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PURCHASING & SUPPLY CHAIN MANAGEMENT

Monczka • Handfield • Giunipero • Patterson

7th Edition

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***Purchasing & Supply Chain Management*, 7th Edition**
Robert M. Monczka, Robert B. Handfield, Larry C. Giunipero, James L. Patterson

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To Shirley, Kathleen, Thomas, and Elliana

Robert M. Monczka

To Sandi, Simone, Luc, and my mom and dad

Robert B. Handfield

To Frank, Tressa, Jan, Matthew, Michael, Amanda, and the memory of my sister Maryetta

Larry C. Giunipero

To Diane; Lindsay, Karl, Seth, Luke, and Norah; and Drew, Laura, Elliott, and Shiloh

James L. Patterson

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Preface

The seventh edition of *Purchasing and Supply Chain Management* reflects the ever-changing face of supply management, such as digitization and the increased recognition in boardrooms of organizations across every industry. The challenges experienced by organizations are calling for a new type of supply manager with many different capabilities. Students seeking to pursue a career in supply management may choose to focus on one or more of these areas as they consider where in supply management they wish to focus.

- Internal Consultant—Ability to connect, listen, and deliver business value to internal stakeholders. Working with procurement systems to derive analytical insights including spend analysis, supplier segmentation, and demand management strategies to drive improved procurement transaction excellence and provide insights and decision support to the business. Developing regional and global supply strategies.
- Market Intelligence and Cost Modeling Analytics—Deployment of total cost analytic modeling and cost to serve capabilities, application of analytical cost modeling approaches for decision support, and building supply market intelligence data gathering and knowledge dissemination capabilities. Deep knowledge and understanding of macroeconomic forces and trade regulations and ability to relate them to future market movements and forecasts.
- Financial Acumen—Knowledge of currency, capital markets, and contribution of procurement to P&L and the balance sheet. Ability to contribute to CFO and other financial leadership discussions and debates. Ability to build logistics cost models, understand contribution of supply management to capitalization, facility productivity, and other key metrics.
- Risk Identification and Mitigation—Knowledge of different sources of risk, ability to identify risk early such as in new-product development, build risk profiles, link recognition of risks to risk mitigation and scenario planning, and understanding how to manage disasters when they occur. Building a business case for risk mitigation planning across the complete supply chain.
- Supplier Coach—Ability to deploy supplier development to drive improvement in high-need categories or regions, especially in emerging countries where local content is required. Becoming a customer of choice and driving improvement in supplier capabilities. Harnessing supplier innovation to meet changing requirements and developing solutions to overall stakeholder requirements.
- Relationship Broker—Managing teams in multicultural environments, managing virtual teams, and understanding pros and cons of different organizational models (centralization vs. decentralization). Working with global engineering teams and understanding of technical knowledge. Managing outsourced relationships and services. Driving supplier innovation and linking to internal teams.
- Legal Expertise—Building relational contracts, understanding legal contractual language, terms and conditions, legal clauses, and vernacular. Building good price and cost modeling indices for contracting, and managing risks and

rewards through improved contract structure. Best practices in on-going contract management. Managing conflicts that emerge post-contract signing. Dealing with IP issues when working with suppliers.

- Talent Management—Building a pipeline of leadership and supply management expertise, mentoring, and leadership development.

The seventh edition emphasizes these competencies through new material and emphasis on traditional competencies that have become more important recently. This new edition includes a number of new topics, including cases in health care, oil and gas, financial services, and industries that have downplayed the role of strategic supply management in the past.

In addition, some of the subjects that are newly introduced or expanded upon in this edition include the following:

- Cross-functional teaming
- Procurement analytics
- Overall digitization of purchasing and supply chain
- Application of mobile technologies in the supply chain
- Supplier integration into new-product development
- Software-as-a-service applications for procurement
- Social networking and cloud applications
- The role of "big data" in procurement
- Supplier development
- Cost modeling and market intelligence
- The role of procurement logistics in globalization
- "Should cost" modeling
- Supplier collaboration for cost savings ideas
- Negotiation simulations
- Contracting and Internet law
- Supply chain risk management
- Sustainability in the supply chain
- The importance of labor and human rights in procurement contracts and codes of conduct
- The role of transportation infrastructure and government regulation in global logistics
- Public procurement and acquisition
- Crowdsourcing and open innovation
- Impact of sourcing strategies on revenue, capital asset management, and share price of the enterprise
- Deployment of category management
- Expanded and comprehensive cases, sourcing snapshots, and good practice examples pulled from direct interviews with senior procurement executives

We are proud of this new edition and believe that it reflects many themes that are emerging in industries worldwide.

