

清华管理学系列英文版教材

# Supply Chain Management

Strategy, Planning, and Operation

# 供应链管理

—— 战略、规划与运作

Sunil Chopra  
Peter Meindl

著



清华大学出版社

<http://www.tup.tsinghua.edu.cn>



Prentice  
Hall

Prentice Hall

<http://www.prenhall.com>

清华管理学系列英文版教材

# 供应链管理

战略、规划与运作

**Supply Chain Management**

Strategy, Planning, and Operation

Sunil Chopra

*Kellogg Graduate School of Management*

*Northwestern University*

Peter Meindl

*i2 Technologies*

清华大学出版社

Prentice Hall

<http://www.tup.tsinghua.edu.cn>

<http://www.prenhall.com>

出

(京)新登字 158 号

Supply Chain Management/Sunil Chopra, Peter Meindl

Copyright © 2001 by Prentice Hall, Inc.

Original English Language Edition Published by Prentice Hall, Inc.

本书英文影印版由 Prentice Hall 出版公司授权清华大学出版社在中国境内（不包括中国香港、澳门特别行政区和台湾地区）独家出版发行。未经出版者书面许可，不得以任何方式复制或抄袭本书的任何部分。

本书封面贴有 Prentice Hall 出版公司激光防伪标签，无标签者不得销售。

北京市版权局著作权合同登记号：01-2001-3207

版权所有，翻印必究。

书 名：供应链管理 战略、规划与运作

作 者：Sunil Chopra Peter Meindl

出版者：清华大学出版社（北京清华大学学研大厦， 邮编 100084）

<http://www.tup.tsinghua.edu.cn>

印刷者：北京市丰华印刷厂

发行者：新华书店总店北京发行所

开 本：850 × 1168 1/16 印张：30.25

版 次：2001 年 9 月第 1 版 2001 年 9 月第 1 次印刷

书 号：ISBN 7-302-04735-9/F · 335

印 数：0001~5000

定 价：43.00 元

# 出版说明

为了适应经济全球化的发展趋势,满足国内广大读者了解、学习和借鉴国外先进的管理经验和掌握经济理论的前沿动态,清华大学出版社与国外著名出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选择的图书,基本上是已再版多次、在国外深受欢迎、并被广泛采用的优秀教材,绝大部分是该领域中较具权威性的经典之作。在选书的过程中,我们得到了很多专家、学者的支持、帮助和鼓励,在此表示谢意!清华管理学系列英文版教材由清华大学经济管理学院马力、毛波、王雪莉、刘丽文、郎立君、钱小军、姜彦福、蔚林巍等老师审阅,在此一并致谢!

由于原作者所处国家的政治、经济和文化背景等与我国不同,对书中所持观点,敬请广大读者在阅读过程中注意加以分析和鉴别。

我们期望这套影印书的出版对我国经济科学的发展能有所帮助,对我国经济管理专业的教学能有所促进。

欢迎广大读者给我们提出宝贵的意见和建议;同时也欢迎有关的专业人士向我们推荐您所接触到的国外优秀图书。

清华大学出版社第三编辑室

2001.8

世纪之交,中国与世界的发展呈现最显著的两大趋势——以网络为代表的信息技术的突飞猛进,以及经济全球化的激烈挑战。无论是无远弗界的因特网,还是日益密切的政治、经济、文化等方面的国际合作,都标示着21世纪的中国是一个更加开放的中国,也面临着一个更加开放的世界。

教育,特别是管理教育总是扮演着学习与合作的先行者的角色。改革开放以来,尤其是20世纪90年代之后,为了探寻中国国情与国际上一切优秀的管理教育思想、方法和手段的完美结合,为了更好地培养高层次的“面向国际市场竞争、具备国际经营头脑”的管理者,我国的教育机构与美国、欧洲、澳洲以及亚洲一些国家和地区的大量的著名管理学院和顶尖跨国企业建立了长期密切的合作关系。以清华大学经济管理学院为例,2000年,学院顾问委员会成立,并于10月举行了第一次会议,2001年4月又举行了第二次会议。这个顾问委员会包括了世界上最大的一些跨国公司和中国几家顶尖企业的最高领导人,其阵容之大、层次之高,超过了世界上任何一所商学院。在这样高层次、多样化、重实效的管理教育国际合作中,教师和学生与国外的交流机会大幅度增加,越来越深刻地融入到全球性的教育、文化和思想观念的时代变革中,我们的管理教育工作者和经济管理学习者,更加真切地体验到这个世界正发生着深刻的变化,也更主动地探寻和把握着世界经济发展和跨国企业运作的脉搏。

