CONTENTS

Preface 11

PART I

Creating Value through Operations and Supply Chains 17

1 Introduction to Operations and Supply Chain Management 17

Introduction 18
1.1 Why Study Operations and Supply Chain Management? 19
Operations Management 20
Supply Chain Management 22
1.2 Important Trends 25
Electronic Commerce 26
Increasing Competition and Globalization 26
Relationship Management 26
1.3 Operations and Supply Chain Management and You 27
Professional Organizations 27
Cross-Functional and Interorganizational Linkages 28
1.4 Purpose and Organization of This Book 29
Chapter Summary 30
Key Terms 30
Discussion Questions 31
Problems 31
Case Study 31
References 32

2 Operations and Supply Chain Strategies 34

Introduction 36
2.1 Elements of the Business 36
2.2 Strategy 36
2.3 Operations and Supply Chain Strategies 39
Customer Value 40
Four Performance Dimensions 41
Trade-Offs among Performance Dimensions 43
Order Winners and Order Qualifiers 43
Stages of Alignment with the Business Strategy 44
Core Competencies in Operations and Supply Chains 45
Chapter Summary 47
Key Formula 47
Key Terms 48
Solved Problem 48
Discussion Questions 49
Problems 50
Case Study 51
References 52

PART II

Establishing the Operations Environment 53

3 Process Choice and Layout Decisions in Manufacturing and Services 53

Introduction 54
3.1 Manufacturing Processes 55
Production Lines and Continuous Flow Manufacturing 56
Job Shops 57
Batch Manufacturing 58
Fixed-Position Layout 58
Hybrid Manufacturing Processes 58
Linking Manufacturing Processes across the Supply Chain 59
Selecting a Manufacturing Process 60
The Product-Process Matrix 60
3.2 Product Customization within the Supply Chain 60
Four Levels of Customization 61
The Customization Point 61
3.3 Service Processes 63
Service Packages 64
Service Customization 65
Customer Contact 66
Service Positioning 69
Services within the Supply Chain 70
3.4 Layout Decision Models 71
Line Balancing 71
Assigning Department Locations in Functional Layouts 75
Chapter Summary 78
Key Formulas 79
Key Terms 79
Solved Problem 79
Discussion Questions 82
Problems 82
Case Study 85
References 86

4 Business Processes 87

Introduction 88
4.1 Business Processes 89
Improving Business Processes 89
4.2 Mapping Business Processes 92
Process Maps 92
Swim Lane Process Maps 95
4.3 Managing and Improving Business Processes 97
Measuring Business Process Performance 97
Productivity 97
Efficiency 99
Cycle Time 100

Benchmarking 101
The Six Sigma Methodology 102
Continuous Improvement Tools 103
4.4 Business Process Challenges and the SCOR Model 111
How Standardized Should Processes Be? 111
Business Process Reengineering 112
Coordinating Process Management Efforts across the Supply Chain 112
The SCOR Model 112
Chapter Summary 114
Key Formulas 114
Key Terms 115
Solved Problem 115
Discussion Questions 117
Problems 117
Case Study 119
References 120

5 Managing Quality 121

Introduction 123
5.1 Quality Defined 123
5.2 Total Cost of Quality 126
5.3 Total Quality Management 128
TQM and the Six Sigma Methodology 130
5.4 Statistical Quality Control 131
Process Capability 131
Six Sigma Quality 133
Control Charts 134
Acceptance Sampling 140
Taguchi's Quality Loss Function 142
5.5 Managing Quality across the Supply Chain 143
ISO 9000 Family 143
External Failures in the Supply Chain 144
Chapter Summary 144
Key Formulas 144
Key Terms 146
Using Excel in Quality Management 147
Solved Problem 147
Discussion Questions 148
Problems 149
Case Study 153
References 154

6 Managing Capacity 155

Introduction 156
6.1 Capacity 156
Measures of Capacity 157
Factors That Affect Capacity 158
Supply Chain Considerations 158
6.2 Three Common Capacity Strategies 158
6.3 Methods of Evaluating Capacity Alternatives 160
Cost 160
Demand Considerations 163
Expected Value 163
Decision Trees 164
Break-Even Analysis 166
Learning Curves 167
Other Considerations 170
6.4 Understanding and Analyzing Process Capacity 171
The Theory of Constraints 171
Waiting Line Theory 174
Little's Law 178
Chapter Summary 180
Key Formulas 180
Key Terms 182
Using Excel in Capacity Management 182
Solved Problem 183
Discussion Questions 184
Problems 184
Case Study 188
References 188