Course Description

Purchasing and Supply Chain Management is intended for college and university courses that are variously titled purchasing, materials management, supply chain management, sourcing management, supply management, and other similar titles. The text is also well suited for training seminars for buyers, and portions of it have been used in executive education forums. Chapters have been used in both undergraduate and MBA classes in supply management, business strategy, operations management, and logistics. Some instructors may also elect to apply sections of the book to undergraduate or graduate classes in operations management.

The text is appropriate for either an elective or a required course that fulfills AACSB International: The Association to Advance Collegiate Schools of Business requirements for coverage of supply chain management issues. Most of the cases included in the book are based on actual companies and all were adapted and modified through classroom use by the authors.

Course Objectives

Depending on the placement of a course in the curriculum or the individual instructor's philosophy, this book can be utilized to satisfy a variety of objectives:

1. Students should be made aware of the demands placed on purchasing and supply chain managers by business stakeholders, both internally and externally to the firm.
2. As prospective managers, students need to understand the impact of purchasing and supply chain management on the competitive success and profitability of modern organizations.
3. Students should appreciate the ethical, contractual, risk management, sustainability, and legal issues faced by purchasing and supply chain professionals.
4. Students must understand the increasingly strategic nature of purchasing/supply, especially the fact that it involves much more than simply buying goods and services.
5. Students entering or currently in the workforce must understand the influence of purchasing/supply on other major functional activities, including product design, information system design, e-commerce, manufacturing/operations planning and control, inventory management, human resource development, financial planning, forecasting, sales, quality management, and many other areas.

Unique to This Edition

Many of the insights and topics presented throughout this book are based on examples developed through discussions with top purchasing executives and from various research initiatives, including research published by CAPS Research, work at the North Carolina State University Supply Chain Resource Consortium, and a project on supplier integration funded by the National Science Foundation. The text also has a chapter format that includes an opening vignette, a set of sourcing snapshots, and a concluding good practice

example that illustrates and integrates each chapter's topics. New and updated vignettes and examples, discussion questions, and additional readings provide up-to-date illustrations of the concepts presented in each chapter. In addition, as mentioned earlier, a number of new or enhanced topics are included.

The concept of cross-functional teaming and collaboration is emphasized throughout this book. Therefore, many of the case exercises require a team effort on the part of students. We recommend that the instructor have students work in teams for such projects to prepare them for the team environment found in most organizations.

Structure of the Book

This book is subdivided into six parts and twenty chapters that provide thorough coverage of purchasing and supply chain management.

Part 1: Introduction

Chapter 1 introduces the reader to purchasing and supply chain management. This chapter defines procurement and sourcing, introduces the notion of the supply chain, and summarizes the evolution of purchasing and supply chain management as an organizational activity.

Part 2: Purchasing Operations and Structure

The chapters in Part 2 provide an in-depth understanding of the fundamentals surrounding the operational activity called "supply management." These chapters focus primarily on the fundamentals of purchasing as a functional activity. Without a solid understanding of purchasing basics, appreciating the important role that purchasing can play is difficult.

Chapter 2 provides an overview of the purchasing process by presenting the objectives of world-class purchasing organizations, the responsibilities of professional purchasers, the purchasing cycle, and various types of purchasing documents and types of purchases. In addition, this chapter now includes health care and services supply management case examples and snapshots. The procure-to-pay (P2P) cycle has been updated with new material on procurement analytics and digital transformation.

Chapter 3 examines various categories and types of purchasing policy and procedure. Ethical issues in procurement are emphasized here. This chapter includes updates on corporate social responsibility and sustainability as a component of purchasing policy and procedures as well as an updated list on the best companies for social responsibility and diversity in procurement.

