Contemporary Logistics

ELEVENTH EDITION

Paul R. Murphy, Jr. • A. Michael Knemeyer

ALWAYS LEARNING

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Eleventh Edition

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Global Edition

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Paul R. Murphy, Jr.

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Authorized adaptation from the United States edition, entitled Contemporary Logistics, 11th edition, ISBN 978-0-13-295346-7, by Paul R. Murphy, Jr. and A. Michael Knemeyer, published by Pearson Education © 2015.

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ISBN 10: 1-292-00484-3
ISBN 13: 978-1-292-00484-6 (Print)
ISBN 13: 978-1-292-00496-9 (PDF)

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library

10 9 8 7 6 5 4 3 2 1
14 13 12 11 10

Typeset in 10/12 pts Minion Pro by Integra Software Solutions.

Printed and bound by Courier Kendallville in The United States of America.

BRIEF CONTENTS

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CONTENTS

PREFACE

This edition of *Contemporary Logistics* reflects a business landscape that is characterized by geopolitical tensions in various parts of the world, steadily increasing trade among countries and across continents, supply chain vulnerabilities caused by severe natural disasters, and an unabated pace of technological advancement. Although these and other events present both challenges and opportunities for logistics managers, the logistics discipline still remains fun, exciting, and dynamic—characteristics that are reflected in our revision.

WHAT'S NEW IN THIS EDITION?

This edition reflects input from reviewers, adopters, and other interested parties in terms of structure, presentation, and content. Specific modifications include the following:

- This edition welcomes a new coauthor, A. Michael Knemeyer, currently Associate Professor of Logistics at the Fisher College of Business, The Ohio State University. Mike's impressive blend of practical, academic, and consulting experience in logistics and supply chain management provides this edition with fresh insights and perspectives.
- This edition contains one new end-of-chapter case, Case 9-1 ("All-Indian Logistics Services"), and modifications of several other cases. For example, some case content, as well as several discussion questions, have been changed in Cases 7-1 ("Handy Andy, Inc."), 11-1 ("Let There Be Light Lamp Shade Company"), and 14-1 ("Nürnberg Augsburg Maschinenwerke (N.A.M.)").
- Each chapter in this edition has been revised and incorporates new examples and references. For example, Chapter 1's discussion of the globalization of trade reports the average growth rate of world trade between 1991 and 2011 (as opposed to between 1997 and 2007 in the tenth edition). As another example, Chapter 14's discussion of Incoterms reflects the revisions associated with Incoterms 2010, which were effective at the beginning of 2011.
- New content has been added throughout this edition. For example, Chapter 1 now includes a discussion of the rapidly emerging topic of humanitarian logistics. In addition, the "Logistics Activity Measures" section in Chapter 3 contains an expanded discussion of warehousing and inventory management performance measurements. Chapter 6 has added a subsection, "Procurement Portfolio Approach," that highlights Kraljic's Portfolio Matrix.
- Tables and figures containing country and industry data have been either revised or updated. Examples include Table 1-1, "The Cost of the Business Logistics System in Relation to a Country's Gross Domestic Product"; Figure 10-3, "2012 Liberty Mutual Workplace Safety Index Findings"; and Table 12-1, "Infrastructure Statistics in Several Countries."
- The list of Key Terms at the beginning of each chapter has been modified in the eleventh edition, and each key term is defined in the Glossary. New Key Terms in this edition include humanitarian logistics, big data, Logistics Uncertainty Pyramid Model, near-sourcing, and total cost of ownership, among others.
- The end-of-chapter Suggested Readings in the eleventh edition have been revised and over 60 percent of them have been published since 2009.

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supplements that accompany this text. The instructor should visit http://247.pearsoned.com/ for answers to frequently asked questions and for toll-free user support phone numbers. Supplements include the following:

- Instructor's Manual
- PowerPoint Slides

The current edition of *Contemporary Logistics* has been prepared by Paul Murphy and Mike Knemeyer, and they welcome your comments and suggestions at drmurphy@jcu.edu (Paul) and knemeyer_4@fisher.osu.edu (Mike). Paul and Mike gratefully acknowledge the important contributions that the late Donald F. Wood, James C. Johnson, and Daniel L. Wardlow made to earlier editions.

Pearson wishes to thank and acknowledge the following people for their work on the Global Edition:

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PART I

OVERVIEW OF LOGISTICS

Part 1 of *Contemporary Logistics* introduces the many dimensions of the complex and dynamic subject of logistics. Chapter 1 presents an overview of logistics and introduces you to what logistics is and why it is important. The chapter covers the economic impact of logistics and discusses how logistics interacts with other functions, such as marketing, in an organization.

Chapter 2 provides an overview of the general types of information management systems that are applicable across each business function, and it provides examples of how these general types of information systems are specifically applied in logistics management. Chapter 2 also explores the Internet's influence on logistics and looks at some of the challenges associated with information technology.

Chapter 3 discusses the strategic financial outcomes influenced by logistics decisions. It uses the strategic profit model to highlight how logistics activities influence the key corporate financial measures of net income, capital employed, and return on capital employed.

Chapter 4 examines organizational and managerial issues in logistics. The chapter begins by looking at organizational structure and organizational design for logistics. Chapter 4 also discusses select managerial issues in logistics such as productivity, theft and pilferage, and the impact of terrorism on logistics systems.

