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Contemporary Logistics

Twelfth Edition

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

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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 several new end-of-chapter cases, such as Cases 9.1 ("All-Indian Logistics Services"), 10.1 ("Fresh Produce Cross-docking Facility"), and 11.1 ("The Adelaide Dairy Company"). In addition, some content has been changed in Case 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 end of each chapter has been modified, 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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- 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@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.

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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

Learning Objectives

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

Learning Objective 1.1

ECONOMIC IMPACTS OF LOGISTICS

Although the logistics discipline today is vastly different from what it was like 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 it is important to discuss the economic aspects of logistics; 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, 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; in particular, the high costs of highway transportation have severely constrained the growth of China's e-commerce market.¹ In a similar fashion, the growth of e-commerce sales in India is challenged by logistical inefficiencies to include poor roads and inferior transportation equipment.²

Apart from the previous examples of macrolevel 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; 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,

¹ 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.

² Sean McLain and Newley Purnell, "Indian Startups Vie to Win E-Commerce Battle," *The Wall Street Journal*, October 25, 2015.

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
Brazil	12.0
South Africa	12.8
India	13.0
People's Republic of China	18.0
Vietnam	25.0
Indonesia	27.0

Sources: Various country reports.

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 is important to recognize that different products have 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 timely utility, the buyer was quite unsatisfied with his purchase. The problem: The greeting card that accompanied the flowers had the 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 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

Learning Objective 1.2

³ www.cscmp.org/about-us/supply-chain-management-definitions

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 supply chain management 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. 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. Indeed, reverse logistics continues to grow in importance as individual companies, and select supply chains, recognize it as an opportunity for competitive advantage.⁴ One illustration of this is FedEx Corporation's (a leading logistics service provider) 2015 acquisition of GENCO, a logistics service provider with long-standing expertise in reverse logistics.

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, who believes that “information about the package is as important as the package itself.”⁵ Furthermore, an important contemporary logistics and supply chain axiom involves the ability to substitute information for inventory;⁶ for example, the cash register at many contemporary retailers also tracks what and when products are being purchased.

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. Contemporary information technology facilitates an understanding of customer wants and needs and this technology allows for real-time 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.⁷

⁴C. 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.

⁵Quote by Fred Smith, CEO and chairman of FedEx.

⁶David Ross, *Distribution Planning and Control: Managing in an Era of Supply Chain Management*, 3rd ed. (New York: Springer, 2015).

For example, one particular retailer might require all its suppliers to route products through the retailer's distribution centers while another retailer might require its suppliers to send products directly to the retailer's stores.

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 the potential consequences of a supply chain disruption. For example, in 2015 Russia officially closed the Northern Distribution Network—consisting of railway and road links—that provided a key logistics route into Afghanistan for countries that were fighting the Taliban insurgency.⁸

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.⁹

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 man-made disaster.¹⁰ For example, natural disasters such as a catastrophic earthquake require food and medical 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.

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. Several key reasons for this are discussed next.

A Reduction in Economic Regulation

During the 1970s and 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.

⁷Joseph B. Fuller, James O'Connor, and Richard Rawlinson, "Tailored Logistics: The Next Advantage," *Harvard Business Review* 71, no. 3 (1993): 87–98.

⁸<http://www.silkroadreporters.com/2015/06/19/central-asia-will-miss-the-northern-distribution-network>

⁹www.foodbanknyc.org

¹⁰Luk N. Van Wassenhove, "Humanitarian Aid Logistics: Supply Chain Management in High Gear," *Journal of the Operational Research Society*, 57 (2006): 475–489.

Learning Objective 1.3

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.¹¹ Likewise, privatization of commercial airports has been found to improve their operational efficiency relative to government-owned and/or government-operated airports.¹²

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. Going forward, mass customization is likely to be facilitated by advances in **3D printing** (additive manufacturing), a process of making three-dimensional solid objects from a digitized file.¹³

Furthermore, 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; customers can choose same-day delivery, next-day delivery by noon, next-day delivery by the close of business, or 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*, in the United States approximately 60 percent of families with children report that both parents work. One consequence of these dual-income families 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 for 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.¹⁴ 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. For example, innovative vacuum packaging technology now allows for shelf lives of up to 45 days for chilled (and not frozen) forms of microwavable foods.¹⁵

¹¹Francine 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.