6S Advanced Waiting Line Theory and Simulation Modeling 189

Introduction 190
6S.1 Alternative Waiting Lines 190
Assumptions behind Waiting Line Theory 191
Waiting Line Formulas for Three Different Environments 191
6S.1 Simulation Modeling 195
Monte Carlo Simulation 196
Building and Evaluating Simulation Models with SimQuick 198
Supplement Summary 201
Discussion Questions 202
Problems 202
References 202

PART III

Establishing Supply Chain Linkages 203

7 Supply Management 203

Introduction 204
7.1 Why Supply Management Is Critical 205
Global Sourcing 205
Financial Impact 205
Performance Impact 208
7.2 The Strategic Sourcing Process 209
Step 1: Assess Opportunities 209
Step 2: Profile Internally and Externally 210
Step 3: Develop the Sourcing Strategy 213
Step 4: Screen Suppliers and Create Selection Criteria 219
Step 5: Conduct Supplier Selection 220
Step 6: Negotiate and Implement Agreements 222
7.3 The Procure-to-Pay Cycle 224
Ordering 224
Follow-Up and Expediting 224
Receipt and Inspection 224
Settlement and Payment 225
Records Maintenance 225
7.4 Trends in Supply Management 225
Sustainable Supply 225
Supply Chain Disruptions 226

Chapter Summary 227
Key Formulas 227
Key Terms 227
Solved Problem 228
Discussion Questions 229
Problems 229
Case Study 231
References 232

8 Logistics 233

Introduction 235
8.1 Why Logistics is Critical 235
8.2 Logistics Decision Areas 236
Transportation 236
Selecting a Transportation Mode 237
Multimodal Solutions 238
Warehousing 239
Logistics Information Systems 242
Material Handling and Packaging 244
Inventory Management 245
8.3 Logistics Strategy 245
Owning versus Outsourcing 245
Measuring Logistics Performance 247
Landed Costs 248
Reverse Logistics Systems 249
8.4 Logistics Decision Models 250
Weighted Center of Gravity Method 250
Optimization Models 252
The Assignment Problem 252
Chapter Summary 257
Key Formulas 258
Key Terms 258
Solved Problem 259
Discussion Questions 260
Problems 260
Case Study 263
References 264

PART IV

Planning and Controlling Operations and Supply Chains 265

9 Forecasting 265

Introduction 266
9.1 Forecast Types 267
Demand Forecasts 267
Supply Forecasts 267
Price Forecasts 267
9.2 Laws of Forecasting 268
Law 1: Forecasts Are Almost Always Wrong (But They Are Still Useful) 269
Law 2: Forecasts for the Near Term Tend to Be More Accurate 269
Law 3: Forecasts for Groups of Products or Services Tend to Be More Accurate 269
Law 4: Forecasts Are No Substitute for Calculated Values 269
9.3 Selecting a Forecasting Method 269
9.4 Qualitative Forecasting Methods 270
9.5 Time Series Forecasting Models 271
Last Period 272
Moving Average 273
Weighted Moving Average 275
Exponential Smoothing 275
Adjusted Exponential Smoothing 278
Linear Regression 279
Seasonal Adjustments 283
9.6 Causal Forecasting Models 287
Linear Regression 287
Multiple Regression 289
9.7 Measures of Forecast Accuracy 292
9.8 Computer-Based Forecasting Packages 294
9.9 Collaborative Planning, Forecasting, and Replenishment (CPFR) 294
Chapter Summary 299
Key Formulas 299
Key Terms 301
Solved Problem 301
Discussion Questions 304
Problems 304
Case Study 308
References 309

10 Sales and Operations Planning (Aggregate Planning) 310

Introduction 311
10.1 S&OP in the Planning Cycle 311
10.2 Major Approaches to S&OP 313
Top-Down Planning 314
Level, Chase, and Mixed Production Plans 316
Bottom-Up Planning 320
Cash Flow Analysis 322
10.3 Organizing for and Implementing S&OP 324
Choosing between Alternative Plans 324
Rolling Planning Horizons 325
Implementing S&OP in an Organization 326
10.4 Services Considerations 327
Making Sales Match Capacity 327
Making Capacity Match Sales 328
10.5 Linking S&OP throughout the Supply Chain 329
10.6 Applying Optimization Modeling to S&OP 330
Chapter Summary 333
Key Formulas 333
Key Terms 334
Solved Problem 334
Discussion Questions 335
Problems 335
Case Study 340
References 341

