CONTENTS

Preface 11

PART I

Creating Value through Operations and Supply Chains 21

1 Introduction to Operations and Supply Chain Management 21

Introduction 22
1.1 Why Study Operations and Supply Chain Management? 23
Operations Management 24
Supply Chain Management 26
1.2 Important Trends 29
Agility 30
Information Technologies 30
People 30
1.3 Operations and Supply Chain Management and You 31
Professional Organizations 32
Cross-Functional and Interorganizational Linkages 33
1.4 Employability Skills 34
Critical Thinking 34
Collaboration 35
Knowledge Application and Analysis 35
Information Technology Application and Computing Skills 35
1.5 Purpose and Organization of This Book 35
Chapter Summary 37
Key Terms 37
Discussion Questions 37
Problems 37
Case Study 38
References 39

2 Operations and Supply Chain Strategies 40

Introduction 42
2.1 *Elements of the Business* 42
2.2 Strategy 42
2.3 Operations and Supply Chain Strategies 45
Customer Value 46
Four Performance Dimensions 47
Trade-Offs among Performance Dimensions 49
Order Winners and Order Qualifiers 49
Stages of Alignment with the Business Strategy 50
Core Competencies in Operations and Supply Chains 52
Chapter Summary 53
Key Formula 54
Key Terms 54
Solved Problem 54
Discussion Questions 56
Problems 56
Case Study 58
References 59

PART II

Establishing the Operations Environment 60

3 Process Choice and Layout Decisions in Manufacturing and Services 60

Introduction 61
3.1 Manufacturing Processes 62
Production Lines and Continuous Flow Manufacturing 63
Job Shops 64
Batch Manufacturing 65
Fixed-Position Layout 65
Hybrid Manufacturing Processes 65
3D Printing 66
Linking Manufacturing Processes across the Supply Chain 67
Selecting a Manufacturing Process 67
The Product-Process Matrix 67
3.2 Product Customization within the Supply Chain 68
Four Levels of Customization 68
The Customization Point 68
3.3 Service Processes 71
Service Packages 72
Service Customization 72
Customer Contact 73
Service Positioning 76
Services within the Supply Chain 77
3.4 Layout Decision Models 78
Line Balancing 79
Assigning Department Locations in Functional Layouts 82
Chapter Summary 86
Key Formulas 86
Key Terms 87
Solved Problem 87
Discussion Questions 89
Problems 90
Case Study 92
References 93

4 Business Processes 94

Introduction 95
4.1 Business Processes 96
Improving Business Processes 96
4.2 Mapping Business Processes 99
Process Maps 99
Swim Lane Process Maps 102

4.3 Managing and Improving Business Processes 104
Measuring Business Process Performance 104
Productivity 104
Efficiency 106
Cycle Time 107
Benchmarking 108
The Six Sigma Methodology 109
Continuous Improvement Tools 111
4.4 Business Process Challenges and the SCOR Model 118
How Standardized Should Processes Be? 118
Business Process Reengineering (BPR) 119
Coordinating Process Management Efforts across the Supply Chain 119
The SCOR Model 119
Chapter Summary 121
Key Formulas 121
Key Terms 122
Solved Problem 122
Discussion Questions 124
Problems 124
Case Study 126
References 127

5 Managing Quality 128

Introduction 130
5.1 Quality Defined 130
5.2 Total Cost of Quality 133
5.3 Total Quality Management 134
TQM and the Six Sigma Methodology 137
5.4 Statistical Quality Control 137
Process Capability 137
Six Sigma Quality 140
Control Charts 141
Acceptance Sampling 147
Taguchi's Quality Loss Function 149
5.5 Managing Quality across the Supply Chain 150
ISO 9000 Family 150
External Failures in the Supply Chain 151
Chapter Summary 151
Key Formulas 151
Key Terms 153
Using Excel in Quality Management 154
Solved Problem 154
Discussion Questions 155
Problems 156
Case Study 160
References 161

6 Managing Capacity 162

Introduction 163
6.1 Capacity 164
Measures of Capacity 164
Factors That Affect Capacity 165
Supply Chain Considerations 165
6.2 Three Common Capacity Strategies 165
6.3 Methods of Evaluating Capacity Alternatives 166
Cost 166
Demand Considerations 169
Expected Value 169
Decision Trees 170
Break-Even Analysis 172
Learning Curves 173
Other Considerations 176
6.4 Understanding and Analyzing Process Capacity 177
The Theory of Constraints 177
Waiting Line Theory 180
Little's Law 184
Chapter Summary 186
Key Formulas 186
Key Terms 188
Using Excel in Capacity Management 188
Solved Problem 189
Discussion Questions 190
Problems 190
Case Study 194
References 194

