
Recommended Readings 49

3 Systems Analysis 51

Decision Problems 52
Solutions to Decision Problems 54
The Systems-Analysis Process 55
Examination and Comparison of Alternatives 55
The Basis for Comparison 59
Uncertainty 62
The Role of Systems Analysis 64
Should All Problems Be Analyzed? 64
Quantitative and Qualitative Analysis 65
Optimization 67
The Role of Judgment in Systems Analysis 69
Summary 70
Recommended Readings 70

4 A Conceptual Framework for Systems Analysis 72

The Decision-making Process 73
Decision-Problem Analysis 74
The Outcome Array 75
Evaluating and Comparing Outcomes 79
Decisions under Certainty 82
A Revisit to the Evaluation and Comparison Problem 84
Decisions under Uncertainty 86
Summary 93
Recommended Readings 93

5 Methods of Systems Analysis 95

Models in Systems Analysis 96
General Cost-Benefit Models 100
Interpreting the Model in Terms of the Conceptual Framework 106
Operational Systems-Analysis Models 108
Measuring Costs and Benefits 109
Predictive Accuracy 112
Incommensurate Benefit Measures 112
Suboptimization 114
Certainty versus Uncertainty 117
Values and Limitations 118
Summary 120
Recommended Readings 120

6 Planning-Programming-Budgeting and Systems Analysis 122

The Need for PPBS 123
Classic Planning Concepts 124
A Classic Taxonomy of Plans 124
The Time Dimension of Planning 125
Values of Long-Range Planning 126
Programs 127
Objectives and Programs 128
Determining a Program Structure 128
Program Budgeting 130
Analytic Capability 134
Information Systems 135
PPBS in Planning and Implementation 137
A Model PPBS 138
The Program and Financial Plan 139
Program Memorandums 141
Special Analytic Studies 142
The Budget Process 142
Summary 143
Recommended Readings 144

7 Information Systems and Systems Analysis 145

The Role of Models in Information Systems 146
An Expanded View of Models 149
Using Models in MIS Design 150
The Model's Predictive Variables 151

The Model's Criterion 153
The Model's Solution 154
Sensitivity Information 155
Implications of Model-based MIS Design 155
Manager-Analyst MIS Design 156
Summary 158
Recommended Readings 159

8 A Strategic Systems Planning Culture 160

A Planning Culture 161
The Need for a Planning Culture 161
Basic Premises of a Planning Culture 163
Organizing for Strategic Systems Planning 165
Basic Organizational Tenets 166
The Planning Process 167
The Planning Organization 168
The Line Manager's Role 172
The Top Manager's Role 173
The Staff Planner's Role 174
Motivating Strategic Planning 175
Implementing Strategic Planning 176
Summary 177
Recommended Readings 178

PART THREE IMPLEMENTATION AND PROJECT MANAGEMENT

9 Project Management and the Matrix Organization 183

System Dynamics—Life Cycles 184
Sales Life Cycle 185
Systems Development Life Cycle 185
Project Dynamics 190
Project Life Cycles 190
Critical Project Dimensions 191
A Stream of Projects 192
The Matrix Organization 193
Matrix Management Concepts 195
The Basis for the Matrix Approach 197
When to Use Project Techniques 198
Summary 201
Recommended Readings 202

10 The Project Environment 203

Characteristics of the Project Environment 203
The Horizontal Culture 204
The Role of Managers 205
Personal Values and Expectations 206
Broad Cultural Changes 208
Changing Concepts of Leadership 208
Organizational Implications 210
Some Horizontal Organizations 211
Weapons Systems Management 211
Project Management in School Administration 212
Product Management 214
Production Task Forces 215
Project Management in City Government 216
Horizontal Top Management 216
University Horizontal Management 217
The Management Environment 217
Traditional Management 217
The Mainstream of Traditional Thought 218
Bureaucracy 223
Questioning the Traditional Model 225
Project Management versus Traditional Management 229
Summary 230
Recommended Readings 232

11 Organizational Concepts of Project Management 234

Organizations 235
Evolving Principles of Organization 236
The Project/Functional Interface 237
A Systems View of an Organization 238
Planning the Matrix Organization 241
Why Matrix Organization? 241
Developing the Project Organization 242
Aligning Organizational Elements 243
The Project Team 243
The Project Office 247
The Manager of Projects 248
The Functional Organization 249
Alternative Organizational Forms 250
Pure Functional Organization 250
Pure Project Organization 251

Matrix Organization 251
Alternative Matrix Forms 252
Interorganizational Project Management 263
Summary 264
Recommended Readings 264

12 The Organization Chart: A Systems Viewpoint 266

The Pyramidal Organizational Chart 267
Charting Horizontal Relationships 268
Usefulness of the Traditional Chart 269
Limitations of the Traditional Chart 269
Alternatives to Traditional Organizational Charting 269
Linear Responsibility Charts (LRCs) 271
Structure and Philosophy of the LRC 272
Limitations of LRCs 276
The Universal Subsystems of Management 277
Systems Characteristics of a Managing Subsystem 278
The LRC in Input-Output Terms 283
The Systematized LRC 285
System Model Schematic Diagrams 291
The LRC in Planning 292
Summary 297
Recommended Readings 298

13 Project Authority 299

What Is Authority? 300
Defining Authority 300
Power 301
How Much Project Authority? 302
What Is Project Authority? 304
A Review of Contemporary Theory 304
Interfaces in Project Authority 305
Authority through Negotiation 309
What Place Hierarchy? 311
Documenting Project Authority 312
Examples of (De Jure) Authority 313
Dual Reporting in Project Management 316
A Test for the Specificity of Project-functional Authority 318
Summary 322
Recommended Readings 322

14 Project Control 324
Control Systems 324
Defining Control 325
Prerequisites of a Control System 326
The Subfunctions of Control 326
The Varied Nature of Standards 328
The Personal Nature of Control 330
Project Management Information Systems (PMIS) 332
Basic Objectives of a PMIS 333
PMIS Criteria 333
Overall Project Control 335
When to Initiate Control 336
Project Documentation and Review 336
Summary 340
Recommended Readings 340

15 Project Planning and Control Techniques 341
Project Planning 342
Planning and Control Techniques 343
The Work Breakdown Structure 343
Project Planning (Gantt) Charts 343
Network Plans 347
Analysis of Network Plans 354
Critical Path Method (CPM) 357
Program Evaluation and Review Technique (PERT) 358
Network Analysis Using Historical Estimating Behavior 363
Network Simulation 365
Simulations Using Historical Estimating Behavior 365
Graphical Evaluation and Review Technique (GERT) 365
PERT-Cost 366
Line of Balance (LOB) 366
Summary 366
Recommended Readings 367

APPENDIXES

1 The Project Plan 371
2 Master Project Manual 381
3 Project-Management Review Checklist 385

Index 393