1 AN OVERVIEW OF LOGISTICS

KEY TERMS

- Big-box retailer
- Co-branding
- Container
- Cost trade-offs
- Disintermediation
- Economic utility
- Form utility
- Humanitarian logistics
- Landed costs
- Logistics
- Marketing channels
- Mass logistics
- Materials management
- Physical distribution
- Place utility
- Possession utility
- Postponement
- Sorting function
- Stock-keeping units (SKUs)
- Stockouts
- Sustainable products
- Systems approach
- Tailored logistics
- Time utility
- Total cost approach

LEARNING OBJECTIVES

- To discuss the economic impacts of logistics
- To define what logistics is
- To analyze the increased importance of logistics
- To discuss the systems and total cost approaches to logistics
- To expose you to logistical relationships within the firm
- To introduce you to marketing channels
- To provide a brief overview of activities in the logistics channel
- To familiarize you with logistics careers

ECONOMIC IMPACTS OF LOGISTICS

Although the logistics discipline today is vastly different than when the first edition of this book was published in the 1970s, one thing that remains constant is the economic impact of logistics. Before defining what logistics is, we believe that it's important to discuss the economic aspects of logistics and you might be surprised at its significant economic impact. From a macroeconomic perspective, Table 1.1 presents logistics costs in relation to gross domestic product (GDP) for a select group of countries. Although absolute and relative logistics costs in relation to GDP vary from country to country, logistics is most definitely an important component in any country's economy.

More specifically, logistics can play an important role in a nation's economic growth and development. For example, a poor transportation infrastructure and high levels of inventory are two key drawbacks that have limited the expansion of Vietnam's economy.[1] In a similar fashion,

[1]No author. "High Logistics Costs Stifle Vietnam's Economic Growth," *eyeforTransport*, February 24, 2009.

Table 1.1 The Cost of the Business Logistics System in Relation to a Country's Gross Domestic Product

Country	Logistics as a Percentage of GDP
United States	8.5
South Africa	12.7
India	13.0
Thailand	15.2
Brazil	15.4
People's Republic of China	17.8
Finland	19.0
Vietnam	22.5

Sources: "South Africa: Logistics costs as percentage of GDP improves," TradeMark SA; http://siteresources.worldbank.org/BRAZILINPOREXTN/Resources/3817166-1323121030855/FreightLogistics.pdf?resourceurlname=FreightLogistics.pdf; "Heavy logistics costs weigh on China's economy: report—Xinhua," English.news.cn; Autocar Professional; "Logistics cost to GDP declines," The Nation; "Vietnam high logistics costs lower businesses' competitiveness," TalkVietnam; http://www.panostaja.fi/index.php?id=150; 24th Annual State of Logistics Report, *Council of Supply Chain Management Professionals*, 2013.

relatively high logistics costs (as a percentage of GDP) in the People's Republic of China (China) continue to restrict the country's economic development, and in particular the high costs of highway transportation have severely constrained the growth of China's e-commerce market.[2]

Apart from the previous examples of macro-level economic impacts, the economic impacts of logistics can affect individual consumers such as you. These impacts can be illustrated through the concept of **economic utility**, which is the value or usefulness of a product in fulfilling customer needs or wants. The four general types of economic utility are possession, form, time, and place, and logistics clearly contributes to time and place utilities.

Possession utility refers to the value or usefulness that comes from a customer being able to take possession of a product. Possession utility can be influenced by the payment terms associated with a product. Credit and debit cards, for example, facilitate possession utility by allowing the customer to purchase products without having to produce cash or a cash equivalent. Likewise, automotive leases allow customers to take possession of a more desirable model than would be possible with conventional automotive loans.

Form utility refers to a product's being in a form that (1) can be used by the customer and (2) is of value to the customer. Although form utility has generally been associated with production and manufacturing, logistics can also contribute to form utility. For example, to achieve production economies (i.e., lower cost per unit), a soft drink company may produce thousands of cases of a certain type of soft drink (e.g., diet cola). You're not likely to purchase diet cola by the thousands of cases (unless you're having a really big social event!) but rather in smaller lot sizes, such as a six- or twelve-pack. Through *allocation*, logistics can break the thousands of cases of diet cola into the smaller quantities that are desired by customers.

Place utility refers to having products available *where* they are needed by customers; products are moved from points of lesser value to points of greater value. Continuing with the diet cola example, place utility is increased by moving the soda from a point of lesser value (e.g., stored in a warehouse) to a point of greater value (e.g., on a supermarket shelf).

Closely related to place utility is **time utility**, which refers to having products available *when* they are needed by customers. It's important to recognize that different products have

[2]Hua Wang, "High Logistics Cost, Toll Road and Institutional Factors Countermeasure in China," *Journal of Modern Accounting and Auditing* 7, no. 11 (2011): 1301–1306.

different sensitivities to time; three-day late delivery of perishable items likely has more serious consequences than three-day late delivery of nonperishable items.

Simultaneously achieving possession, form, place, and time utility goes a long way toward facilitating—but not guaranteeing—customer satisfaction. Consider the experience of a former student who placed an online order of Valentine's Day flowers for his out-of-state girlfriend. The seller facilitated possession utility by allowing the student to pay by credit card, and a healthy arrangement of the correct bouquet (form utility) arrived at the girlfriend's residence on Valentine's Day (place and time utility). Although the seller provided possession, form, place, and time utility, the buyer was quite unsatisfied with his purchase. The problem: The greeting card that accompanied the flowers had a wrong name for the girlfriend (but the right name for the boyfriend)!

LOGISTICS: WHAT IT IS

Now that you have been introduced to select economic impacts of logistics, it's important to define what **logistics** is. This book adopts the current definition promulgated by the Council of Supply Chain Management Professionals (CSCMP), one of the world's most prominent organizations for logistics professionals. According to the CSCMP, "Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements."[3]

Let's analyze this definition in closer detail. First, logistics is part of supply chain management. We'll talk about supply chains and supply chain management in greater detail in Chapter 5, but the key point for now is that logistics is part of a bigger picture in the sense that the supply chain focuses on coordination among business functions (such as marketing, production, and finance) within and across organizations. The fact that logistics is explicitly recognized as part of supply chain management means that logistics can affect how well (or how poorly) an individual firm—and its associated supply chain(s)—can achieve goals and objectives.