¹²Tae 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.

¹³<http://3dprinting.com/what-is-3d-printing>

¹⁴Jane Hiback, “Alternative Retailing Strategies,” *Natural Food Merchandiser*, August 2011, 18–19.

¹⁵Joe Condon, “Packaging Technology Extends Chilled Shelf-Life out to 45 Days,” www.beefcentral.com/p/news/article/3180, May 2013.

As for *rising customer expectations*, it should come as no surprise that customer expectations tend to increase over time, which means that a satisfactory level of performance in the past might not be considered 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 In a similar vein, online retailer Amazon now provides same-day delivery in a number of U.S. cities, and some of these cities also offer *one-hour delivery service*.¹⁷

Technological Advances

Prior to the start of every academic year, Beloit College in Wisconsin releases its annual Mindset list that details the world view of incoming first-year college students.¹⁸ The class of 2019, which assumes a 1997 birthdate, is particularly noteworthy because it has never lived in a world without access to Google. 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 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 bricks-and-mortar stores (e.g., orders from a defined customer base; orders in larger quantities).

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 information about the vehicle's temperature, humidity, and vibrations. Such information can be especially important to pharmaceutical and health-care companies.²⁰

¹⁶<http://toyotadriveseat.com/pr/tds/same-day-parts-deliveries-help-230692.aspx>

¹⁷<http://techcrunch.com/2015/10/22/amazon-brings-its-one-hour-delivery-service-prime-now-to-the-san-francisco-bay-area/>

¹⁸<http://www.beloit.edu/mindset/2019/>

¹⁹Kristi Montgomery, "Tips for Quicker Product Picking," *Multichannel Merchant*, December/January 2012, 28–29.

²⁰Ian Putzger, "Apps Mania," *CT&L*, April 2012, 32–33.

Advances in Retailing

Retailing in the second decade of the twenty-first century is noticeably different than at the beginning of the twenty-first century, and the differences exemplify the importance of effective and efficient logistics for retailing success. Consider for example, so-called **big-box retailers**—stores with large amounts of both floor space and products for sale—such as Walmart, Carrefour, and Dick’s Sporting Goods. 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. Big-box retailers have also been trendsetters with respect to environmental and social issues in logistics. For example, 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).^{21, 22}

Omnichannel retailing is a strategy that focuses on providing customers a seamless shopping experience regardless of sales channel. Retailers enable their customers to transact within and across any contract channel (online, in-store, mobile app, etc.) to enhance information availability and customer experience. Omnichannel retailing takes a number of different forms and if you have ordered something online and picked it up at a bricks-and-mortar store, then you have engaged in omnichannel retailing. What you might not have thought about in this situation is that the inventory used to fill your online order depletes that store’s inventory, and thus inventory visibility and accurate demand forecasting become essential for successful omnichannel retailing.²³

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 has grown at an average annual rate of approximately five percent since 1990, including the worldwide economic slowdown in 2008 and 2009.²⁴ Looking forward, the annual growth in world trade between 2016 and 2020 is forecast to be between 3 and 4 percent.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. The shipping container allows many different products to be securely transported long distances via water transportation—important because long-distance water transportation is much less expensive than long-distance air transportation.

We’ll look at international logistics in much greater detail in Chapter 14, but for now one should recognize that the international logistics created by global trade 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.

