

SUPPLY CHAIN MANAGEMENT

STRATEGY, PLANNING, AND OPERATION

SECOND EDITION

SUNIL CHOPRA · PETER MEINDL

Contents

Preface xv

PART I: BUILDING A STRATEGIC FRAMEWORK TO ANALYZE SUPPLY CHAINS 1

CHAPTER 1 Understanding the Supply Chain 3

- 1.1 What Is a Supply Chain? 4
- 1.2 Decision Phases in a Supply Chain 7
- 1.3 Process View of a Supply Chain 8
- 1.4 The Importance of Supply Chain Flows 18
- 1.5 Examples of Supply Chains 20
- 1.6 Summary of Learning Objectives 25
- Discussion Questions 26
- Bibliography 26

CHAPTER 2 Supply Chain Performance: Achieving Strategic Fit and Scope 27

- 2.1 Competitive and Supply Chain Strategies 27
- 2.2 Achieving Strategic Fit 29
- 2.3 Expanding Strategic Scope 44
- 2.4 Summary of Learning Objectives 49
- Discussion Questions 49
- Bibliography 50

CHAPTER 3 Supply Chain Drivers and Obstacles 51

- 3.1 Drivers of Supply Chain Performance 51
- 3.2 A Framework for Structuring Drivers 53
- 3.3 Facilities 54
- 3.4 Inventory 56
- 3.5 Transportation 59
- 3.6 Information 61

3.7	Obstacles to Achieving Strategic Fit	64
3.8	Summary of Learning Objectives	66
	Discussion Questions	67
	Bibliography	67

PART II: DESIGNING THE SUPPLY CHAIN NETWORK 69

CHAPTER 4	Designing the Distribution Network in a Supply Chain	71
4.1	The Role of Distribution in the Supply Chain	72
4.2	Factors Influencing Distribution Network Design	73
4.3	Design Options for a Distribution Network	77
4.4	The Value of Distributors in the Supply Chain	92
4.5	Distribution Networks in Practice	94
4.6	Summary of Learning Objectives	96
	Discussion Questions	97
	Bibliography	97
CHAPTER 5	Network Design in the Supply Chain	98
5.1	The Role of Network Design in the Supply Chain	99
5.2	Factors Influencing Network Design Decisions	100
5.3	A Framework for Network Design Decisions	107
5.4	Models for Facility Location and Capacity Allocation	109
5.5	Making Network Design Decisions in Practice	128
5.6	Summary of Learning Objectives	130
	Discussion Questions	130
	Exercises	131
	Bibliography	133
	Case Study: Managing Growth at SportStuff.com	134
CHAPTER 6	Network Design in an Uncertain Environment	136
6.1	The Impact of Uncertainty on Network Design	137
6.2	Discounted Cash Flow Analysis	137
6.3	Representations of Uncertainty	139
6.4	Evaluating Network Design Decisions Using Decision Trees	141
6.5	AM Tires: Evaluation of Supply Chain Design Decisions Under Uncertainty	150
6.6	Making Supply Chain Decisions Under Uncertainty in Practice	164
6.7	Summary of Learning Objectives	165
	Discussion Questions	165

Exercises	166
Bibliography	168

PART III: PLANNING DEMAND AND SUPPLY IN A SUPPLY CHAIN 169

CHAPTER 7 Demand Forecasting in a Supply Chain	171
7.1 The Role of Forecasting in a Supply Chain	172
7.2 Characteristics of Forecasts	173
7.3 Components of a Forecast and Forecasting Methods	174
7.4 Basic Approach to Demand Forecasting	176
7.5 Time Series Forecasting Methods	178
7.6 Measures of Forecast Error	190
7.7 Forecasting Demand at Tahoe Salt	192
7.8 Forecasting in Practice	199
7.9 Summary of Learning Objectives	199
Discussion Questions	200
Exercises	201
Bibliography	202
Case Study: Specialty Packaging Corporation, Part A	203
CHAPTER 8 Aggregate Planning in the Supply Chain	205
8.1 The Role of Aggregate Planning in the Supply Chain	206
8.2 The Aggregate Planning Problem	208
8.3 Aggregate Planning Strategies	209
8.4 Aggregate Planning Using Linear Programming	210
8.5 Aggregate Planning in Excel	219
8.6 Implementing Aggregate Planning in Practice	222
8.7 Summary of Learning Objectives	223
Discussion Questions	223
Case Study: Specialty Packaging Corporation, Part B	225
CHAPTER 9 Planning Supply and Demand in the Supply Chain: Managing Predictable Variability	228
9.1 Responding to Predictable Variability in the Supply Chain	229
9.2 Managing Supply	230
9.3 Managing Demand	233
9.4 Implementing Solutions to Predictable Variability in Practice	241
9.5 Summary of Learning Objectives	242
Discussion Questions	242

Bibliography 243
Case Study: Mintendo Game Girl 244

**PART IV: PLANNING AND MANAGING INVENTORIES
IN A SUPPLY CHAIN 247**

**CHAPTER 10 Managing Economies of Scale in the Supply Chain:
Cycle Inventory 249**

10.1 The Role of Cycle Inventory in the Supply Chain 250
10.2 Economies of Scale to Exploit Fixed Costs 253
10.3 Economies of Scale to Exploit Quantity Discounts 265
10.4 Short-Term Discounting: Trade Promotions 278
10.5 Managing Multi-Echelon Cycle Inventory 283
10.6 Estimating Cycle Inventory Related Costs in Practice 287
10.7 Summary of Learning Objectives 290
Discussion Questions 291
Exercises 291
Bibliography 292
Case Study: Delivery Strategy at MoonChem 293
Appendix 10A: Economic Order Quantity (EOQ) 295