The CSCMP definition also indicates that logistics "plans, implements, and controls." Of particular importance is the word *and*, which suggests that logistics should be involved in all three activities—planning, implementing, controlling—and not just one or two. Some suggest, however, that logistics is more involved in the implementation than in the planning of certain logistical policies.[4]

Note that the CSCMP definition also refers to "efficient and effective forward and reverse flows and storage." Broadly speaking, effectiveness can be thought of as, "How well does a company do what it says it's going to do?" For example, if a company promises that all orders will be shipped within 24 hours of receipt, what percentage of orders are actually shipped within 24 hours of receipt? In contrast, efficiency can be thought of as how well (or poorly) company resources are used to achieve what a company promises it can do. For instance, some companies use premium or expedited transportation services—which cost more money—to cover for shortcomings in other parts of their logistics systems.

With respect to forward and reverse flows and storage, for many years logistics focused only on forward flows and storage, that is, those directed *toward* the point of consumption. Increasingly, however, the logistics discipline has recognized the importance of reverse flows and storage (*reverse logistics*), that is, those that *originate* at the point of consumption. Although the majority of the discussion in this book focuses on forward logistics, many companies today recognize the tactical and strategic implications of reverse logistics.[5] Indeed, reverse logistics

[3]www.cscmp.org
[4]Paul R. Murphy and Richard F. Poist, "Socially Responsible Logistics: An Exploratory Study," *Transportation Journal* 41, no. 4 (2002): 23–35.
[5]M. Jose Alvarez-Gil, Pascual Berrone, F. Javier Husillos, and Nora Lado, "Reverse Logistics, Stakeholders' Influence, Organizational Slack, and Managers' Posture," *Journal of Business Research* 60, no. 5 (2007): 463–473.

continues to grow in importance as individual companies, and select supply chains, recognize it as an opportunity for competitive advantage.[6]

The CSCMP definition also indicates that logistics involves the flow and storage of "goods, services, and related information." Indeed, in the contemporary business environment, logistics is as much about the flow and storage of information as it is about the flow and storage of goods. The importance of information in contemporary logistics is captured by Fred Smith, CEO and chairman of FedEx (a leading logistics service provider), who believes that "information about the package is as important as the package itself."[7] Furthermore, social media such as Facebook (launched in 2004), Twitter (launched in 2006), and LinkedIn (launched in 2007) are becoming key informational tools in contemporary logistics management.

Finally, the CSCMP definition indicates that the purpose of logistics is "to meet customer requirements." This is important for several reasons, with one being that logistics strategies and activities should be based on customer wants and needs, rather than the wants, needs, and capabilities of manufacturers or retailers. Advances in information technology have facilitated, and continue to facilitate, an understanding of customer wants and needs, and these technological advances increasingly allow for interactive communication with customers—a key to meeting customer requirements.

A second reason for the importance of meeting customer requirements is the notion that because different customers have different logistical needs and wants, a one-size-fits-all logistics approach (**mass logistics**)—in which every customer gets the same type and levels of logistics service—will result in some customers being overserved while others are underserved. Rather, companies should consider **tailored logistics** approaches, in which groups of customers with similar logistical needs and wants are provided with logistics service appropriate to these needs and wants.[8]

The principles in this textbook are generally applicable not only to for-profit situations, but also to governmental and not-for-profit situations. From a governmental perspective, logistics is quite germane to the armed forces, which shouldn't be surprising, given that logistics was first associated with the military. Consider, for example, the potential consequences of a supply chain disruption—a challenge faced by many for-profit organizations—in a war zone. For example, the United States military has been forced to shift supply routes to support its troops in Afghanistan whenever Pakistan closes its border crossings into Afghanistan.[9]

A community food bank provides one example of the relevance of logistics to not-for-profit situations. As an example, the Food Bank of New York City is responsible for delivering nearly 75 million pounds of food annually to more than 1,000 food assistance programs such as homeless shelters and food pantries. From a logistical perspective, the Food Bank of New York City is responsible for collecting, storing, repacking, and distributing food from its 90,000 square-foot warehouse.[10]

Furthermore, **humanitarian logistics** represents an emerging application of logistics to not-for-profit situations. Briefly, humanitarian logistics can be defined as the process and systems involved in mobilizing people, resources, skills, and knowledge to help people who have been affected by either a natural or a human-made disaster.[11] For example, natural disasters such as a catastrophic earthquake require food and medicinal supplies to be located, collected, transported, and distributed—and sooner, rather than later. Because of the increasing frequency (and severity) of disasters over the past 50 years, humanitarian logistics is likely to be an important topic into the foreseeable future.

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[6]C. Clifford Defee, Terry Esper, and Diane Mollenkopf, "Leveraging Closed-Loop Orientation and Leadership for Environmental Sustainability," *Supply Chain Management: An International Journal* 14, no. 2 (2010): 87–98.
[7]Jonathan Reiskin, "Carriers Invest in Web Sites, Software, Networks," *Transport Topics,* May 8, 2006, 10.
[8]Joseph B. Fuller, James O'Conor, and Richard Rawlinson, "Tailored Logistics: The Next Advantage," *Harvard Business Review* 71, no. 3 (1993): 87–98.
[9]Agency Group 09, "Military Logistics Strained, but Healthy, Official Says," *FDCH Regulatory Intelligence Database*, January 10, 2012.
[10]www.foodbanknyc.org
[11]Luk N. Van Wassenhove, "Humanitarian Aid Logistics: Supply Chain Management in High Gear," *Journal of the Operational Research Society* 57 (2006): 475–489.

THE INCREASED IMPORTANCE OF LOGISTICS

The formal study of business logistics, and predecessor concepts such as traffic management and physical distribution, has existed since the second half of the twentieth century. Quite frankly, from approximately 1950 to 1980, limited appreciation was shown for the importance of the logistics discipline. Since 1980, however, increasing recognition has been given to business logistics, in part because of tremendous—and rapid—changes in the discipline and several key reasons are discussed next.