6S Advanced Waiting Line Theory and Simulation Modeling 195

Introduction 196
6S.1 Alternative Waiting Lines 196
Assumptions behind Waiting Line Theory 197
Waiting Line Formulas for Three Different Environments 197
6S.2 Simulation Modeling 201
Monte Carlo Simulation 202
Building and Evaluating Simulation Models with SimQuick 204
Supplement Summary 207
Discussion Questions 208
Problems 208
References 208

PART III

Establishing Supply Chain Linkages 209

7 Supply Management 209

Introduction 210
7.1 Why Supply Management Is Critical 211
Global Sourcing 211
Financial Impact 212
Performance Impact 214
7.2 The Strategic Sourcing Process 215
Step 1: Assess Opportunities 215
Step 2: Profile Internally and Externally 217
Step 3: Develop the Sourcing Strategy 220
Step 4: Screen Suppliers and Create Selection Criteria 227
Step 5: Conduct Supplier Selection 228
Step 6: Negotiate and Implement Agreements 230
7.3 The Procure-to-Pay Cycle 232
Ordering 232
Follow-Up and Expediting 232
Receipt and Inspection 232
Settlement and Payment 233
Records Maintenance 233

7.4 Trends in Supply Management 233
Sustainable Supply 233
Supply Chain Disruptions 234
Chapter Summary 235
Key Formulas 235
Key Terms 235
Solved Problem 236
Discussion Questions 237
Problems 237
Case Study 239
References 240

8 Logistics 241

Introduction 243
8.1 Why Logistics Is Critical 243
8.2 Logistics Decision Areas 245
Transportation 245
Selecting a Transportation Mode 246
Multimodal Solutions 247
Warehousing 248
Logistics Information Systems 251
Material Handling and Packaging 253
Inventory Management 254
8.3 Logistics Strategy 254
Owning versus Outsourcing 255
Measuring Logistics Performance 256
Landed Costs 257
Reverse Logistics Systems 258
8.4 Logistics Decision Models 259
Weighted Center of Gravity Method 259
Optimization Models 261
The Assignment Problem 261
Chapter Summary 266
Key Formulas 267
Key Terms 267
Solved Problem 268
Discussion Questions 269
Problems 270
Case Study 272
References 273

PART IV

Planning and Controlling Operations and Supply Chains 274

9 Forecasting 274

Introduction 275
9.1 Forecast Types 276
Demand Forecasts 276
Supply Forecasts 276
Price Forecasts 276
9.2 Laws of Forecasting 277
Law 1: Forecasts Are Almost Always Wrong (But They Are Still Useful) 278
Law 2: Forecasts for the Near Term Tend to Be More Accurate 278
Law 3: Forecasts for Groups of Products or Services Tend to Be More Accurate 278
Law 4: Forecasts Are No Substitute for Calculated Values 278
9.3 Selecting a Forecasting Method 278
9.4 Qualitative Forecasting Methods 279
9.5 Time Series Forecasting Models 280
Last Period 281
Moving Average 282
Weighted Moving Average 284
Exponential Smoothing 284
Adjusted Exponential Smoothing 287
Linear Regression 288
Seasonal Adjustments 292
9.6 Causal Forecasting Models 296
Linear Regression 296
Multiple Regression 298
9.7 Measures of Forecast Accuracy 301
9.8 Computer-Based Forecasting Packages 303
9.9 Collaborative Planning, Forecasting, and Replenishment (CPFR) 303
Chapter Summary 308
Key Formulas 308
Key Terms 310
Solved Problem 310
Discussion Questions 313
Problems 313
Case Study 317
References 318

10 Sales and Operations Planning (Aggregate Planning) 319

Introduction 320
10.1 S&OP in the Planning Cycle 320
10.2 Major Approaches to S&OP 322
Top-Down Planning 323
Level, Chase, and Mixed Production Plans 325
Bottom-Up Planning 329
Cash Flow Analysis 331
10.3 Organizing for and Implementing S&OP 333
Choosing between Alternative Plans 333
Rolling Planning Horizons 334
Implementing S&OP in an Organization 335
10.4 Services Considerations 336
Making Sales Match Capacity 336
Making Capacity Match Sales 338
10.5 Linking S&OP throughout the Supply Chain 339
10.6 Applying Optimization Modeling to S&OP 339
Chapter Summary 343
Key Formulas 343
Key Terms 343
Solved Problem 343
Discussion Questions 345
Problems 345
Case Study 349
References 350

