



#### PART 1 BASIC CONCEPTS OF OM AND VALUE CHAINS

- 1 Operations Management and Value Chains 1
- 2 Measuring Performance in Operations and Value Chains 31
- **3** Operations Strategy 59
- 4 Technology and Operations Management 83

#### PART 2 DESIGNING OPERATIONS AND SUPPLY CHAINS

- **5** Goods and Service Design 106
- 6 Supply Chain Design 140
- 7 Process Selection, Design, and Improvement 174
- 8 Facility and Work Design 203

#### PART 3 MANAGING OPERATIONS AND SUPPLY CHAINS

- 9 Forecasting and Demand Planning 234
- **10** Capacity Management 262
- 11 Process Analysis and Resource Utilization 287
- 12 Managing Inventories in Supply Chains 330
- 13 Supply Chain Management and Logistics 374
- 14 Resource Management 407
- **15** Operations Scheduling and Sequencing 451
- 16 Quality Management 488
- 17 Quality Control and SPC 521
- 18 Lean Operating Systems 546
- **19** Project Management 572

#### **SUPPLEMENTS**

- A Probability and Statistics 607
- **B** Decision Analysis 619
- C Break-Even Analysis 626
- **D** Linear Optimization 631
- E The Transportation and Assignment Problems 638
- F Queuing Models 645
- **G** Simulation 655

**Appendix A** Areas for the Cumulative Standard Normal Distribution 661

**Appendix B** Factors for  $\bar{x}$ - and R-Control Charts 664

**Endnotes** 665

Glossary 669

Index 677

### **CONTENTS**

#### Part 1

# BASIC CONCEPTS OF OM AND VALUE CHAINS

## Operations Management and Value Chains 1

- 1-1 Operations Management 2
- 1-2 OM in the Workplace 3
- 1-3 Understanding Goods and Services 5
- 1-4 The Concept of Value 8
- 1-5 Customer Benefit Packages 8
- 1-6 Value Chains 11
- 1-7 Value Chain Frameworks 13
- 1-8 OM: A History of Change and Challenge 20
- 1-9 Current and Future Challenges 24

**Chapter Case:** Mickey Mouse: To Talk or Not? 29 **Chapter Case:** Zappos, A Subsidiary of Amazon 29

Integrative Case: Hudson Jewelers 30

# Measuring Performance in Operations and Value Chains 31

- 2-1 Types of Performance Measures 32
- 2-2 Analytics in Operations Management 38
- 2-3 Designing Measurement Systems in Operations 43
- 2-4 Models of Organizational Performance 44

Chapter Case: Rapido Burrito 56

Chapter Case: Greyhound Bank: Credit Card Division 57

Integrative Case: Hudson Jewelers 58

### **3** Operations Strategy 59

- 3-1 Gaining Competitive Advantage 60
- 3-2 Understanding Customer Wants and Needs 60

- 3-3 Evaluating Goods and Services 61
- 3-4 Competitive Priorities 63
- 3-5 OM and Strategic Planning 66
- 3-6 A Framework for Operations Strategy 71

**Chapter Case:** The Greater Cincinnati Chamber of Commerce 80

**Chanter Case:** Sustainable Lawn Ca

**Chapter Case:** Sustainable Lawn Care 81 **Integrative Case:** Hudson Jewelers 82

#### 4 Technology and Operations Management 83

- 4-1 Understanding Technology in Operations 84
- 4-2 Technology in Value Chains 88
- 4-3 Benefits and Challenges of Technology 90
- 4-4 Technology Decisions and Implementation 91

Chapter Case: RoboJet Car Wash 102

**Chapter Case:** Bracket International—The

RFID Decision 104

**Integrative Case:** Hudson Jewelers 105

#### Part 2

# DESIGNING OPERATIONS AND SUPPLY CHAINS

### **5** Goods and Service Design 106

- 5-1 Designing Goods and Services 107
- 5-2 Customer-Focused Design 110
- 5-3 Designing Manufactured Goods 112
- 5-4 Service-Delivery System Design 121
- 5-5 Service-Encounter Design 123
- 5-6 An Integrative Case Study of LensCrafters 126