Chapter 4 examines purchasing as an internal consultant. Much of what purchasing involves requires interacting and working with other functional areas and suppliers and facilitating category strategies. This chapter examines the linkages between purchasing and other groups, including suppliers.

Chapter 5 focuses on purchasing and supply chain organization. This includes a discussion of purchasing in the organizational hierarchy, how the purchasing function is organized, and the placement of purchasing authority, including the center-led approach. The chapter also describes the team approach as part of the organizational structure.

Part 3: Strategic Sourcing

A major premise underlying this book is that purchasing is a critical process and makes as important a contribution as manufacturing, marketing, or engineering to the pursuit of a firm's strategic objectives. Progressive firms have little doubt about purchasing's impact on total quality, cost, delivery, technology, and responsiveness to the needs of external customers. Part 3 addresses what firms must do to achieve a competitive advantage from their procurement and sourcing processes. Realizing these advantages requires shifting our view of purchasing from a tactical or clerically oriented activity to one focusing on strategic supply management. This type of management involves developing the strategies, approaches, and methods for realizing a competitive advantage and improvement from the procurement and sourcing process, particularly through direct involvement and interaction with suppliers.

Chapter 6 develops an understanding of how firms set purchasing strategies and category management. This process should include a vision and plan of what a firm must do in its purchasing/sourcing efforts to support the achievement of corporate goals and objectives. Clearly, the category strategy development process should be the starting point for any discussion of strategic supply management. This chapter contains an updated section on strategic category management, reflecting the latest developments in the field. There are also discussions of insourcing versus outsourcing as a component of strategy, with examples featuring Boeing Corporation, illustrating how the economic recession is impacting category management strategies. There is also a new section on how to perform market intelligence and risk assessments for category management, as well as fresh information on stakeholder engagement.

Chapter 7 focuses on one of the most important processes performed by firms today—supplier evaluation, selection, and measurement. Selecting the right suppliers helps ensure that buyers receive the right inputs to satisfy their quality, cost, delivery, and technology requirements. Choosing the right suppliers also requires doing due diligence via supplier visits. Performing the selection process correctly creates the foundation for working closely with suppliers while continually enhancing performance.

Chapter 8 describes how a progressive and proactive buying firm incorporates supplier quality into its supplier selection and supplier performance evaluation processes. Improving supplier quality can also create substantial tactical and strategic competitive advantages that may not be available to competing firms. Six Sigma, ISO 9000, and ISO 14000 applications have been updated.

Chapter 9 describes what firms must do to manage and develop world-class supply-base performance. A strong focus on supplier development, managing supply base risk, and sustainability in the supply chain is provided. Revised sections to this chapter include Managing Supply Base Risk and Managing Sustainability in the Supply Base to include supply chain fraud.

Finally, Chapter 10 focuses on worldwide sourcing, which is an important part of strategic supply management as firms search globally for the best resources.

Part 4: Strategic Sourcing Process

Chapter 11 focuses on strategic cost management, cost/price analysis, and target costing. Progressive firms focus on cost control and reduction with suppliers as a way to improve (i.e., reduce) purchase price over time. This chapter details various types of costs, presents cost analysis techniques, and discusses the factors that affect a supplier's price.

The chapter also discusses total cost analysis, cost-based pricing, use of pricing indicators for category management, and other innovative techniques designed to provide accurate and timely cost data. New sections on both strategic cost management and target costing at Honda of America and pricing indicators for different categories are included, as well as best practice research on strategic cost management based on a 2009 study.

Purchasing professionals rely on an assortment of tools, techniques, and approaches for managing the procurement and supply chain process.

Chapter 12 presents various quantitative tools that purchasers use when problem-solving and pursuing performance improvements. Process mapping, value analysis, price break analysis, and the learning curve can help purchasers achieve specific outcomes such as reducing cost/price, improving quality, reducing time, or improving delivery performance from suppliers.

Chapter 13 deals with supply management negotiation. Effective supply managers must know how to plan for and negotiate value-adding contracts within a buyer-seller relationship. Increasingly, procurement contracts emphasize far more issues than simply purchase price. Buyers and sellers may negotiate cost reductions, delivery requirements, higher quality levels, payment terms, access to technology, or anything else important to the parties. The Negotiation Framework in Supply Management section has been revised, and The Impact of Electronic Media on Negotiations has been updated and expanded.