我国管理教育的发展,闭关锁国、闭门造车是绝对不行的,必须同国际接轨,按照国际一流的水准来要求自己。正如朱镕基总理在清华大学经济管理学院成立十周年时所发的贺信中指出的那样:“建设有中国特色的社会主义,需要一大批掌握市场经济的一般规律,熟悉其运行规则,而又了解中国企业实情的经济管理人才。清华大学经济管理学院就要敢于借鉴、引进世界上一切优秀的经济管理学院的教学内容、方法和手段,结合中国的国情,办成世界第一流的经营学院。”作为达到世界一流的一个重要基础,朱镕基总理多次建议清华的MBA教育要加强英语教学。我体会,这不仅因为英语是当今世界交往中重要的语言工具,是连接中国与世界的重要桥梁和媒介,而且更是中国经济管理人才参与国际竞争,加强国际合作,实现中国企业的国际战略的基石。推动和实行英文教学并不是目的,真正的目的在于培养学生——这些未来的企业家——能够具备同国际竞争对手、合作伙伴沟通和对抗的能力。按照这一要求,清华大学经济管理学院正在不断推动英语教学的步伐,使得英语不仅是一门需要学习的核心

课程,而且渗透到各门专业课程的学习当中。

课堂讲授之外,课前课后的大量英文原版著作、案例的阅读对于提高学生的英文水平也是非常关键的。这不仅是积累相当的专业词汇的重要手段,而且是对学习者思维方式的有效训练。

我们知道,就阅读而言,学习和借鉴国外先进的管理经验和掌握经济理论动态,或是阅读翻译作品,或是阅读原著。前者属于间接阅读,后者属于直接阅读。直接阅读取决于读者的外文阅读能力,有较高外语水平的读者当然喜欢直接阅读原著,这样不仅可以避免因译者的疏忽或水平所限而造成的纰漏,同时也可以尽享原作者思想的真实表达。而对于那些有一定外语基础,但又不能完全独立阅读国外原著的读者来说,外文的阅读能力是需要加强培养和训练的,尤其是专业外语的阅读能力更是如此。如果一个人永远不接触专业外版图书,他在获得国外学术信息方面就永远会比别人差半年甚至一年的时间,他就会在无形中减弱自己的竞争能力。因此,我们认为,有一定外语基础的读者,都应该尝试一下阅读外文原版,只要努力并坚持,就一定能过了这道关,到那时就能体验到直接阅读的妙处了。

在掌握大量术语的同时,我们更看重读者在阅读英文原版著作时对于西方管理者或研究者的思维方式的学习和体会。我认为,原汁原味的世界级大师富有特色的表达方式背后,反映了思维习惯,反映了思想精髓,反映了文化特征,也反映了战略偏好。知己知彼,对于跨文化的管理思想、方法的学习,一定要熟悉这些思想、方法所孕育、成长的文化土壤,这样,有朝一日才能真正“具备国际战略头脑”。

以往,普通读者购买和阅读英文原版还有一个书价的障碍。一本外版书少则几十美元,多则上百美元,一般读者只能望书兴叹。随着全球经济合作步伐的加快,目前在出版行业有了一种新的合作出版的方式,即外文影印版,其价格几乎与国内同类图书持平。这样一来,读者可以不必再为书价发愁。清华大学出版社这些年在这方面一直以独特的优势领先于同行。早在1997年,清华大学出版社敢为人先,在国内最早推出一批优秀商学英文版教材,规模宏大,在企业界和管理教育界引起不小的轰动,更使国内莘莘学子受益良多。

为了配合清华大学经济管理学院推动英文授课的急需,也为了向全国更多的MBA试点院校和更多的经济管理学院的教师和学生提供学习上的支持,清华大学出版社再次隆重推出与世界著名出版集团合作的英文原版影印商学教科书,也使广大工商界人士、经济管理类学生享用到最新最好质优价廉的国际教材。