A Reduction in Economic Regulation

During the 1970s and the 1980s, widespread reductions in economic regulation (commonly referred to as *deregulation*) relaxed government control of carriers' rates and fares, entry and exit, mergers and acquisitions, and more. These controls were particularly onerous in the U.S. transportation industry in the sense that price competition was essentially nonexistent, and customers were pretty much forced to accept whatever service the carriers chose to provide. This meant that logistics managers had relatively little control over one of the most important cost components in a logistics system.

Reductions in economic regulation in the U.S. airfreight, railroad, and trucking industries allowed individual carriers flexibility in pricing and service. This flexibility was important to logistics for several reasons. First, it provided companies with the ability to implement the tailored logistics approach discussed earlier, in the sense that companies could specify different logistics service levels, and prices could be adjusted accordingly. Second, the increased pricing flexibility allowed large buyers of transportation services to reduce their transportation costs by leveraging large amounts of freight with a limited number of carriers.

Although the preceding discussion has focused on lessened economic regulation in the United States, it appears that deregulation has had similar effects in other countries. For example, lessened economic regulation of transportation among European countries has resulted in lower prices for truck shipments in these countries.[12] Likewise, privatization of commercial airports has been found to improve their operational efficiency relative to government owned and/or operated airports.[13]

Changes in Consumer Behavior

A common business adage suggests that "change is the only constant." Although changes in consumer behavior are commonly the purview of the psychology and marketing disciplines, such changes have important logistical implications as well. Several examples of changes in consumer behavior (customized customer, changing family roles, and rising customer expectations) and their possible logistical implications are discussed next.

The *customized customer* signifies that the customer desires a product offering that is highly tailored to the customer's exact preferences. One approach for addressing the customized customer is through mass customization, which refers to the ability of a company to deliver highly customized products and services that are designed to meet the needs and wants of individual segments or customers. The customized customer will not accept a "one size fits all" approach, and this means that logistics systems must be flexible rather than rigid. As an example, logistics service providers such as FedEx and UPS offer a variety of delivery options to prospective customers. FedEx and UPS customers can choose same-day delivery, next-day delivery by noon, next-day delivery by the close of business,

[12]Francine LaFontaine and Laura Malaguzzi Valeri, "The Deregulation of International Trucking in the European Union: Form and Effect," *Journal of Regional Economics* 35, no. 1 (2009): 19–44.
[13]Tae H. Oum, Jia Yan, and Chunyan Yu, "Ownership Forms Matter for Airport Efficiency: A Stochastic Frontier Investigation of Worldwide Airports," *Journal of Urban Economics* 64, no. 2 (2008): 422–435.

second-day delivery by noon, among others. As a general rule, the earlier the delivery time, the more expensive the transportation cost.

In terms of *changing family roles*, 40 years ago less than 45 percent of U.S. adult women were in the workforce; today, by contrast, approximately 60 percent are in the working world.[14] Moreover, approximately 30 percent of U.S. children live in a single-parent household. One consequence of these changing family roles has been an increasing emphasis on the convenience associated with a family's grocery shopping experiences. This convenience is manifested in various ways to include extended store hours, home delivery of purchased items, and ready-to-eat/ready-to-cook foods, and each of these has logistics-related implications. With extended store hours—some stores are now open 24 hours—retailers must address issues such as the optimal delivery times for replenishment trucks and when to replenish merchandise. For example, it wouldn't be a good idea for a 24-hour grocery store to replenish the shelves when its stores are crowded with customers.

Although home delivery could be convenient to the purchaser, the time-sensitive nature of grocery products means that delivery should be made when the purchaser is at home. As such, scheduling home deliveries to coincide with the purchaser's availability is paramount to avoiding dissatisfied customers.[15] Finally, the growth in ready-to-eat/ready-to-cook foods means that some food processors have added high-volume cooking systems at their production facilities. From a logistics perspective, food processors continue to experiment with packaging alternatives that will extend the shelf life of ready-to-cook foods.

As for *rising customer expectations*, it should come as no surprise that customer expectations tend to increase through time, which means that a satisfactory level of performance in the past might not be considered as so today. An excellent example of rising customer expectations is provided by Toyota Motor Company's North American Parts Operations. In an effort to retain customers and to reduce losing customers to other automotive repair facilities, Toyota now offers same-day delivery (rather than one-day delivery) of automotive parts to certain Toyota dealerships located in major metropolitan areas. This same-day delivery has been facilitated by a redesign of Toyota's automotive parts distribution network.[16]

Technological Advances

Prior to the start of every academic year, Beloit College in Wisconsin releases its annual Mindset list that details the worldview of incoming first-year college students.[17] The class of 2017, which assumes a 1995 birth date, is particularly noteworthy because it has never lived in the non-Internet world. Tremendous technological advances during the course of your lifetime—from desktop computers to tablets, from second-generation mobile phones to fourth-generation mobile phones—have profoundly influenced business management and, by extension, business logistics. The following paragraphs will discuss several examples of the logistical impacts of technological advances.