Chapter 14 addresses the fundamentals of contracting. The formal contracting process creates the framework for conducting business between two or more firms. As such, an understanding of contracting is essential when attempting to manage costs within a buyer-seller relationship. Contract management best practices are viewed in light of recent events and supply chain risk. The chapter also explores the role of contract management systems and blockchain contracts.

Chapter 15 addresses the major legal considerations in purchasing, including the legal authority of the purchasing manager. The chapter also discusses sources of U.S. law, warranties, purchase order contracts, breaches of contract, and patent and intellectual property rights. Because contracting is a part of the legal process, this chapter naturally follows the contracting chapter.

Part 5: Critical Supply Chain Elements

Part 5 describes the major activities that relate to or directly support supply chain management. Some of these activities involve specific disciplines, such as inventory management and transportation; other activities relate to the development of supply chain support systems. These systems include performance measurement systems and computerized information technology systems. The activities presented in this part may or may not be a formal part of the purchasing organization. These activities and systems, however, are key elements of purchasing and supply chain management.

Without them, purchasing most likely cannot pursue its goals and objectives effectively. Therefore, purchasing students must be familiar with a range of supply chain activities.

Chapter 16 focuses on overall lean thinking in supply management, including the management of a firm's inventory investment and working capital. The money that a firm commits to inventory usually involves a significant commitment of financial resources. This chapter discusses the function of inventory within a firm, factors leading to inventory waste, creating a lean supply chain, approaches for managing a firm's inventory investment, and future trends related to managing inventory. The role of real-time inventory analytics is also explored.

The purchase of transportation and other services is another important supply consideration. We have witnessed major changes in transportation over the last two decades or so, many of which have affected supply management. Since Congress deregulated the U.S. transportation industry in the early 1980s, the role of the buyer has changed dramatically. More than ever, supply management is involving itself in the evaluation, selection, and management of transportation modes and carriers. Even if a buyer does not get involved directly with transportation, having a working knowledge of this dynamic area is critical.

Chapter 17 highlights supply management's role in procuring transportation, as well as services buying, presents a decision-making framework for developing a transportation procurement strategy, discusses ways to control and influence inbound transportation, and evaluates trends affecting the purchase of transportation services, such as performance-based logistics. Four sections in this chapter have been revised or updated.

Information technology systems are changing business. Purchasing, too, can benefit from the development of current information technology systems and complete digitization to help agility and autonomous (nonhuman) systems.

Chapter 18 examines the role of technology in supply chain information systems and electronic commerce. The chapter addresses the newer Internet-based electronic linkages between firms as well as traditional electronic data interchange (EDI). The chapter also discusses the impact of social networking, blogs, and cloud computing in addition to advanced and future e-purchasing and supply systems' applications. The use of information technology systems, fully digitized, greatly enhances supply management's ability to operate at the highest levels of efficiency and effectiveness.

Chapter 19 focuses on performance measurement and evaluation with a new emphasis on innovation sourcing and an update on trends. Increasingly, firms must develop valid measurement systems that reveal how well a firm is performing, including the performance of its purchasing and supply chain management efforts. These systems need to be clearly linked to overall company objectives. Measurement systems support procurement and sourcing decision making by providing accurate and timely performance data. This chapter examines why firms measure performance, defines various purchasing performance measurement categories, and discusses how to develop a purchasing performance measurement system, including a balanced scorecard. In this chapter, data on supply strategy performance results has been updated.

Part 6: Future Directions

Chapter 20 focuses on what purchasing and supply chain management will look like by 2025. Significant macro and micro changes are occurring and have impacted supply (purchasing) and supply chain management. To better understand these changes and their impact on supply chain management during 2020–2025, future-oriented perspectives were obtained from a number of leading thinkers and practitioners at different business organizations, universities and research centers, earlier case studies, and the published literature. The relationships of these trends to important supply and supply chain strategies and practices are organized around eight areas that are discussed and then related to 12 critical supply areas.