祝愿我国的管理教育事业在社会各界的大力支持和关心下不断发展、日进日新;祝愿我国的经济建设在不断涌现的大批高层次的面向国际市场竞争、具备国际经营头脑的管理者的勉力经营下早日中兴。

赵纯钧 教授

清华大学经济管理学院院长  
全国工商管理硕士教育指导委员会副主任

*I would like to thank my colleagues at Kellogg for all that I have learned from them about logistics and supply chain management. I am grateful for the love and encouragement my parents, Krishan and Pushpa, and sisters, Sudha and Swati, have always provided during every endeavor in my life. I thank my children Ravi and Rajiv for the joy they have brought me. Finally, none of this would have been possible without the constant love, caring, and support of my wife Maria Cristina.*

*Sunil Chopra*

*I would like to thank three mentors: Sunil Chopra my co-author, Hau Lee my advisor at Stanford University and beyond, and Gerry Lieberman, also of Stanford University, all of whom have taught me a great deal and inspired me even more. I would like to thank my parents, Freddy and Jim, and sister, Candace, for their constant love and support. And, most importantly, I would like to thank my wife, Sarah, who makes my life wonderful and whom I love with all of my heart.*

*Pete Meindl*



---

# Preface

This book has grown from a course on supply chain management taught to second-year MBA students at the Kellogg Graduate School of Management. The goal of this class is to cover not only high-level supply chain strategy and concepts, but also to give students a solid understanding of the analytical tools necessary to solve supply chain problems. With this class goal in mind, our objective was to create a book that would develop an understanding of the following three key areas and their interrelationships:

- The strategic role of the supply chain
- Key drivers of supply chain performance
- Analytical tools and techniques for supply chain analysis

Our first objective in this book is for the reader to learn the strategic importance of good supply chain design, planning, and operation for every firm. The reader will be able to understand and visualize how good supply chain management can be a competitive advantage for a firm. Similarly, a reader should understand how weaknesses in supply chain design, planning, and operation can hurt the performance of a firm. We use several examples to illustrate this idea and develop a strategic framework for supply chain management.

Within the strategic framework we identify inventory, transportation, information, and facilities as the key drivers of supply chain performance. Our second goal in the book is to convey how these drivers may be used on a conceptual level during supply chain design, planning, and operation to improve performance. For each driver of supply chain performance, our goal is to provide readers with practical managerial levers and concepts that may be used to improve supply chain performance.

Utilizing these managerial levers optimally during the design, planning, and operational phases requires knowledge of logistics and supply chain methodologies. Our third goal is to give the reader knowledge of these methodologies. Every methodological discussion is illustrated with its application in Excel. When discussing methodologies and techniques, we stress the managerial context in which they are used and the managerial levers for improvement that they support.

The strategic framework and concepts discussed in the book are tied together through a variety of examples that show how a combination of concepts is needed to achieve significant increases in performance. There is a particular focus on the analysis of e-business and how it can help firms in different industries improve their supply chain performance.

The book is targeted toward an academic as well as a practitioner audience. On the academic side, it should be appropriate for MBA, engineering management, or senior undergraduate courses in logistics and supply chain management. It should also



serve as a suitable reference for both concepts as well as methodology for practitioners in consulting as well as industry.

There are many people we would like to thank who helped us throughout this process. We thank the reviewers whose suggestions significantly improved the book: James Noble, University of Missouri-Columbia; Sime Curkovic, Western Michigan University; Effie Stavoulaki, Penn State University; and James K. Higginson, University of Waterloo (Ontario). We are grateful to the students at the Kellogg Graduate School of Management who suffered through typo-ridden drafts of earlier versions of the book. Specially, we thank Christoph Roettelle and Vikas Vats for carefully reviewing several chapters and solving problems at the end of chapters. Our developmental editor, Libby Rubenstein, who read all our writing with a critical eye and raised all the right issues, was instrumental in improving the book. The book is much better because of her involvement. We would also like to thank our editor Tom Tucker and the staff at Prentice-Hall for their effort with the book. Finally, we'd like to thank you, our readers, for reading and using this book. We hope it contributes to all your efforts to improve the performance of companies and supply chains throughout the world.

