Supply Chain Management and Transport Logistics

John J. Liu

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John J. Liu

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Preface

Why supply chain management and transport logistics?

The urgent need for a book on ***supply chain management and transport logistics*** (or simply ***supply chain logistics***) can be illustrated with a number of questions regarding state-of-the-art developments in the field of logistics and supply chain management (SCM).

- Are you aware that over 90 percent of international trade volume is carried across seas and waterways, and consequently over 90 percent of supply chains involve ***port and transport logistics***?
- Are you aware that **manufacturing** and **transportation** each generated the same average of 14 percent of global greenhouse gas emissions in 2006?
- Do you understand why it is important to study ***supply chain management*** together with ***transport logistics***? What is the difference between ***supply chain logistics*** and ***manufacturing logistics***?
- Do you know the difference between ***firm-focal*** and ***port-focal logistics***? (Note: Economic globalization is bringing about an inevitable trend toward port/airport-focused logistics, with firm-based logistics/SCM as building blocks.)
- Are ***supply chain logistics*** and ***supply chain management*** the same thing?

Although complete answers to these questions are still being explored, the most important and innovative developments in this regard are embedded throughout this book. In short, the answers are based on the following findings:

- Globalization is not a prediction; it is an inevitable reality.
- Globalization is underpinned by two technological innovations: containerization and the Internet, on which the "World's Factory" and the Wal-Mart Economy are founded.
- Globalization consists of two dimensions: global manufacturing and global services, with logistics as the vital link between the two.

For the sake of reference, we will begin with a brief introduction to the relevant terminologies. *Logistics* refers to the provision of supplies, which not only includes shipping and the transportation of supplies (物流, the Chinese translation

of logistics), but also the relevant services and support (后勤, such as maintenance and insurance, etc.). In terms of professional content and academic terminology, shipping encompasses all modes of navigation, aviation, and transportation, whereas logistics services are wide-ranging, including finance, insurance, technology, and infrastructure. *Supply chain management* (SCM) has so far been referred to by both researchers and practitioners as the management of supply chains within a business organization, and most existing textbooks on SCM are based on enterprise-focused manufacturing settings and applications. In this connection, two categories have emerged in supply chain and transport logistics: *industrial logistics* and the *logistics industry*. *Industrial logistics* is enterprise focused (e.g., typical business logistics and manufacturing logistics), whereas the *logistics industry* is enterprise crossing (e.g., third-party logistics and the shipping industry). Specifically, *industrial logistics* is a necessary logistical function of individual enterprises and firms, whereas the *logistics industry* refers to industrial organizations that specialize in SCM and transport logistics. For example, logistics is geared around a *focal factory* as described in the mainstream SCM literature (e.g., La Londe 1998) and is a specific form of *industrial logistics*, whereas third-party logistics firms serving the automobile industry represent a specific *logistics industry* in the form of *nested* industrial supply chains.

Nevertheless, the interrelationship between logistics and SCM has been both striking and intriguing. On the one hand, when the supply chain is viewed as a business platform for the acquisition and provision of supplies and goods, industrial *logistics* is inseparable from SCM, and at the same time supply chain operations contain logistics. On the other hand, when viewed as a service industry, *logistics* is enterprise crossing rather than enterprise focused, according to the conventional definition of SCM. In this regard, logistics can be clearly distinguished from SCM.

The motivation for writing a book on *supply chain and transport logistics* arises from the observation that the enterprise-focused framework of SCM, which an overwhelming majority of books on SCM have adopted, falls short of explaining recent real-world developments, especially the so-called Wal-Mart model in which a "factory" is a virtual logistics network of multiple international manufacturing firms. The success of the Wal-Mart model rests on two dynamic innovations: all-mode logistics service facilitation and the industrial organization of supply chains, which are inadequately covered by existing SCM textbooks. For example, the management of transport utilities and facilities, such as seaports and airports, has become an expected part of logistics and SCM, especially from an international perspective, yet is seldom covered in textbooks on SCM and logistics. *Supply chain and transport logistics*, as termed in this book, is based on this intriguing interrelationship, referring to supply-chain centered logistics with enterprise-crossing characteristics, including both the service facilitation and the industrial organization (IO) aspects of logistics. The true challenge in writing a book on *supply chain and transport logistics* is the development of a unified methodological framework that underpins all of the characteristics of the intriguing interrelationship between firm-focal and port-focal SCM and logistics.

