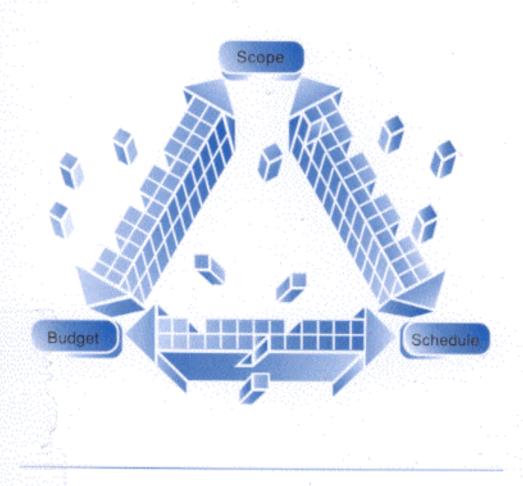
Project Management for Engineering and Construction

Second Edition



Garold D. Oberlender



CONTENTS

iχ

1	INTRODUCTION	
	Purpose of this Book	`
	Arrangement of this Book	
	Definition of a Project	
	Responsibilities of Parties	
	Who Does the Project Manager Work For?	
	Purpose of Project Management	
	Types of Management	
	Functions of Management	1
	Key Concepts of Project Management	1
	Role of the Project Manager	1.
	Professional and Technical Organizations	1
	Questions for Chapter 1—Introduction	1:
	References	1
2	WORKING WITH PROJECT TEAMS	1
		-
	Project Teams	1
	Project Teams Teamwork	1
	•	1 1 1
	Teamwork	1 1: 1: 1:
	Teamwork Teams for Small Projects	1 1 1 1 1 2
	Teamwork Teams for Small Projects Working with Multiple Teams	1 1 1 1 2 2
	Teamwork Teams for Small Projects Working with Multiple Teams Design Teams	
	Teamwork Teams for Small Projects Working with Multiple Teams Design Teams Construction Teams	2
	Teamwork Teams for Small Projects Working with Multiple Teams Design Teams Construction Teams Team Management	2
	Teamwork Teams for Small Projects Working with Multiple Teams Design Teams Construction Teams Team Management Teams and the Project Manager's Responsibilities Key Factors in Team Leadership Team Building	2 2 2
	Teamwork Teams for Small Projects Working with Multiple Teams Design Teams Construction Teams Team Management Teams and the Project Manager's Responsibilities Key Factors in Team Leadership	2 2 2 2

31 31

127		Developing a Consensus	28
	Дъ,	Market Ma	28
		Questions for Chapter 2—Working with Project Teams	29
		noter of ICes	30
	3	PROJECT INITIATION	31
		Design and Construction Process	31
		Advances in the Engineering and Construction Process	33
		Private versus Public Projects	33
		Contractual Arrangements	33
		Phases of a Project	36
		Owner's Study	38
		Owner's Needs and Project Objectives	38
		Project Scope Definition	40
		Project Strategy	42
		Selection of Design Firms and Construction Contractors	42
		Partnering	44
		Questions for Chapter 3—Project Initiation	45
		References	45
	4	EARLY ESTIMATES	47
		Importance of Early Estimates	47
		Classification of Early Estimates	47
		Estimating Work Process	49
		Importance of Team Alignment in Preparing Early Estimates	51
		Scope Definition and Early Estimates	52
		Preparing Early Estimates	55
		Organizing to Prepare Estimates	55
		Establishing an Estimate Work Plan	56
		Methods and Techniques	58
		Cost-Capacity Curves	58
		Capacity Ratios Raised to an Exponent	59
		Plant Cost per Unit of Production	60
		Equipment Factored Estimates Computer-Generated Estimates	61
		Estimate Check Lists	62
		Estimate Documentation	63
		Estimate Reviews	63
		Risk Assessment	65
		Risk Analysis	66
		Contingency	67
		Traditional Methods of Assigning Contingency	68
		Percentage of Base Estimate	68
		Expected Net Risk	68 60

	.*	
	Simulation	70
	Assessing Estimate Sensitivity	71
	Assigning Contingency Based on the Quality and Completeness	_
	of the Estimate	72
	Estimate Feed-Back for Continuous Improvement	74
	Questions for Chapter 4—Early Estimates	76
	References	77
5	PROJECT BUDGETING	78
	Project Budgets	78
	Development of Project Estimates for Budgeting	78
	Levels of Accuracy	80
	Owner's Estimate for Budgeting	81
	Economic Feasibility Study	85
	Single Payments	85
	Uniform Payment Series	` 86
	Fundamental Equations of Time Value of Money	87
	Design Budgets	90
	Contractor's Bid	93
	Questions for Chapter 5—Project Budgeting	97
	References	98
6	DEVELOPMENT OF WORK PLAN	99
	Project Manager's Initial Review	99
	Owner's Orientation	100
	Organizational Structures	101
	Work Breakdown Structure	106
	Forming the Project Team	108
	Kick-Off Meeting .	109
	Work Packages	110
	Follow-Up Work	111
	Project Work Plan	113
	Questions for Chapter 6—Development of Work Plan	116
	References	117
7	DESIGN PROPOSALS	118
	Evolution of Projects	118
	Project Execution Plan	119
	Project Definition	119
	Problems in Developing Project Definition	121
	Design Proposals	121
	Engineering Organization	124
	Scope Baseline for Budget	124