**Sunil Chopra**  
*Kellogg Graduate School of Management*  
*Northwestern University*

**Peter Meindl**  
*i2 Technologies*

# 简 明 目 录

第1部分 供应链战略分析框架 .....	1
第1章 供应链的基本概念 .....	3
第2章 供应链绩效：战略制定的指导思想 .....	25
第3章 供应链管理关键要素及其难点 .....	49
第2部分 供应链中的供需管理 .....	65
第4章 供应链中的需求预测 .....	67
第5章 供应链中的综合计划 .....	101
第6章 供应链中的供需计划管理：可预测变化的管理 .....	121
第3部分 供应链中的库存计划与管理 .....	135
第7章 如何利用供应链中的规模效益：周转库存管理 .....	137
第8章 如何管理供应链中的不确定性：安全库存管理 .....	179
第9章 如何确定最优顾客服务水平 .....	221
第4部分 供应链中的运输问题、网络设计和信息技术 .....	259
第10章 供应链中的运输问题 .....	261
第11章 设施决策：供应链网络设计 .....	303
第12章 供应链中的信息技术 .....	335
第5部分 供应链中的合作关系和电子商务 .....	357
第13章 供应链中的合作关系 .....	359
第14章 供应链与电子商务 .....	391
第6部分 供应链管理决策中的财务因素 .....	419
第15章 供应链管理决策中的财务评价 .....	421
人名索引 .....	449
主题索引 .....	451

---

# Contents in Brief

## PART ONE: BUILDING A STRATEGIC FRAMEWORK TO ANALYZE SUPPLY CHAINS 1

- Chapter 1 Understanding the Supply Chain 3
- Chapter 2 Supply Chain Performance: Achieving Strategic Fit and Scope 25
- Chapter 3 Supply Chain Drivers and Obstacles 49

## PART TWO: PLANNING DEMAND AND SUPPLY IN A SUPPLY CHAIN 65

- Chapter 4 Demand Forecasting in a Supply Chain 67
- Chapter 5 Aggregate Planning in a Supply Chain 101
- Chapter 6 Planning Supply and Demand in a Supply Chain: Managing Predictable  
Variability 121

## PART THREE: PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN 135

- Chapter 7 Managing Economies of Scale in a Supply Chain:  
Cycle Inventory 137
- Chapter 8 Managing Uncertainty in a Supply Chain: Safety Inventory 179
- Chapter 9 Determining Optimal Level of Product Availability 221

## PART FOUR: TRANSPORTATION, NETWORK DESIGN, AND INFORMATION TECHNOLOGY IN A SUPPLY CHAIN 259

- Chapter 10 Transportation in a Supply Chain 261
- Chapter 11 Facility Decisions: Network Design in a Supply Chain 303
- Chapter 12 Information Technology in a Supply Chain 335

## PART FIVE: COORDINATING A SUPPLY CHAIN AND THE ROLE OF E-BUSINESS 357

- Chapter 13 Coordination in a Supply Chain 359
- Chapter 14 E-Business and the Supply Chain 391

**xii** Contents in Brief

PART SIX: FINANCIAL FACTORS INFLUENCING SUPPLY CHAIN DECISIONS 419

Chapter 15 Financial Evaluation of Supply Chain Decisions 421

NAME INDEX 449

SUBJECT INDEX 451

---

# Contents

**Preface**      XIX

**PART ONE: BUILDING A STRATEGIC FRAMEWORK TO ANALYZE  
SUPPLY CHAINS**      1

**CHAPTER 1 Understanding the Supply Chain**      3

- 1.1 What Is a Supply Chain?      3
- 1.2 Decision Phases in a Supply Chain      6
- 1.3 Process View of a Supply Chain      7
- 1.4 The Importance of Supply Chain Flows      16
- 1.5 Examples of Supply Chains      18
- 1.6 Summary of Learning Objectives      22
- Discussion Questions      23
- Bibliography      23

**CHAPTER 2 Supply Chain Performance: Achieving Strategic Fit  
and Scope**      25

- 2.1 Competitive and Supply Chain Strategies      25
- 2.2 Achieving Strategic Fit      27
- 2.3 Expanding Strategic Scope      40
- 2.4 Summary of Learning Objectives      46
- Discussion Questions      46
- Bibliography      47