Technological advances have influenced channel design by allowing companies to offer an alternate distribution channel (or alternate distribution channels) to already existing channels. In some cases, this alternate channel is direct (i.e., no intermediaries between the producer and final customer) in nature because the final customer orders directly from the producer rather than through an intermediary. The removal of intermediaries between producer and consumer—called **disintermediation**—can clearly affect the design of logistics systems in the sense that there could be changes in both the number and location of fixed facilities such as

[14]http://www.bls.gov/spotlight/2011/women/pdf/women_bls_spotlight.pdf
[15]Jane Hiback, "Alternative Retailing Strategies," *Natural Food Merchandiser*, August 2011, 18–19.
[16]http://toyotadriverseat.com/pr/tds/same-day-parts-deliveries-help-230692.aspx
[17]http://www.beloit.edu/mindset/

warehouses and distribution centers. In addition, the logistical considerations of a retailer's online store (e.g., orders from numerous customers; orders for small quantities) are quite different from that retailer's brick-and-mortar stores (e.g., orders from a defined customer base; orders in larger quantities).[18]

Technological advances can also improve the productivity of the order picking process, which we'll discuss in greater detail in Chapter 7. Order picking traditionally involved paper pick tickets that listed the particular item(s) and quantity to be picked—and not necessarily the item's location in a facility. Locating the items to be picked could be quite time consuming, and paper picking often resulted in picking errors in part because of illegible pick orders. Today, by contrast, order picking can utilize radio frequency (RF) devices, voice-directed picking, as well as robotic picking. Although these technological picking advances are more costly than paper picking, they can lead to substantial improvements in picking efficiency. For example, RF terminals can reduce pick errors by approximately 60 percent compared to paper picking.[19]

Shipment tracking provides another example of how technological advances have impacted logistics management. When one of the authors worked for a U.S. trucking company in the early 1980s, shipment tracking was a time-consuming, labor-intensive process that sometimes did not yield a location for the shipment in question. If we fast-forward to today, global positioning systems can provide real-time location information about a shipment (sometimes to within *10 feet* of its exact location), as well as providing information about the vehicle's temperature, humidity, and vibrations. Such information can be especially important to pharmaceutical and health-care companies.[20]

The Growing Power of Retailers

Another influence on logistics involves the growing power of retailers relative to manufacturers in channels of distribution. Indeed, a 2011 study indicated that both manufacturers and retailers agree that retailers wield greater power in the manufacturer–retailer arrangement, and both parties agree that the retailers' power will increase in the future.[21] So-called **big-box retailers**—stores with large amounts of both floor space and products for sale—such as Walmart, Costco, and Dick's Sporting Goods provide an excellent example of the growing power of retailers.

Many big-box retailers explicitly recognize superior logistics as an essential component of their corporate strategies, and because of this, their logistical practices are often viewed as a barometer for emerging logistics trends. In the 1990s, for example, Walmart and Warner-Lambert were the first two companies to explore collaborative planning, forecasting, and replenishment (CPFR), a practice in which trading partners share planning and forecasting data to better match up supply and demand. Since then, there have been hundreds of successful (e.g., increased sales, reduced inventory levels) CPFR initiatives, although, to be fair, not all CPFR initiatives have been successful.

Big-box retailers have also been trendsetters with respect to environmental and social issues in logistics. For example, Target is committed to reducing its carbon footprint and does so with transportation by choosing the proper transport modes, reducing the number of transportation miles that freight is moved, and improving vehicle loading practices by maximizing space utilization.[22] In a similar fashion, two of Best Buy's sustainability goals for 2020 are to recycle one billion pounds of consumer goods and reduce its carbon footprint by 20 percent (relative to 2009 performance).[23]

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[18]Shelly Banjo, "Wal-Mart's E-Stumble with Amazon," *The Wall Street Journal*, June 18, 2013, B1.
[19]Kristi Montgomery, "Tips for Quicker Product Picking," *Multichannel Merchant*, December/January 2012, 28–29.
[20]Ian Putzger, "Apps Mania," *CT&L*, April 2012, 32–33.
[21]No author, "Kantor Study Dissects Category Management," *Drug Store News*, June 27, 2011, 30–34.
[22]http://hereforgood.target.com/environment/efficient-operations/
[23]http://sustainability.bby.com/management-approach/product-stewardship

Globalization of Trade

Although countries have traded with each other for thousands of years, globalization's impact is greater today than ever before. Consider that world trade grew at an average annual rate of approximately 5.5 percent between 1991 and 2011, including the worldwide economic slowdown in 2008 and 2009.[24] Looking forward, the annual growth in world trade is forecast to be approximately 3.8 percent through 2017.[25] Many factors, such as rising standards of living and multicountry trade alliances, have contributed to the growth of global trade; logistics has played a key role, too. Indeed, the shipping **container**—a uniform sealed reusable metal box in which goods are shipped—is often championed as an important catalyst for the growth in global trade.

We'll look at international logistics in much greater detail in Chapter 14, but for now one should recognize that international logistics is much more challenging and costly than domestic logistics. With respect to challenges, the geographic distances between buyers and sellers are often greater (which may translate into longer transit times), and monitoring logistics processes is sometimes complicated by differences in business practices, culture, and language. As for costs, the greater geographic distances tend to result in higher transportation costs, and documentation requirements can be quite costly as well.

THE SYSTEMS AND TOTAL COST APPROACHES TO LOGISTICS

Logistics is a classic example of the systems approach to business problems. From a company-wide perspective, the **systems approach** indicates that a company's objectives can be realized by recognizing the mutual interdependence of the major functional areas of the firm, such as marketing, production, finance, and logistics. One implication of the systems approach is that the goals and objectives of the major functional areas should be compatible with the company's goals and objectives. This means that *one logistics system does not fit all companies* because goals and objectives vary from one firm to another. As such, the logistics system of an organization that emphasizes customer satisfaction is likely different from the logistics system of an organization that emphasizes cost minimization.

A second implication is that decisions made by one functional area should consider the potential implications on other functional areas. For example, one consequence of pursuing the marketing concept, which focuses on satisfying customer needs and wants, is often a marked increase of the number of **stock-keeping units (SKUs)** or line items of inventory (each different type or package size of a good is a different SKU) offered for sale by many companies. An increased number of SKUs provides customers with more choices, which today's customer often wants.

Alternatively, from a logistics perspective, the proliferation of SKUs creates challenges such as more items to identify, more items to store, and more items to track, which increases the chances of mistakes—which today's customers don't like. An example of misidentification involves a consumer products company that mistakenly assigned the *same product code* to a 3-pack, 6-pack, and 12-pack of a particular product it sold. Imagine the reaction of the customer who ordered a 3-pack of the product, only to receive a 6-pack or a 12-pack of it!