**Chapter Case:** Gulf Coast Bank: Service Guarantees 136

**Chapter Case:** Tom's Auto Service 137 **Integrative Case:** Hudson Jewelers 139

iV Contents

### **6** Supply Chain Design 140

- 6-1 Global Supply Chains 141
- 6-2 Supply Chain Design Trade-Offs 145
- 6-3 A Global Supply Chain Example: Inditex/Zara 153
- 6-4 Location Decisions 156
- 6-5 Supply Chain Optimization 162

**Chapter Case:** Bookmaster: Value

Chain Design 170

**Chapter Case:** Boston Red Sox Spring Training

Decision 171

**Integrative Case:** Hudson Jewelers 173

# 7 Process Selection, Design, and Improvement 174

- 7-1 Process Choice Decisions 175
- 7-2 The Product-Process Matrix 179
- 7-3 The Service-Positioning Matrix 180
- 7-4 Process Design 183
- 7-5 Mistake-Proofing Processes 189
- 7-6 Process Improvement 192

**Chapter Case:** Custom Drapes, Inc. 199 **Chapter Case:** Hickory Medical Clinic 200 **Integrative Case:** Hudson Jewelers 202

### Facility and Work Design 203

- 8-1 Facility Layout 204
- 8-2 Designing Product Layouts 208
- 8-3 Designing Process Layouts 215
- 8-4 Work Measurement 216
- 8-5 Workplace and Job Design 219

Chapter Case: Employee 842 versus

The State 229

Chapter Case: BankUSA: Cash Movement 231

Integrative Case: Hudson Jewelers 233

#### Part 3

# MANAGING OPERATIONS AND SUPPLY CHAINS

# Forecasting and Demand Planning 234

- 9-1 Forecasting and Demand Planning 235
- 9-2 Basic Concepts in Forecasting 237
- 9-3 Statistical Forecasting Models 241
- 9-4 Regression as a Forecasting Approach 246
- 9-5 Judgmental Forecasting 250
- 9-6 Forecasting in Practice 251

Chapter Case: United Dairies, Inc. 259

Chapter Case: BankUSA: Forecasting Help Desk

Demand by Day 260

Integrative Case: Hudson Jewelers 261

### 10 Capacity Management 262

- 10-1 Understanding Capacity 263
- 10-2 Capacity Measurement 265
- 10-3 Long-Term Capacity Strategies 270
- 10-4 Short-Term Capacity Management 273
- 10-5 Learning Curves and Capacity Requirements 276

Chapter Case: Appleton Pulp and Paper Mill 284

Chapter Case: David Christopher, Orthopedic

Surgeon 285

**Integrative Case:** Hudson Jewelers 286

## 11 Process Analysis and Resource Utilization 287

- 11-1 Resource Utilization 288
- 11-2 Process Throughput and Bottlenecks 290

1	1-3	Little's Law	296

- 11-4 Managing Waiting Lines 299
- 11-5 Simulation Models for AnalyzingQueueing Processes 306
- 11-6 The Theory of Constraints 310

Chapter Case: The University Rare Book Library

Process 325

**Chapter Case:** Bourbon County Court 327 **Integrative Case:** Hudson Jewelers 329

# 12 Managing Inventories in Supply Chains 330

- 12-1 Understanding Inventory 331
- 12-2 Inventory Characteristics 335
- 12-3 ABC Inventory Analysis 337
- 12-4 Managing Fixed-Quantity Inventory Systems 340
- 12-5 Managing Fixed-Period Inventory Systems 350
- 12-6 Single-Period Inventory Model 353
- 12-7 Simulation Modeling of Inventory Systems 355

Chapter Case: Margate Hospital 370
Chapter Case: Hardy Hospital 371
Integrative Case: Hudson Jewelers 373

## 13 Supply Chain Management and Logistics 374

- 13-1 Managing Supply Chains 375
- 13-2 Logistics 379
- 13-3 Risk Management in Supply Chains 383
- 13-4 Supply Chains in E-Commerce 386
- 13-5 Measuring Supply Chain Performance 387
- 13-6 Sustainability in Supply Chains 394