**CHAPTER 3 Supply Chain Drivers and Obstacles**      49

- 3.1 Drivers of Supply Chain Performance      49
- 3.2 A Framework for Structuring Drivers      51
- 3.3 Inventory      52
- 3.4 Transportation      54
- 3.5 Facilities      56
- 3.6 Information      58
- 3.7 Obstacles to Achieving Fit      60
- 3.8 Summary of Learning Objectives      63
- Discussion Questions      63
- Bibliography      63

**PART TWO: PLANNING DEMAND AND SUPPLY IN A SUPPLY CHAIN 65**

**CHAPTER 4 Demand Forecasting in a Supply Chain 67**

- 4.1 The Role of Forecasting in a Supply Chain 68
- 4.2 Characteristics of Forecasts 69
- 4.3 Components of a Forecast and Forecasting Methods 69
- 4.4 Basic Approach to Demand Forecasting 72
- 4.5 Time Series Forecasting Methods 75
- 4.6 Measures of Forecast Error 86
- 4.7 Forecasting Demand at NaturalGas.com 88
- 4.8 Summary of Learning Objectives 95
- Discussion Questions 96
- Exercises 96
- Bibliography 97
- Case Study: Specialty Packaging Corporation, Part A 98

**CHAPTER 5 Aggregate Planning in a Supply Chain 101**

- 5.1 The Role of Aggregate Planning in a Supply Chain 101
- 5.2 The Aggregate Planning Problem 103
- 5.3 Aggregate Planning Strategies 104
- 5.4 Aggregate Planning Using Linear Programming 105
- 5.5 Aggregate Planning in Excel 113
- 5.6 Implementing Aggregate Planning in Practice 115
- 5.7 Summary of Learning Objectives 116
- Discussion Questions 117
- Case Study: Specialty Packaging Corporation, Part B 118

**CHAPTER 6 Planning Supply and Demand in a Supply Chain: Managing Predictable Variability 121**

- 6.1 Responding to Predictable Variability in a Supply Chain 121
- 6.2 Managing Supply 123
- 6.3 Managing Demand 125
- 6.4 Implementing Solutions to Predictable Variability in Practice 132
- 6.5 Summary of Learning Objectives 133
- Discussion Questions 133
- Case Study: Nintendo Game Girl 134

**PART THREE: PLANNING AND MANAGING INVENTORIES  
IN A SUPPLY CHAIN 135**

**CHAPTER 7 Managing Economies of Scale in a Supply Chain:  
Cycle Inventory 137**

- 7.1 The Role of Cycle Inventory in a Supply chain 138
- 7.2 Economies of Scale to Exploit Fixed Costs 141

7.3 Economies of Scale to Exploit Quantity Discounts	152
7.4 Short-Term Discounting: Trade Promotions	164
7.5 Estimating Cycle Inventory–Related Costs in Practice	169
7.6 Summary of Learning Objectives	172
Discussion Questions	172
Exercises	173
Bibliography	174
Case Study: Delivery Strategy at MoonChem	175
Appendix 7A: Economic Order Quantity	177

## **CHAPTER 8 Managing Uncertainty in a Supply Chain: Safety Inventory 179**

8.1 The Role of Safety Inventory in a Supply Chain	180
8.2 Determining Appropriate Level of Safety Inventory	181
8.3 Impact of Supply Uncertainty on Safety Inventory	193
8.4 Impact of Aggregation on Safety Inventory	195
8.5 Impact of Replenishment Policies on Safety Inventory	207
8.6 Estimating and Managing Safety Inventory in Practice	210
8.7 Summary of Learning Objectives	211
Discussion Questions	212
Exercises	212
Bibliography	214
Case Study : Managing Inventories at ALKO Inc.	215
Appendix 8A: The Normal Distribution	218
Appendix 8B: The Normal Distribution in Excel	219
Appendix 8C: Expected Shortage Cost per Cycle	220