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Winning-before-doing methodology for supply chain and transport logistics

> A winner secures victory before engaging in a fight, whereas a loser engages a fight and then seeks victory. 是故胜兵先胜而后求战败兵先战而后求胜.
>
> *The Art of War*, Chapter 4, Verse 4.15 (500 BC, by Sun Zi)

In modern language, Sun Zi's words from 500 BC mean "winning before doing," which I sincerely believe in, especially because I have realized how well it still applies in modern times. In *The Art of War*, Sun Zi wrote "兵马未到, 粮草先行", which translates as, "a vital secret to *winning-before-doing* (WBD) is the efficient and timely *provision of supplies,*" which is undeniably the earliest reference to the concept of *supply chain* and *logistics*. Sun Zi went on to say that the world is constantly *changing* in an extremely precise yet seemingly uncertain manner. The inevitable challenge in WBD is to deal with changes that are often unpredictable and to identify and then solve the seemingly unsolvable problems that arise from such changes. The key to winning-before-doing lies in flawless planning and adaptation. It is astonishing how these 1,000-year-old words sound just like lecture notes for a modern management class in a business school. It is no wonder that *The Art of War* has been referred to in Japan as "the bible of business competition" since the 1950s. The term "logistics" in this book is broadly defined in the sense of Sun Zi's portrayal.

When it comes to modern management, the six-sigma principle cannot be ignored by researchers and practitioners. An easy test for someone who claims to know six-sigma is to check if he/she can spell out the five-letter golden rule of the six-sigma principle: D-M-A-I-C: Define–Measure–Analysis–Improve–Control. To demonstrate how great Chinese culture is, I need only quote Sun Zi's *The Art of War*: "兵法: 一曰度 (define), 二曰量 (measure), 三曰数 (count), 四曰称 (balance), 五曰胜 (win)." The five-word rule of war defined by Sun Zi over 2,500 years ago is virtually identical to the D-M-A-I-C of modern enterprise management. I was astonished to find this identical translation in 1999 when I was preparing lectures for a SCM course at the University of Wisconsin, Milwaukee.

Supply Chain Management and Transport Logistics is written particularly for senior undergraduate and postgraduate students in general management and decision sciences, especially with a major or specialization in SCM and logistics. For example, the book could be used for a compulsory MBA course with a specialization or "track" in SCM and logistics. The book is expected to be particularly useful for MBA curricula in Asia. In addition to SCM- and OM-oriented programs, the book will also be useful for shipping and maritime logistics programs, at both the undergraduate and postgraduate levels.

This book focuses on the system dynamics and solution tools that are essential to WBD, streamlined into three parts (modules). Parts I and II are devoted to the basics of SCM and transport logistics, and Part III offers unique coverage of the integrated all-mode logistics of navigation, aviation, and transportation. Part III

is written by five contributing editors who are specialized in different aspects of transport logistics. The three parts are organized as follows.

- **Part I. Business supplies and logistics: theories and methodologies** are covered in Chapters 1, 2, 3, and 4.
- **Part II. Supply chain management: sourcing and outsourcing** are covered in Chapters 5, 6, and 7.
- **Part III. Integrated supply chain and transport logistics: integration of all-mode supply chain logistics** is covered in Chapters 8, 9, 10, 11, and 12, which are authored by five contributing editors: Tzs-Leung Yip (Chapter 8 on shipping and navigation logistics), Adolf Ng (Chapter 9 on global port logistics facilitation), Zhou Xu (Chapter 10 on logistics information technology), Xiaowen Fu (Chapter 11 on aviation logistics), and Meifeng Luo (Chapter 12 on environment logistics).