Information about the eight critical areas is primarily based on a special report about Global Supply Chains published by the *Economist*, perspectives about future trends (2020–2025) from leading thinkers or organizations, joint research initiatives of CAPS Research, the Institute for Supply Management (ISM), A.T. Kearney Inc., and a CAPS Research Study

by Monczka and Petersen, combined with other literature and actual practice observations all provide a relevant framework for discussion today.

This information can help students identify how the field of purchasing and supply management is changing and what knowledge and skills they will need to develop, given these changes.

As we enter the third decade of the twenty-first century, a host of new technologies will have an impact on the supply chain. Among the more prominent of these technologies are (1) blockchain, (2) artificial intelligence, (3) Internet of things (IOT), (4) virtual reality, (5) 3-D printing, and (6) robotics.

In conjunction with these advanced technologies, has been the maturation and development of social networking software for business purposes. B2B marketers are using these social media tools to identify purchasers and assist in starting, building, and maintaining relationships.

Supply managers who join professional networks can expand their relationships not only within their organization but also in the general buying community and build relationships with selling organizations through this new media. In addition, the challenges of managing all this data has created a term "big data" that needs to be managed within and across organizations. Finally, gains in supply chain effectiveness will be realized by use of these newer technologies to enable increased information visibility and collaboration. Students will understand how technology and related software will affect the future job activities of the purchasing function.

In parallel with technology is the movement to consider sustainability in sourcing decisions. The concept of *sustainable sourcing* focuses on making sure that products and services are purchased with the lowest environmental impact and that they produce positive social results. Closely related to sustainable sourcing is the concept of *ethical sourcing*. When using ethical sourcing, supplier selection decisions are made in a responsible and sustainable way. Further, the workers making them must be safe and treated fairly. When these decisions involve offshore suppliers, readers will understand their obligations and risks under Incoterms 2020.

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Part 1

Introduction

Chapter 1 Introduction to Purchasing and Supply Chain Management

Introduction to Purchasing and Supply Chain Management

CHAPTER 1

Learning Objectives

After completing this chapter, you should be able to

- Understand the differences between purchasing and supply management
- Understand the differences between supply chains and value chains
- Identify the activities that are part of supply chain management
- Understand how technology is changing the purchasing job
- Appreciate the importance of supply chain enablers
- Identify the historical stages of purchasing's evolution

Chapter Outline

CSX Purchasing and Supply: Managing Scheduled Railroading

Evan Bell, a Stetson University graduate, knows the difficulties posed by business change from growing up in Hazleton, Pennsylvania. Hazleton is in heart of the anthracite coal region. "I lived through major change just by seeing what happens to a town when the mines closed," he stated. His background gave him the necessary perspective to deal with changes at CSX.

When Bell was named Head of Procurement at CSX Transportation in 2017, CSX was in the process of implementing a new operating system called Scheduled Railroading (SR). Hunter Harrison was a railroad veteran and previously CEO of both Canadian National and Canadian Pacific railways. CSX hired Mr. Harrison to be their CEO on March of 2017.

The goal of SR is to improve customer service while utilizing assets and people more efficiently. Implementing SR operationally means lower dwell time (the average time a rail car is sitting idle) at terminals and increases in the average number of rail cars pulled by each locomotive. Fewer trainloads are run, but the average train length is increased. Thus, there is a decreased unit cost per carload or ton-mile. The outcomes of these actions are improved customer service, increased operating margin, and lower operating ratio. As these changes become adapted, fewer fixed assets and employees are required. To illustrate, CSX has dropped its headcount from 29,000 employees in 2015 to 22,500 in 2018. While the overall percentage decline in total employment was 23 percent, the management portion of cutbacks was 39 percent. CSX's annual 2018 report highlights many of these changes, including taking 1,100 locomotives from the active fleet and removing 28,000 railcars from the network.

Mr. Bell was challenged with supporting the SR operating philosophy. He realized it would require taking an innovative approach to reorganize the headquarters procurement department. Some of the early challenges Mr. Bell faced in accomplishing this transformation included the following:

- Redesigning the purchasing function to operate more efficiently with a lower headcount
- Assuring employees had the right skill sets to succeed in this new environment
- Increasing the capabilities of the buying professionals
- Redesigning or changing basic purchasing processes to increase both efficiency and effectiveness
- Maintaining a competitive supply base despite a forecasted drop in total purchase dollar expenditures resulting from efficiencies gained through SR

Evan's overall goal in this new challenging environment was to put the company's procurement and supply chain function on the "strategic and global" track to twenty-first century excellence. CSX is

one of four Class 1 Railroads in the United States. In 2018, the company had sales of over $12.25 billion and net earnings of $3.84/share.