Just as the major functional areas of a firm should recognize their interdependence, so too should the various activities that comprise the logistics function (what we'll call *intrafunctional logistics*). The logistics manager should balance each logistics activity to ensure that none is stressed to the point where it becomes detrimental to others.

This can be illustrated by referring to Figure 1.1, which indicates that business logistics is made up of **materials management** (movement and storage of materials into a firm) and **physical distribution** (storage of finished product and movement to the customer). Intrafunctional

[24]http://www.wto.org/english/news_e/pres12_e/pr658_e.htm
[25]HSBC Global Connections, "Trade Forecast Update: Global," February 2012.

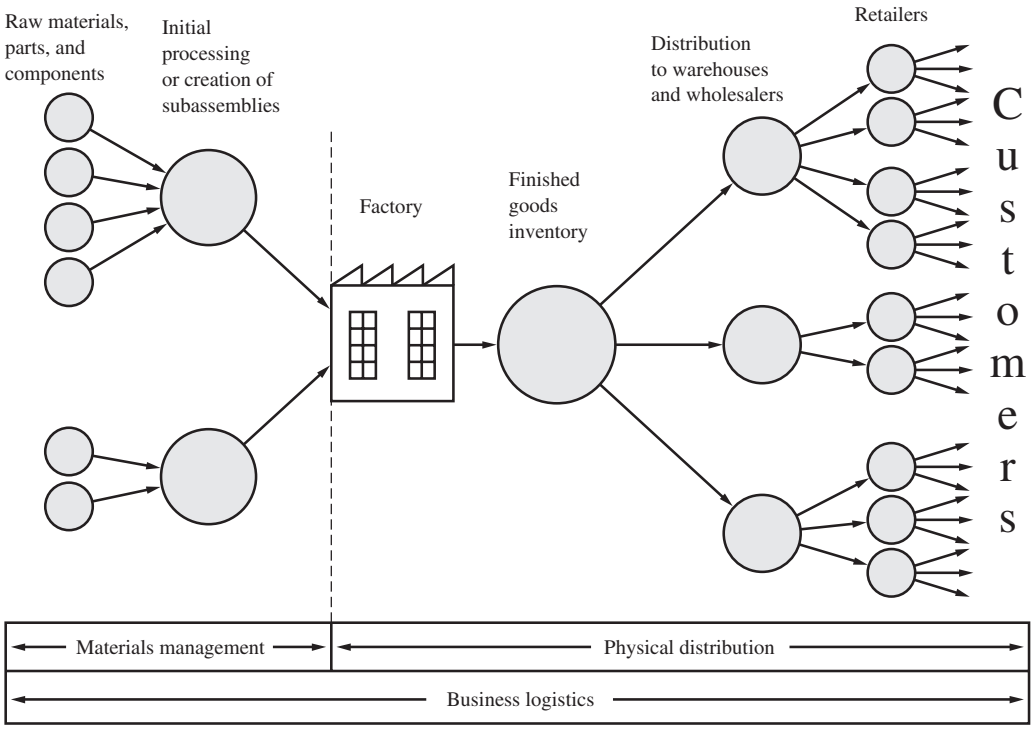

FIGURE 1.1 Control Over the Flow of Inbound and Outbound Movements
In this drawing, the circles represent buildings where inventories are stored, and the lines with arrows represent movement performed by carriers, a stop-and-start process. Current thought deals more with flows, possibly in different volumes and at different speeds, but without the inventory standing still. The supply chain extends to both the left and right of this diagram and includes the suppliers' suppliers and the customers' customers.

logistics attempts to coordinate materials management and physical distribution in a cost-efficient manner that supports an organization's customer service objectives.

Materials management and physical distribution can be coordinated in many ways. One way is by using the same truck to deliver materials and component parts and to pick up finished goods. Although this may appear to be little more than common sense—and the authors believe that *common sense is one of the keys to being an effective logistics manager*—consider the case of the company that used the same trucking company to deliver materials and parts to one of its production plants as well as to take finished products from the facility. Unfortunately, one truck would arrive early in the morning to deliver the materials and parts, and another truck would arrive in the late afternoon to pick up the finished products. How could this happen? Quite simply: The inbound logistics group and the outbound logistics group were unaware that they were using the same trucking company—the two groups never communicated even though they worked in the same building!

Logistics managers use the **total cost approach** to coordinate materials management and physical distribution in a cost-efficient manner. This approach is built on the premise that all relevant activities in moving and storing products should be considered as a whole (i.e., their total cost), not individually. Use of the total cost approach requires an understanding of **cost trade-offs**; in other words, changes to one logistics activity cause some costs to increase and others to decrease. Importantly, an understanding of logistical cost trade-offs recognizes that the costs of certain logistical activities generally move in opposite directions. As an example, a decrease in transportation costs is often associated with an increase in warehousing costs.

The key to the total cost approach is that all relevant logistical cost items are *considered simultaneously* when making a decision. For example, expedited transportation, such as air freight, will increase a company's transportation costs. At the same time, expedited transportation leads to a faster order cycle, which allows the receiving company to hold lower levels of inventory, thus reducing both its inventory carrying costs and warehousing costs. The total cost approach evaluates if the decreased inventory and warehousing costs are greater than the increased costs of expedited transportation. If so, the company might consider using expedited transportation (assuming that customer satisfaction isn't negatively impacted), because the total logistics costs (consisting, in this example, of transportation, inventory, and warehousing costs) are less than the total costs of the existing system.

When used in the logistics decision-making process, the total cost concept approach forms what is commonly called the *total logistics concept*. This concept is unique not because of the activities performed, but because of the integration of all activities into a unified whole that seeks to minimize distribution costs in a manner that supports an organization's customer service objectives. The total logistics concept can be extended to include a firm's suppliers and customers, such as in supply chain management, which will be covered in Chapter 5.