11 Managing Inventory throughout the Supply Chain 351

Introduction 353
11.1 The Role of Inventory 354
Inventory Types 354
Inventory Drivers 356
Independent versus Dependent Demand Inventory 358
11.2 Periodic Review Systems 358
Restocking Levels 359
11.3 Continuous Review Systems 360
The Economic Order Quantity (EOQ) 361
Reorder Points and Safety Stock 363
Quantity Discounts 366
11.4 Single-Period Inventory Systems 368
Target Service Level 368
Target Stocking Point 370
11.5 Inventory in the Supply Chain 372
The Bullwhip Effect 372
Inventory Positioning 373
Transportation, Packaging, and Material Handling Considerations 374
Chapter Summary 375
Key Formulas 375
Key Terms 376
Using Excel in Inventory Management 376
Solved Problem 377
Discussion Questions 378
Problems 378
Case Study 382
References 383

12 Managing Production across the Supply Chain 384

Introduction 385
12.1 Master Scheduling 386
The Master Schedule Record 387
Using the Master Schedule 392
12.2 Material Requirements Planning 393
The MRP Record 395
The Advantages of MRP 400
Special Considerations in MRP 400
12.3 Production Activity Control and Vendor Order Management Systems 402
Job Sequencing 402
Monitoring and Tracking Technologies 403
12.4 Synchronizing Planning and Control across the Supply Chain 404
Distribution Requirements Planning 404
Chapter Summary 407
Key Formulas 409
Key Terms 409
Solved Problem 410
Discussion Questions 410
Problems 411
Case Study 418
References 418

12S Supply Chain Information Systems 419

Introduction 420
12S.1 Understanding Supply Chain Information Needs 421
Differences across Organizational Levels 421
Direction of Linkages 422
12S.2 Supply Chain Information Systems 422
12S.3 Trends to Watch 425
BPM Tools 425
Cloud Computing 425
Internet of Things (IoT) 426
Supplement Summary 426
Key Terms 427
Discussion Questions 427
References 427

13 JIT/Lean Production 428

Introduction 430
13.1 The Lean Perspective on Waste 431
13.2 The Lean Perspective on Inventory 432
13.3 Recent Developments in Lean Thinking 433
13.4 Kanban Systems 434
Controlling Inventory Levels Using Kanbans 439
Synchronizing the Supply Chain Using Kanbans 441
Using MRP and Kanban Together 442
Chapter Summary 443
Key Formula 443
Key Terms 444
Solved Problem 444
Discussion Questions 445
Problems 445
Case Study 446
References 448

PART V

Project Management and Product/Service Development 449

14 Managing Projects 449

Introduction 450
14.1 The Growing Importance of Project Management 451
14.2 Project Phases 452
Concept Phase 452
Project Definition Phase 452
Planning Phase 453
Performance Phase 453
Postcompletion Phase 453
14.3 Project Management Tools 454
Gantt Charts 454
Network Diagrams 456
Constructing a Network Diagram 456
Crashing a Project 460

14.4 Project Management Software 462
14.5 PMI and the *Project Management Body of Knowledge* (PMBOK®) 465
Chapter Summary 465
Key Formulas 465
Key Terms 466
Solved Problem 466
Discussion Questions 467
Problems 468
Case Study 470
References 470

15 Developing Products and Services 471

Introduction 473
Product Design and the Development Process 473
Four Reasons for Developing New Products and Services 473
15.1 Operations and Supply Chain Perspectives on Design 474
Repeatability, Testability, and Serviceability 475
Production Volumes 475
Product Costs 475
Match with Existing Capabilities 476
15.2 The Development Process 477
A Model of the Development Process 477
Sequential Development versus Concurrent Engineering 479
15.3 Organizational Roles in Product and Service Development 480
Engineering 480
Marketing 480
Accounting 480
Finance 480
Designers 481
Purchasing 481
Suppliers 482
Who Leads? 482
15.4 Approaches to Improving Product and Service Designs 482
DMADV (Define–Measure–Analyze–Design–Verify) 482
Quality Function Deployment (QFD) 483
Computer-Aided Design (CAD) and Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) 484
The "Design for . . . " Approaches 484
Target Costing and Value Analysis 486
Chapter Summary 486
Key Terms 487
Discussion Questions 487
Case Study 487
References 488

Appendices 489

Glossary 495

Index 507