Parts I and II are related to operational economics and the management of logistics and supply chains, with Part I devoted to the fundamentals of operational economics and management in the context of supply chain logistics and Part II to the management of firm-focal SCM and logistics. The first two parts were largely developed from my lecture notes compiled over the past 20 years of teaching operations management and business logistics, and particularly from two redesigned courses—*Logistics and Supply Chain Management* and *Manufacturing Technology and Simulation*. Part III offers unique coverage of the integration of port-focal supply chain and transport logistics, with firm-focal logistics and SCM as the building blocks. Part III contains collective teaching notes developed by my colleagues at the Department of Logistics and Maritime Studies at Hong Kong PolyU, including Dr. Tsz-Leung Yip on "shipping and navigation logistics" (Chapter 8), Dr. Adolf Ng on "global ports/airports and logistics facilitation" (Chapter 9), Dr. Zhou Xu on "information technology in supply chain and transport logistics" (Chapter 10), Dr. Xiaowen Fu on "aviation logistics management" (Chapter 11), and Dr. Meifeng Luo on "environment logistics" (Chapter 12).

System dynamics are introduced and then explained with reference to the three modules, with emphasis given to *descriptive* models, such as time-series, queuing, and simulation models, because these have fared better for solving persistent and complex management problems, compared with *prescriptive* models. The descriptive models are selected in conjunction with methodological tools and topics that are pertinent to both firm-focal and port-focal SCM and transport logistics: time-series forecasting, inventory systems, efficiency assessment (statistical and econometrical), and Purchasing-Manager-Indexing (PMI) techniques. Because simulation is nonanalytical and visually interactive, and thus applicable to a wide range of complex problems, most chapters include a simulation-lab session where appropriate.

Part I, *Business supplies and logistics: theories and methodologies*, starts with how to deal with fundamental changes in logistics and supply chain operations, especially the revolutionary changes that have been brought about by computer and information technology (Chapter 1). Such changes have instigated all recent innovative advances and technologies, such as enterprise resource planning (ERP), manufacturing

data warehousing, and business-to-business (B2B) logistics, to name just a few. Nevertheless, any change involves uncertainty and risk, which makes accurate calculation and planning seemingly impossible. Principles and useful models are then described according to three basic aspects of a supply chain—the operational core of a company. Logistical activities are explained in the context of a supply order fulfillment system, a descriptive flow network model of capacitated resources plus transitional inventory. Chapter 2 is devoted to the planning and control of production capacity. Basic repetitive supply management is discussed in Chapter 3. Demand management in supply chain and transport logistics is covered in Chapter 4, including time-series forecasting in the main part of the chapter, and the preliminaries of time-series demand with first-order time-series processes in the supplement (Chapter S4).

Part II, *Supply chain management: sourcing and outsourcing*, covers issues and developments in managing a supply chain. It consists of three chapters (Chapters 5–7), which are particularly suited for corporate buyers who are specialized in contract production and supply chain and logistics operations, including supply outsourcing. Chapter 5 provides unique coverage of supply chain efficiency and quality management, which represents the latest advances in SCM. Chapter 6 focuses on basic coverage of transportation and distribution problems. Chapter 7 is devoted to the newly emerging topics of maintenance and contingent supply chains, including production maintenance supply chains, post-sale service supply chains, and humanitarian supply chains.

Part III, "Integrated supply chain and transport logistics", is concerned with the study of port- and airport-focused networks of global logistics and supply chain management. Chapter 8 covers the analysis of "shipping and navigation logistics", Chapter 9 focuses on "global ports and logistics facilitation", and Chapter 10 on "information technology in supply chain and transport logistics". The book concludes with two unique and important chapters, Chapter 11 on "aviation logistics management" and Chapter 12 on "environment logistics".

This book is intended to provide an integrated coverage of both subjects with a modular structure, so that it can be easily customized to fit a particular pedagogical focus and style. There is no separate coverage of computer simulation; rather, it is covered through case studies and projects incorporated throughout the text. Most chapters include a designated simulation case, and each of the core subjects ends with a simulation project. Thus, to fully utilize the book, it is important to ensure that students have access to simulation software installed in a lab environment.

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February 10, 2011 (in Hong Kong)

Reference

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