	Mini-Drawings	130
	Development of the Design Work Plan	13:
	Engineering Project Controls	13
	Progress Measurement of Engineering Design	134
	Questions for Chapter 7—Design Proposals	13
	References	130
8	PROJECT SCHEDULING	139
	Project Planning and Project Scheduling	139
	Desired Results of Planning	140
	Principles of Planning and Scheduling	141
	Responsibilities of Parties	142
	Planning for Multiple Projects	142
	Techniques for Planning and Scheduling	143
	Network Analysis Systems	144
	Development of CPM Diagram from the WBS	147
	Assigning Realistic Durations	150
	Computer Applications	152
	Schedule Coding System	153
	Cost Distribution	157
	Resource Allocations for Design	163
	Resource Allocations for Construction	164
	Program Evaluation and Review Technique (PERT)	164
	Successor/Predecessor Relationships	172
	Problems Using Successor/Predecessor Relationships	173
	Questions for Chapter 8—Project Scheduling	181
	References	183
9	TRACKING WORK	185
	Control Systems	185
	Linking the WBS and CPM	186
	Coding Systems for Project Reports	188
	Control Schedules for Time and Cost	193
	Relationships Between Time and Work	200
	Integrated Cost/Schedule/Work	205
	Percent Complete Matrix Method	206
	Progress Measurement of Design	211
	Measurement of Construction Work	213
	Project Measurement and Control	216
	Earned-Value System	217
	Monitoring Project Performance	225
	Interpretation of Performance Indices	227
	Analysis Tree of Total Float (TF) and Schedule Performance	
	Index (SPI)	007

	,		CONTENTS	XIII
	Causes of Cost/Schedule Variances			228
	Trend Analysis and Forecasting	€.		229
	Work Status System			233
	Questions for Chapter 9—Tracking Work			236
	References			239
10	DESIGN COORDINATION			240
	Design Work Plan			240
	Producing Contract Documents			241
	Managing Scope Growth During Design			241
	Managing Small Projects			242
	Project Team Meetings			243
	Weekly/Monthly Reports			244
	Drawing and Equipment Index			244
	Distribution of Documents			246
	Authority/Responsibility Check List			247
	Check List of Duties for Design			248
	Team Management			248
	Evaluation of Design Effectiveness			251
	Constructability			253
	Post Design Review			255
	Questions for Chapter 10—Design Coordination			256
	References			256
	•			
11	CONSTRUCTION PHASE			258
	Importance of Construction			258
	Assumptions for Construction Phase			259
	Contract Pricing Formats			260
	Design/Bid/Build Method of Project Delivery			261
	Design/Build Method of Project Delivery			262
	Construction Management Method of Project Delivery			262
	Bridging Project Delivery Method			263
	Fast-Track Projects			264
	Turn-Key Projects			264
	Design Development and Performance Specifications			264
	Key Decisions for Project Delivery	•		264
	Number of Contracts .			265
	Selection Criteria			265
	Contractual Relationship			265
	Terms of Payment			265
	Prospective Bidders and Bidding			266
	Qualification-Based Selection (QBS)			267
	Check List for Bidding			269
	Keys to a Successful Project			270

XIV CONTENTS

	Construction Schedules	271
	Problems with Construction Schedules	273
	Precautions for Construction Submittais	274
	Delivery Dates of Owner-Furnished Equipment or Materials	275
	Scheduling Contractor Procured and Installed Equipment	275
	Contract Schedule Constraints	276
	Sequestering Float	276
	Schedule Updates	277
	Relations with Contractors	277
	Check List of Duties	278
	Quality Control	278
	Dispute Resolutions	281
	Job-Site Safety	282
	Management of Changes	283
	Resource Management	284
	Questions for Chapter 11—Construction Phase	286
	References	286
12	PROJECT CLOSE OUT	288
	System Testing and Start-Up	288
	Final Inspection	289
	Guarantee and Warranties	290
	Lien Releases	290
	Record and As-Built Drawings	290
	Check List of Duties	291
	Disposition of Project Files	291
	Post Project Critique	292
	Owner Feed-Back	292
	Questions for Chapter 12—Project Close Out	292
	References	293
13	PERSONAL MANAGEMENT SKILLS	294
	Challenges and Opportunities	294
	Using New Innovations	294
	Human Aspects	297
	Assignment of Work	299
	Motivation	300
	Decision Making	301
	Time Management	302
	Communications	303
	Presentations	308
	Meetings	307
	Reports and Letters	307

CON	JTF	NTS	XV
\sim	***	1113	^*

	Questions for Chapter 13—Personal Management Skills	309
	References	309
14	TOTAL QUALITY MANAGEMENT	311
	Background	311
:	Customer Satisfaction	314
n-1	Continual Improvement	315
	Management Commitment	318
	Training	319
	Teamwork	320
	Statistical Methods	322
	Cost of Quality	324
	Supplier Involvement	325
	Customer Service	326
-	Implementation	326
	References	328
Appendix A	Example Project	329
Appendix B	List of EJCDC Contract Documents	348
Appendix C	List of AIA Contract Documents	351
Appendix D	List of AGC Contract Documents	354
Appendix E	MasterFormat™—Master List of Section Titles and Numbers	357