One of the benefits of implementing SR is that it lowers CSX's cost-per-ton-mile and allows them to compete very favorably with other transportation modes. Railroads own both the land and the rails that support the movement of freight via locomotives and railcars. Keeping a modern railroad running, however, requires that significant amounts of money be reinvested into infrastructure. CSX has historically spent over a billion dollars on annual capital expenditures to maintain and modernize its infrastructure. Capital expenditures are typically large dollar budget items and require significant interface with internal customers (engineers, field support personnel, etc.) and longer more complex negotiations with suppliers. A skilled procurement and supply chain group is required to manage this spend effectively.

Supporting business growth in newer markets and sustaining high levels of customer service, while controlling materials costs, posed major challenges for the CSX procurement and supply chain department. Meeting the challenge was compounded by a changing supply base. Bell states, "Over time there has been a consolidation of the domestic supply base through mergers and acquisitions resulting in a downsizing of our domestic supply base." "Supporting our customers with a responsive railroad is a concern given the reduced number of domestic suppliers," stated Bell.

Bell and his buying team's $4 billion total annual purchase expenditures are spread over a broad group of products and services. The CSX procurement and supply chain management group purchase over 100,000 unique items necessary to keep 21,000 route miles of track, about 54,000 freight cars, and 3,000 locomotives moving freight to customers. The geographic range is large, consisting of 23 eastern states and the District of Columbia, as well as two Canadian provinces. CSX serves over 3,300 customers at over 6,000 locations and connects to more than 70 ocean, river, and lake port terminals. CSX's intermodal business links customers to railroads via trucks and terminals. CSXT also serves thousands of production and distribution facilities through track connections to approximately 230 short-line and regional railroads. This extensive network reaches nearly two-thirds of the population in the United States.

"Based on the demands of our operating environment, the shrinking supply base, and the need to continuously add value to the company from a supply perspective, it was imperative that we had to develop a more global perspective," says Bell.

As stated previously, the new SR environment demanded a new set of skills to meet the global and other challenges required to successfully support SR. Toward that end, Bell required all current employees and new hires to further develop their skill sets and attain the status of CPSM. Currently, over 90 percent of his supply management professionals are CPSM certified. "As we move to an even more strategic focus, CSX must continue to raise the bar and focus its resources on development of its highly talented professionals. The CPSM provides a basic skill set foundation required to understand both tactical and strategic approaches to sourcing." says Bell.

"Having a global supply base, coupled with a more strategic focus in our supply group, allows our team to make a significant and lasting impact," Bell states. Through improving employee skill sets, Evan was able to utilize his resources more efficiently by simplifying his organization. This has resulted excellent support for SR with a much lower headcount. There is a focused effort to identify commodities with sourcing sensitivities and then develop new or existing suppliers to meet the needs of the company from a global perspective.

One of the biggest challenges has been the imposition of tariffs from countries that affect not only CSX's direct offshore purchases but also suppliers who use offshore sources for materials that go into products sold to CSX. "In spite of these challenges, our purchasing group has worked hard to ensure we have a strong base of suppliers, both global and domestic, who are prepared to meet

all our rail infrastructure needs." "Whether our source is domestic or offshore, we never lose focus on improving the quality of components and services," says Bell. The company continually monitors and evaluates supplier performance by working with their internal customers. This requires the team to work with internal customers and then take these requirements and develop goals with suppliers to prioritize opportunities for improvement.

Complementing the global push is CSX's extensive involvement in e-commerce. The railroads have a long history of doing business electronically, beginning with their pioneering efforts in using EDI with their customers. CSX continues the use of electronic tools to facilitate sourcing. According to Katie Clifford, director of Procure to Pay, 98.6 percent of our purchasing expenditures are now transmitted electronically. Ms. Clifford further states, "On an average month we run about 2,000 items a day over our Oracle system."