**CHAPTER 11 Managing Uncertainty in the Supply Chain:
Safety Inventory 296**

11.1 The Role of Safety Inventory in the Supply Chain 297
11.2 Determining Appropriate Level of Safety Inventory 298
11.3 Impact of Supply Uncertainty on Safety Inventory 311
11.4 Impact of Aggregation on Safety Inventory 313
11.5 Impact of Replenishment Policies on Safety Inventory 325
11.6 Managing Safety Inventory in a Multi-Echelon
Supply Chain 329
11.7 Estimating and Managing Safety Inventory in Practice 330
11.8 Summary of Learning Objectives 331
Discussion Questions 332
Exercises 332
Bibliography 334
Case Study: Managing Inventories at ALKO Inc. 335
Appendix 11A: The Normal Distribution 338
Appendix 11B: The Normal Distribution in Excel 339
Appendix 11C: Expected Shortage Cost per Cycle 340

CHAPTER 12	Determining Optimal Level of Product Availability	341
12.1	The Importance of the Level of Product Availability	342
12.2	Factors Affecting Optimal Level of Product Availability	342
12.3	Managerial Levers to Improve Supply Chain Profitability	352
12.4	Supply Chain Contracts and Their Impact on Profitability	364
12.5	Setting Optimal Levels of Product Availability in Practice	371
12.6	Summary of Learning Objectives	372
	Discussion Questions	373
	Exercises	373
	Bibliography	375
	Appendix 12A: Optimal Level of Product Availability	376
	Appendix 12B: An Intermediate Evaluation	377
	Appendix 12C: Expected Profit from an Order	378
	Appendix 12D: Expected Overstock from an Order	379
	Appendix 12E: Expected Understock from an Order	380
	Appendix 12F: Simulation Using Spreadsheets	381

PART V: SOURCING, TRANSPORTING, AND PRICING PRODUCTS 385

CHAPTER 13	Sourcing Decisions in a Supply Chain	387
13.1	The Role of Sourcing in a Supply Chain	387
13.2	Supplier Scoring and Assessment	389
13.3	Supplier Selection and Contracts	393
13.4	Design Collaboration	402
13.5	The Procurement Process	404
13.6	Sourcing Planning and Analysis	406
13.7	Making Sourcing Decisions in Practice	407
13.8	Summary of Learning Objectives	408
	Discussion Questions	409
	Bibliography	410
CHAPTER 14	Transportation in the Supply Chain	411
14.1	The Role of Transportation in the Supply Chain	412
14.2	Factors Affecting Transportation Decisions	413
14.3	Modes of Transportation and Their Performance Characteristics	415
14.4	Design Options for a Transportation Network	420
14.5	Trade-offs in Transportation Design	425
14.6	Tailored Transportation	433
14.7	Routing and Scheduling in Transportation	436

14.8	Making Transportation Decisions in Practice	451
14.9	Summary of Learning Objectives	453
	Discussion Questions	453
	Exercises	454
	Bibliography	456

**CHAPTER 15 Pricing and Revenue Management
in the Supply Chain 457**

15.1	The Role of Revenue Management in the Supply Chain	457
15.2	Revenue Management for Multiple Customer Segments	460
15.3	Revenue Management for Perishable Assets	464
15.4	Revenue Management for Seasonal Demand	467
15.5	Revenue Management for Bulk and Spot Contracts	468
15.6	Using Revenue Management in Practice	470
15.7	Summary of Learning Objectives	472
	Discussion Questions	473
	Exercises	473
	Bibliography	474

PART VI: COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN 475

CHAPTER 16 Coordination in the Supply Chain 477

16.1	Lack of Supply Chain Coordination and the Bullwhip Effect	478
16.2	Effect of Lack of Coordination on Performance	480
16.3	Obstacles to Coordination in the Supply Chain	482
16.4	Managerial Levers to Achieve Coordination	487
16.5	Building Strategic Partnerships and Trust within a Supply Chain	493
16.6	Achieving Coordination in Practice	501
16.7	Summary of Learning Objectives	503
	Discussion Questions	504
	Bibliography	504
	Appendix 16A: The Beer Game	506

CHAPTER 17 Information Technology and the Supply Chain 510

17.1	The Role of IT in the Supply Chain	511
17.2	The Supply Chain IT Framework	513
17.3	Customer Relationship Management	517
17.4	Internal Supply Chain Management	519

17.5	Supplier Relationship Management	520
17.6	The Transaction Management Foundation	522
17.7	The Future of IT in the Supply Chain	523
17.8	Supply Chain IT in Practice	524
17.9	Summary of Learning Objectives	525
	Discussion Questions	526
	Bibliography	526
	For More Information	526
CHAPTER 18	E-Business and the Supply Chain	527
18.1	The Role of E-Business in Supply Chains	527
18.2	The E-Business Framework	529
18.3	The B2B Addition to the E-Business Framework	548
18.4	E-Business in Practice	554
18.5	Summary of Learning Objectives	556
	Discussion Questions	557
	Bibliography	557
Name Index	559	
Subject Index	561	