Learning Objective 1.4

THE SYSTEMS AND TOTAL COST APPROACHES TO LOGISTICS

Logistics is a classic example of the systems approach to business problems. From a companywide 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

²¹<http://sustainability.bby.com/management-approach/product-stewardship>

²²<http://searchcio.techtarget.com/definition/omnichannel>

²³<http://multichannelmerchant.com/opsandfulfillment/warehouse/key-omnichannel-success-strong-logistics-strategy-21022014/>

²⁴https://www.wto.org/english/news_e/pres15_e/pr739_e.htm

²⁵<https://www.atkearney.com/documents/10192/5498252/Global+Economic+Outlook+2015-2020--Beyond+the+New+Mediocre.pdf/5c5e8945-00cc-4a4f-a04f-adeef094e90b8>

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 in 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 customers often want.

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 customers don’t like. An example of misidentification involves a consumer products company that mistakenly assigned the *same product code* to a three-pack, six-pack, and twelve-pack of a particular product it sold. Imagine the reaction of the customer who ordered a three-pack of the product, only to receive a six-pack or a twelve-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 into and storage of materials in a firm) and **physical**

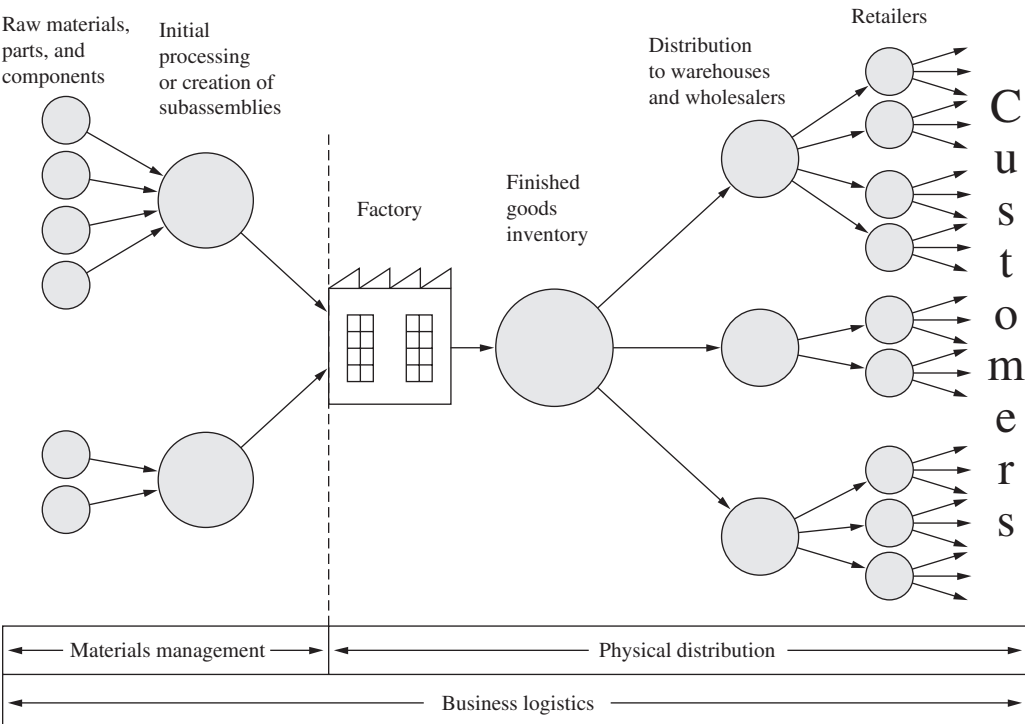


Figure 1.1 Control over the Flow of Inbound and Outbound Movements

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.

distribution (storage of finished product and movement to the customer). Intrafunctional 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? It's quite simple: 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 strategic 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.

Learning Objective 1.5

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 between purchasing or leasing 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 two 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 two 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. Furthermore, certain items of inventory (for example, automobiles and produce, among others) lose value over time, and the authors have had consulting experiences with companies that showed a particular SKU to have a market 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 5 unit of a product than 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 non-selling) 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 by 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

²⁶ Glossary, www.cscmp.org

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 within Marriott hotels, Subway restaurants located within some Walmart stores, and co-located 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 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 cost**, which refers 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.

²⁷ Marilyn Odesser-Torpey, "Co-Branding: Positives and Pitfalls," *Convenience Store Decisions*, April 2012, 46–48.