Chapter Case: LCC Medical Manufacturing, Inc. 404

Chapter Case: J&L Packaging, Inc.: Cash-to-Cash

Conversion Cycle 405

**Integrative Case:** Hudson Jewelers 406

### **14** Resource Management 407

- 14-1 Resource Planning Framework for Goods and Services 408
- 14-2 Aggregate Planning Options 412
- 14-3 Strategies for Aggregate Production Planning 414
- 14-4 Using Optimization Models for Resource Management 422
- 14-5 Disaggregation in Manufacturing 427
- 14-6 Capacity Requirements Planning 437

Chapter Case: Rocker Industries (A) 447
 Chapter Case: Rocker Industries (B) 448
 Chapter Case: Blue Note Mortgage 449
 Integrative Case: Hudson Jewelers 450

# 15 Operations Scheduling and Sequencing 451

- 15-1 Understanding Scheduling and Sequencing 452
- 15-2 Scheduling Applications and Approaches 453
- 15-3 Sequencing 462
- 15-4 Dispatching Rules for Job Shop Scheduling 468
- 15-5 Two-Resource Sequencing Problem 470
- 15-6 Schedule Monitoring and Control 472
- 15-7 Vehicle Routing and Scheduling 473

Chapter Case: Luke's Balloon Shop 483

Chapter Case: Midwest Frequent Flyer Call Center 484

Integrative Case: Hudson Jewelers 487

### 16 Quality Management 488

- 16-1 Understanding Quality 489
- 16-2 Influential Leaders in Modern Quality Management 492
- 16-3 The Gap Model 494
- 16-4 ISO 9000 495
- 16-5 Six Sigma 496

16-6 Cost-of-Quality Measurement 501 19-4 Uncertainty in Project Management 589 16-7 The "Seven QC Tools" 503 Chapter Case: University Medical Center 602 16-8 Other Quality Improvement Strategies 508 Chapter Case: Alternative Water Supply 603 Chapter Case: Bonnie Blaine, Director of Hospital Integrative Case: Hudson Jewelers 605 Operations 515 Chapter Case: Sunshine Enterprises 518 **Supplements** Integrative Case: Hudson Jewelers 520 Quality Control and SPC f A Probability and Statistics 607 17-1 Quality Control Systems 522 Descriptive Statistics 607 17-2 Variation and Statistical Process Control 524 Spreadsheet Template for Statistical Analysis 608 17-3 Constructing Control Charts 527 Excel Data Analysis Tools 610 17-4 Practical Issues in SPC Implementation 534 Sampling and Sample Size 610 17-5 Process Capability 535 Probability 611 Chapter Case: Eckhardt Hospital 543 Useful Probability Distributions 614 Chapter Case: Goodman Tire and Rubber Regression and Correlation 617 Company 544 **Integrative Case:** Hudson Jewelers 545 B Decision Analysis 18 Lean Operating Systems Selecting Decision Alternatives 621 18-1 Principles of Lean Operating Systems 547 Break-Even Analysis 626 18-2 Lean Tools and Approaches 549 Profitability Analysis 626 18-3 Lean Six Sigma 554 Outsourcing Decisions 627 18-4 Lean Manufacturing and Service Tours 554 Technology Choice Decisions 628 18-5 Just-in-Time Systems 557 Excel Break-Even Template 629 18-6 Comparing Six Sigma, Lean, and the Theory of Constraints 562 Chapter Case: Kempfer Furniture, Inc. 569 Linear Optimization Chapter Case: Community Medical Associates 570 Developing Linear Optimization Models 631 Integrative Case: Hudson Jewelers 571 Solving Linear Optimization Models with Excel Solver 634 **19** Project Management 572 The Transportation and 19-1 The Scope of Project Management 574 Assignment Problems 638 19-2 Techniques for Planning, Scheduling, and Controlling Projects 576 Modeling the Transportation Problem 638 19-3 Time/Cost Trade-Offs 585 Modeling the Assignment Problem 642

## Queuing Models 645

Queuing Systems 645 Multiple Server Queuing Model 652

G Simulation 655

Using Probability Distributions in Simulation 656

**Appendix A** Areas for the Cumulative Standard Normal Distribution 661

**Appendix B** Factors for  $\bar{x}$ - and R-Control Charts 664

**Endnotes** 665

**Glossary** 669

Index 677