11 Managing Inventory throughout the Supply Chain 342

Introduction 344
11.1 The Role of Inventory 345
Inventory Types 345
Inventory Drivers 347

Independent versus Dependent Demand 349
11.2 Periodic Review Systems 349
Restocking Levels 350
11.3 Continuous Review Systems 351
The Economic Order Quantity (*EOQ*) 352
Reorder Points and Safety Stock 354
Quantity Discounts 356
11.4 Single-Period Inventory Systems 358
Target Service Level 359
Target Stocking Point 360
11.5 Inventory in the Supply Chain 362
The Bullwhip Effect 362
Inventory Positioning 363
Transportation, Packaging, and Material Handling Considerations 364
Chapter Summary 365
Key Formulas 366
Key Terms 367
Using Excel in Inventory Management 367
Solved Problems 368
Discussion Questions 368
Problems 369
Case Study 372
References 373

12 Managing Production across the Supply Chain 374

Introduction 375
12.1 Master Scheduling 376
The Master Schedule Record 377
Using the Master Schedule 382
12.2 Material Requirements Planning 383
The MRP Record 385
The Advantages of MRP 390
Special Considerations in MRP 390
12.3 Production Activity Control and Vendor Order Management Systems 392
Job Sequencing 392
Monitoring and Tracking Technologies 393
12.4 Synchronizing Planning and Control across the Supply Chain 394
Distribution Requirements Planning 394
Chapter Summary 397
Key Formulas 399
Key Terms 399
Solved Problem 400
Discussion Questions 400
Problems 401
Case Study 408
References 408

12S Supply Chain Information Systems 409

Introduction 410
12S.1 Understanding Supply Chain Information Needs 410
Differences across Organizational Levels 410
Direction of Linkages 412
12S.2 Supply Chain Information Systems 412
12S.3 Trends to Watch 414
BPM Tools 415
Cloud Computing 415
Supplement Summary 416
Key Terms 416
Discussion Questions 416
References 417

13 JIT/Lean Production 418

Introduction 420
13.1 The Lean Perspective on Waste 421
13.2 The Lean Perspective on Inventory 422
13.3 Recent Developments in Lean Thinking 423
13.4 Kanban Systems 424
Controlling Inventory Levels Using Kanbans 429
Synchronizing the Supply Chain Using Kanbans 431
Using MRP and Kanban Together 432
Chapter Summary 433
Key Formula 433
Key Terms 434
Solved Problem 434
Discussion Questions 435
Problems 435
Case Study 436
References 438

PART V

Project Management and Product/Service Development 439

14 Managing Projects 439

Introduction 440
14.1 The Growing Importance of Project Management 441
14.2 Project Phases 442
Concept Phase 442
Project Definition Phase 442
Planning Phase 443
Performance Phase 443
Postcompletion Phase 443
14.3 Project Management Tools 444
Gantt Charts 444
Network Diagrams 446
Constructing a Network Diagram 446
Crashing a Project 450
14.4 Project Management Software 452
14.5 PMI and the *Project Management Body of Knowledge* (PMBOK®) 455
Chapter Summary 455
Key Formulas 455
Key Terms 456
Solved Problem 456
Discussion Questions 457

Problems 458
Case Study 460
References 460

15 Developing Products and Services 461

Introduction 463
Product Design and the Development Process 463
Four Reasons for Developing New Products and Services 463
15.1 Operations and Supply Chain Perspectives on Design 464
Repeatability, Testability, and Serviceability 465
Production Volumes 465
Product Costs 466
Match with Existing Capabilities 466
15.2 The Development Process 467
A Model of the Development Process 467
Sequential Development versus Concurrent Engineering 469
15.3 Organizational Roles in Product and Service Development 469
Engineering 470
Marketing 470
Accounting 470
Finance 470
Designers 470
Purchasing 471
Suppliers 471
Who Leads? 472
15.4 Approaches to Improving Product and Service Designs 472
DMADV (Define–Measure–Analyze–Design–Verify) 472
Quality Function Deployment (QFD) 473
Computer-Aided Design (CAD) and Computer Aided Design/Computer-Aided Manufacturing (CAD/CAM) 474
The "Design for …" Approaches 474
Target Costing and Value Analysis 475
Chapter Summary 476
Key Terms 476
Discussion Questions 477
Case Study 477
References 478

Appendices 479

Glossary 485

Index 497