LOGISTICAL RELATIONSHIPS WITHIN THE FIRM

From a companywide perspective, the system and total cost approaches to logistics require an understanding of logistics and its relationships with other functional areas. Because Chapter 6 is devoted specifically to procurement (purchasing), our discussion here focuses on logistical relationships with finance, production, and marketing.

Finance

The finance staff is often charged with the responsibility of allocating the firm's funds to projects desired by the various operating departments. As such, the finance department is often instrumental in approving capital budgeting decisions that affect logistics, such as the acquisition of materials handling equipment (e.g., forklifts) and packaging equipment (e.g., a shrink-wrap machine). In such situations, finance personnel may decide to either purchase or lease the relevant equipment, assuming they have approved the decision to acquire it.

Inventory is another area where finance and logistics can interact. A basic challenge for the two areas is that the finance department often measures inventory in terms of its cost or value in dollars, whereas logistics tends to measure inventory in terms of units. The differing ways of measuring inventory can create potential friction between the two groups, as illustrated in the following example. From a cash flow perspective, the finance department might prefer to sell 2 boxes of hair dryers worth $1,000 dollars than to sell 15 boxes of hair shampoo worth $900. Alternatively, from a productivity perspective such as the number of boxes handled per worker, the logistics department might prefer selling the 15 boxes of hair shampoo rather than the 2 boxes of hair dryers.

In addition, in times of inflation, identical items added to inventory at different times means that each unit has a different cost, and even though inventory levels are not affected, it makes a difference whether an organization uses historic cost or current value as an indicator of the inventory's total value. Or, consider the concept of depreciation, which reduces the monetary value of inventory by a certain amount per period of time, even though the actual quantity of inventory may be unchanged. Indeed, the authors have consulting experiences with companies that showed a particular SKU to be fully depreciated, with an accounting value of $0—while the companies' warehousing facilities contained several hundred units of physical inventory of the particular SKU.

Production

One of the most common interfaces between production and logistics involves the length of production runs. In many cases, the production people favor long production runs of individual products because this allows the relevant fixed costs to be spread over more units, thus

resulting in a lower production cost per unit. Having said this, long production runs generate large amounts of inventory, and it is often the logistician's responsibility to store and track the inventory. It's generally much easier to store and track five units of a product that it is to store and track 500 units of the product.

Another consideration with long production runs is that sometimes excess inventory for particular products occurs because of limited (or no) demand for them. At a minimum, these products add to a company's inventory carrying costs and also take up space that could be used to store other products. Slow-selling (or nonselling) products may also increase a company's handling costs, as illustrated by a situation in which forklift drivers would periodically move 150 refrigerators from one warehouse area to another, just to ensure that the company's managers would not see the refrigerators sitting in the same place for an extended period of time! You may find it difficult to believe that these 150 refrigerators were moved throughout the warehouse for nearly five years before managers were alerted to the behavior.

Increasing utilization of the **postponement** concept (the delay of value-added activities such as assembly, production, and packaging until the latest possible time[26]) also influences the interface between production and logistics. More specifically, some value-added activities (e.g., case packing, case labeling) that were traditionally performed at a production plant are now performed in warehousing facilities. As a result, warehousing facilities are adding new types of equipment and being configured differently to allow specific value-added activities to take place.

Marketing

Contemporary marketing places a heavy emphasis on customer satisfaction, and logistics strategies can facilitate customer satisfaction through reducing the cost of products, which can translate into lower prices as well as bringing a broader variety of choices closer to where the customer wishes to buy or use the product. Logistics strategies offer a unique way for a company to differentiate itself among competitors, and logistics now offers an important route for many firms to create marketing superiority. The following discussion about the interactions between logistics and marketing focuses on the marketing mix, sometimes referred to as the *four Ps* of marketing (place, price, product, and promotion).

PLACE DECISIONS Decisions regarding place involve two types of networks, namely, logistics and the marketing channel (which is discussed in greater detail later in this chapter). Logistics decisions concern the most effective way to move and store the product from where it is produced to where it is sold. An effective logistics system can provide positive support by enabling the firm to attract and utilize what it considers to be the most productive channel and supply chain members. Channel members are frequently in a position to pick and choose which manufacturer's products they wish to merchandise. If a manufacturer is not consistently able to provide a certain product at the right time, in the right quantities, and in an undamaged condition, the channel members may end their relationship with the supplier or cease active promotion of the supplier's product.

From a marketing perspective, place decisions may also involve new strategies for reaching customers. A popular contemporary marketing strategy involves **co-branding**, which refers to an alliance that allows customers to purchase products from two or more name-brand retailers at one store location. Examples of co-branding include Starbucks coffee shops located with Marriott hotels, Subway restaurants located within some Walmart stores, and colocated Dunkin' Donuts and Baskin-Robbins stores. From a marketing perspective, co-branding offers potential customers convenience by allowing for one-stop shopping as well the opportunity to purchase

[26]John J. Coyle, Edward J. Bardi, and C. John Langley, *The Management of Business Logistics: A Supply Chain Perspective,* 7th ed. (Mason, OH: South-Western, 2003).

brand-name, rather than private-label (proprietary), products.[27] From a logistical perspective, one decision involves product delivery to the particular retail locations. Should, for example, each co-branding party deliver its respective products to a particular location, or should the co-branding parties co-load vehicles to minimize the number of deliveries that arrive at a particular location? While the former might result in higher delivery costs because of multiple deliveries, the latter requires a higher degree of coordination between the co-branding parties.