## **CHAPTER 9 Determining Optimal Level of Product Availability 221**

9.1 The Importance of the Level of Product Availability	222
9.2 Factors Affecting Optimal Level of Product Availability	222
9.3 Managerial Levers to Improve Supply Chain Profitability	231
9.4 Supply Chain Contracts and Their Impact on Profitability	242
9.5 Setting Optimal Levels of Product Availability in Practice	247
9.6 Summary of Learning Objectives	248
Discussion Questions	249
Exercises	249
Bibliography	251
Appendix 9A: Optimal Level of Product Availability	252
Appendix 9B: An Intermediate Evaluation	252
Appendix 9C: Expected Profit from an Order	253
Appendix 9D: Expected Overstock from an Order	254



Appendix 9E: Expected Understock from an Order	254
Appendix 9F: Simulation Using Spreadsheets	255

**PART FOUR: TRANSPORTATION, NETWORK DESIGN, AND INFORMATION  
TECHNOLOGY IN A SUPPLY CHAIN 259**

<b>CHAPTER 10 Transportation in a Supply Chain</b>	<b>261</b>
10.1 The Role of Transportation in a Supply Chain	262
10.2 Factors Affecting Transportation Decisions	263
10.3 Modes of Transportation and Their Performance Characteristics	265
10.4 Design Options for a Transportation Network	270
10.5 Trade-offs in Transportation Design	274
10.6 Tailored Transportation	282
10.7 Routing and Scheduling in Transportation	284
10.8 Making Transportation Decisions in Practice	297
10.9 Summary of Learning Objectives	299
Discussion Questions	300
Exercises	300
Bibliography	302
<b>CHAPTER 11 Facility Decisions: Network Design in a Supply Chain</b>	<b>303</b>
11.1 The Role of Facility Decisions in a Supply Chain	303
11.2 Factors Influencing Network Design Decisions	305
11.3 A Framework for Network Design Decisions	314
11.4 Models for Facility Location and Capacity Allocation	316
11.5 Making Network Design Decisions in Practice	327
11.6 Summary of Learning Objectives	329
Discussion Questions	329
Exercises	330
Bibliography	332
Case Study: Managing Growth at SportStuff.com	333
<b>CHAPTER 12 Information Technology in a Supply Chain</b>	<b>335</b>
12.1 The Role of Information Technology in a Supply Chain	335
12.2 The Importance of Information in a Supply Chain	336
12.3 Use of Information in a Supply Chain	338
12.4 Information Technology: The Information Enabler	339
12.5 Supply Chain Information Technology in Practice	353
12.6 Summary of Learning Objectives	354
Discussion Questions	355
Bibliography	355
For More Information	355

## PART FIVE: COORDINATING A SUPPLY CHAIN AND THE ROLE OF E-BUSINESS 357

<b>CHAPTER 13 Coordination in a Supply Chain</b>	<b>359</b>
13.1 Lack of Supply Chain Coordination and the Bullwhip Effect	359
13.2 Effect of Lack of Coordination on Performance	361
13.3 Obstacles to Coordination in a Supply Chain	363
13.4 Managerial Levers to Achieve Coordination	368
13.5 Building Strategic Partnerships and Trust within a Supply Chain	374
13.6 Achieving Coordination in Practice	381
13.7 Summary of Learning Objectives	383
Discussion Questions	384
Bibliography	384
Appendix 13A: The Beer Game	386
<b>CHAPTER 14 E-Business and the Supply Chain</b>	<b>391</b>
14.1 The Role of E-Business in a Supply Chain	391
14.2 The Impact of E-Business on Supply Chain Performance	393
14.3 Value of E-Business in Different Industries	399
14.4 Setting up E-Business in Practice	415
14.5 Summary of Learning Objectives	417
Discussion Questions	418
Bibliography	418

## PART SIX: FINANCIAL FACTORS INFLUENCING SUPPLY CHAIN DECISIONS 419

<b>CHAPTER 15 Financial Evaluation of Supply Chain Decisions</b>	<b>421</b>
15.1 The Impact of Financial Factors on Supply Chain Decisions	421
15.2 Discounted Cash Flow Analysis	422
15.3 Representations of Uncertainty	424
15.4 Evaluating Supply Chain Decisions Using Decision Trees	426
15.5 AM Tires: Financial Evaluation of Supply Chain Design Decisions	433
15.6 Financial Analysis of Supply Chain Decisions in Practice	444
15.7 Summary of Learning Objectives	445
Discussion Questions	445
Exercises	446
Bibliography	448

NAME INDEX 449

SUBJECT INDEX 451