

# Managing Supply Chains

Concepts, Tools and Applications

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*This book is dedicated to my family—Rani, Apsara, and Vidhya—  
and to the memory of my parents.*

*Ananth Iyer*



# Preface

Why are there pictures of coffee, chocolate, cake, and coupons on the cover of this book? They were gifts from German students who had just finished my class on supply chain management and were intended to represent the 4C framework that underlies this book's content. In this book, however, the 4Cs are *Chain structure and ownership*, *Capacity*, *Coordination*, and *Competitiveness*. If you visualize the set of ordinary items on the cover of this book, you can use them as a mnemonic to remember the 4Cs of supply chain management—and we have accomplished a key goal of this book in this very first paragraph.

This book has been several years in the making. My goal is to bridge the gap between applications, tools, and concepts, linking ideas generated by researchers, practices described in the press, and tools that can be used to generate insights. Connecting these worlds, each of which has been developed by people passionate about supply chain management, will make for a smoother transition between theory and practice. This textbook is a static object that can serve as the start of conversations between you, your professor, your fellow students, your current or future work colleagues, and me, albeit remotely, engaging your heart and mind in understanding, managing, and enabling supply chain systems—leading to growth and commerce, while promoting sustainability. In order to support those conversations, I write a daily blog (<http://www.wordpress.aviyer2010.com/>) to cover current ideas linked to global supply chain management.

Supply chain management is primarily about a collection or a chain of companies that coordinate their activities and choose the appropriate capacities and some metric of competition to deliver a valuable product or service to customers. This activity is inherently global in many industries and is thus subject to the vagaries of economic shocks, political upheavals, weather-related disruptions, and many other factors. Ensuring that the supply chain keeps its commitment to customers requires planning, contracting to share risk, and adapting to changes in all functions and transactions. Ensuring that transportation capacity is available and deliveries take place as scheduled, suppliers invest effort, people, resources to keep component designs competitive, and warehouses and associated inventories are deployed to optimize performance. These are a few examples of topics we will discuss in detail.

Information systems now have a ubiquitous presence, enabling customers to access data regarding products and schedules from product genesis to final delivery, and judge whether they approve. Virtually, the supply chain sits in a glass box, with every decision or choice documented and rated, thus impacting customer purchase decisions, the top-line revenue of the firm, and, finally, the bottom-line profits. Customers care about sustainable choices, and firms who recycle and reuse both reduce costs and attract customers. Matching information and material flows is key to effective supply chain management and sustainability.

This book is written to make you aware of the choices made by existing supply chain managers and to provide you with suggestions for alternate solutions as well as the tools to analyze their impacts. Vigilance about the competitiveness of current choices ensures that managerial interventions can be made when necessary to make course corrections.

Circumstances may require a shift to outsourcing from local sourcing, which may involve higher costs but also higher profits, if the resulting decisions are made quickly and adapt to current trends. For example, moving from a promotion-intensive retail environment to an every-day-low-price format may improve or decrease profits, depending on the context. The models and tools we will discuss will enable these decisions.

The concepts in this book have been tested on over a thousand students, and the book includes new cases developed to illustrate contexts based on my consulting and research experience. Several of the chapters are motivated by the content of research papers, which I have adapted to be accessible to students in a business school or an industrial engineering course. The problem sets provide many contexts to test your ability to apply the tools we will learn. The applications are highlighted with specific case studies, references to

websites that provide updated content, and trade and government publications to let you gauge the financial impact of choices. Through this work, I hope you will be convinced and understand that supply chains can and do have a significant impact.

This book is built on the shoulders of insight generated by practitioners in industry, as well as researchers and students in universities. But it would not have been possible without the support of my family, to whom I am eternally grateful. I am also grateful for the environment in the operations management group, and all the faculty colleagues and graduate and doctoral students at the Krannert School of Management here at Purdue, where I have been fortunate to try out many of these concepts on students. I take responsibility for any errors and have endeavored to acknowledge all sources for their input.

I would like to acknowledge the many coauthors and students over the years who have made the journey to write this book memorable. My students and now faculty include Professors Apurva Jain at University of Washington at Seattle; Jinghua Wu at Renmin University; Zhengping Wu at Singapore Management University; Mohammad Saoud at Kuwait University; Hung Do Tuan at University of Vermont; Asima Mishra at Intel Labs; and Kyoongsun Lee, now in South Korea. Other collaborating faculty whose insights and research influenced and are representing in this book include Professors Sridhar Seshadri at University of Texas at Austin, Arnd Huchzermeier at WHU-Koblenz, Vinayak Deshpande at University of Texas at Austin, Svenja Sommer at HEC Paris, and Lee Schwarz at Purdue University. I deeply appreciate the opportunity to work with each of them.

The following colleagues provided detailed reviews and hundreds of very thoughtful and valuable suggestions for improvement to this text. I am very grateful to each and hope each will be pleased with how it has turned out.

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 Paul Hong, University of Toledo

My publisher, Dick Hercher, has been a staunch advocate of this book through its many manifestations—I hope you enjoy his efforts and enable his fledgling company to soar. Jennifer Murtoff, the copyeditor, has been a diligent and effective advisor, turning notes into precise text, and reminding me time and again of the reader's perspective. My daughters Apsara and Rani have suffered through many years of hearing about the 4Cs (which I tried out on them during their elementary school years), and my wife Vidhya has endured the long journey of this book from start to finish—I thank them for their patience and support on this journey.

So please enjoy this book, and, if you can, drop me an email so that I can learn of your experience with it. If you decide to make a career in managing supply chains, you will find a large global community ready to welcome your ideas. Enjoy the ride, and remember the 4Cs described in this book.

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