PRICE DECISIONS A key price-related decision for marketers involves how a product's transportation costs should be reflected in its selling price, and this has proved to be a particularly vexing issue for some online merchants. For example, should a company's selling price reflect its product's **landed costs**, which refer to the price of a product at the source plus transportation costs to its destination? On the one hand, a selling price that is based on a product's landed cost allows the seller to offer "free" delivery of the product to prospective customers, because the transportation costs associated with delivery are captured in the landed cost. On the other hand, a selling price that is based on a product's landed cost could result in a substantial increase in a product's selling price, and a higher selling price tends to decrease buyer demand for most products. One way that some online merchants address this conundrum is to require a minimum order amount (e.g., $50) to qualify for "free" delivery.

In addition to transportation considerations, logistics managers may play an important role in product pricing. They are expected to know the costs of providing various levels of customer service and therefore should be consulted to determine the trade-offs between costs and customer service. Because many distribution costs produce per unit savings when larger volumes are handled, the logistics manager can also help formulate the firm's quantity discount pricing policies.

PRODUCT DECISIONS A number of potential interfaces are possible between marketing and logistics in terms of product decisions. For example, as noted earlier, the marked increase in product offerings—which allows for more customer choice—creates logistical challenges in terms of identification, storage, and tracking.

Another product interface between marketing and logistics involves the amount of particular SKUs to hold. Marketers often prefer to carry higher quantities of particular items because this reduces the likelihood of **stockouts** (being out of an item at the same time there is demand for it). However, from a logistics perspective, higher quantities of inventory (1) necessitate additional storage space and (2) increase inventory carrying costs.

Product design, which is often the purview of marketers, can also have important implications for logistical effectiveness and efficiency. For example, long-necked glass beverage containers might be more distinctive than aluminum cans; however, from a logistics perspective, long-necked bottles take up more space and are more likely to be damaged than aluminum cans.

In addition, marketers' growing emphasis on offering **sustainable products**—products that meet present needs without compromising the ability of future generations to meet their needs—can also impact logistical decisions. Consider, for example, *fair trade products*, or those that guarantee a better deal for producers in the developing world through fair and stable prices as well as teaching farming methods that are environmentally sustainable.[28] From a marketing perspective, customer demand for fair trade products such as coffee or chocolate has resulted in some companies establishing distinct fair trade brands.[29] From a logistical perspective, an organization's commitment to selling fair trade products, such as coffee or chocolate, may result in changed sourcing requirements for the necessary raw materials.

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[27]Marilyn Odesser-Torpey, "Co-Branding: Positives and Pitfalls," *Convenience Store Decisions*, April 2012, 46–48.
[28]Derek Townsend, "Fair Trade Future?" *Food Service*, June 2008, 27.
[29]No author, "More Chocolate Manufacturers Moving to Ethical Sourcing," *Candy Industry*, April 2010, 10–12.

PROMOTION DECISIONS Many promotional decisions require close coordination between marketing and logistics. One important situation concerns the availability of highly advertised products, particularly when a company is running pricing campaigns that lower the price of certain items. Few things are more damaging to a firm's goodwill than being stocked out of items that are heavily promoted in a sales campaign. In addition, in some instances imbalances of product supply and demand can be viewed as *bait and switch tactics*—that is, enticing customers with the promises of a low-priced product, only to find that it is unavailable, but that a higher-priced substitute product is readily available.

Moreover, once a decision is made to promote the introduction of a new product, the logistics staff assumes responsibility for having the product in place on the scheduled release date—not earlier, not later. The complexity of so doing is well illustrated by looking at some of the activities associated with the release of *Harry Potter and the Deathly Hallows*, the final book in the *Harry Potter* series, which went on sale at midnight on July 21, 2007. The book's author, J.K. Rowling, finished writing *Harry Potter and the Deathly Hallows* in Edinburgh, Scotland, in early 2007. Mark Seidenfeld, who was in charge of bringing the manuscript to New York to begin the publishing process, made sure the manuscript was safe by *sitting on it* during his airplane flight to the United States! Barnes and Noble, a large book retailer, hired an outside security firm to guard the padlocked trucks that contained its copies of the *Deathly Hallows*.[30]

MARKETING CHANNELS

Another concept that is useful to studying the marketing relationships between and among firms is to look at **marketing channels**, which refer to "a set of institutions necessary to transfer the title to goods and to move goods from the point of production to the point of consumption and, as such, which consists of all the institutions and all the marketing activities in the marketing process."[31] The principal, traditional institutions in the marketing channel are the manufacturer, the wholesaler, and the retailer. These channel members work together in several different channel arrangements—*ownership channel*, *negotiation channel*, *financing channel*, *promotions channel*, and *logistics channel*—and we'll look more closely at how manufacturers, wholesalers, and retailers interact in these five channels.

The *ownership channel* covers movement of the title to the goods, and the goods themselves might not be physically present or even exist. If a good is in great demand, one might have to buy it before it is produced, such as a commissioned piece of art or a scarce new consumer product. Sometimes, a product will not be made until there are sufficient financial commitments, which is often the case with new models of commercial airplanes. The party owning the good almost always has the right to trade or sell it and bears the risks and costs associated with having it in inventory. Also, while owning the good, one can use it as collateral for a loan, although this may place some restrictions on its use or movement.

The *negotiations channel* is the one in which buy and sell agreements are reached. This could include transactions face-to-face or by telephone, e-mail, electronic data interchange, or almost any other form of communication. In many situations, no actual negotiations take place; the price for the product is stated, and one either buys at that price or does not. In some trades, auctions are used; in others, highly structured, organized trading takes place, such as markets for some commodities. One part of the negotiations covers how activities in the other channels are to be handled. For example, each buying party will specify the point and time of delivery and the point and time of payment. Even packaging design may be negotiated. (An old Henry Ford story is that suppliers of some parts were directed to ship in wooden crates built of good lumber and to

[30]Lev Grossman, Andrea Sachs, Kristine Dell, and Laura Fitzpatrick, "Harry Potter and the Sinister Spoilers," *Time*, July 9, 2007, 49–52.
[31]American Marketing Association Dictionary, www.marketingpower.com