Putting the right structure in place to achieve results in all these different, yet related areas is no easy task. "I felt my core team was somewhat disjointed and hindered the ability to make rapid decisions," states Bell. "Under SR you need to streamline the organization and become able to identify and seize market opportunities quickly." Bell's vision is to have a lean, responsive supply management organization that anticipates and meets the needs of CSX. "I want make sure that we drive value by having a quality product available, at a convenient place and at the right cost, while working with both our suppliers and internal customers to provide a very high level of cooperation and customer service after the sale."

Bell is pushing his procurement team to work at a more strategic level, while eliminating or automating tactical processes. He believes that the tactical piece of procurement will be either automated or eliminated. "Before spending money on automation, we really need to decide if the process is necessary." states Evan. For example, he recently restructured the variance in accounts payables after finding that the total buying staff was taking the equivalent of two fulltime positions in verifying minor variations.

Eliminating or minimizing unnecessary processes allows the procurement team to spend more providing services to their business partners that add value and support the company's SR objectives. "In today's rapidly changing environment we need skilled, open-minded supply professionals who can deliver results to our organization regardless of economic conditions and in any area of spend. I view our purchasing and supply area as a major contributor to the bottom line and critical to the service capabilities of our railroad company." Accomplishing their mission requires a staff of dedicated professionals who can ensure availability of the locomotives, cars, track, and maintenance parts needed to keep CSX trains running at a very demanding operating capacity. Bell is optimistic that their sourcing group will continue to build on their string of recent successes. In an ever-changing business environment, Bell feels his staff has the skills and talent to meet the current and future changes by delivering innovative solutions for CSX while supporting the goals of SR.

Source: Giunipero, L. (2019, October), Interview with Evan Bell.

1-1 Introduction

As the CSX story illustrates, a new management philosophy, mergers in the supply base, and changes in markets served affect how supply management is deployed in a major Fortune 500 company. Today world-class supply organizations such as CSX directly help their firms maintain or improve their competitive position in a rapidly changing business environment. During the first two decades of the twenty-first century, many supply

management organizations are viewed as a strategic function capable of contributing to corporate success. This is the exact opposite of purchasing's historical role where it was unlikely to hear the words "strategic" and "purchasing" in the same sentence. Prior to the twenty-first century, the life of many purchasing professionals was comfortable and predictable. When someone required something, a buyer sent a request to suppliers for competitive bids, awarded short-term contracts based on price, enjoyed a free lunch or ball game with salespeople, and figured out how to meet not-too-demanding performance measures. Although the buying position did not carry much prestige, it was a stable job.

This model worked relatively well until new competitors from around the world began gaining market share with higher-quality products. What American management discovered was that these competitors achieved dramatic reductions in cost, exponential improvements in quality, and unheard-of reductions in the time it takes to develop new products. Their supply management model featured (1) developing closer relationships with critical suppliers, (2) performing extensive due diligence on suppliers before awarding long-term contracts, (3) conducting worldwide Internet searches for the best sources of supply, and (4) inviting key suppliers to participate in product development and process improvement. Furthermore, executive managers began to require purchasing professionals to achieve demanding performance improvements. What really changed the purchasers' comfortable world was global competition. Borrowing a phrase from Thomas Friedman, the world is flat, and competition is now 24/7, anywhere and anytime.[1]

As is illustrated in the CSX story, global sourcing is a requirement and no longer a luxury for most firms. This chapter introduces the reader to the changing world of purchasing and supply chain management. The world has dramatically changed during the first 20 years of the twenty-first century, and the rate of change will continue to accelerate going forward. The first section of this chapter describes the new competitive environment where we now operate—an environment that affects every major industry. We next present the reasons why purchasing has taken on increased importance. Third, we clarify the confusing terminology that surrounds purchasing and supply chain management. The next sections present the activities that are part of supply chain management, discuss the four enablers of purchasing and supply chain excellence, and review the historic evolution of supply management. The last section outlines the contents of this book.

1-2 A New Competitive Environment

Today's business climate features increasing numbers of *world-class competitors,* domestically and internationally, that are forcing organizations to improve their internal processes to stay competitive. Sophisticated customers, both industrial and consumer, no longer talk about price increases—they demand price reductions! Information that is available over the Internet will continue to alter the balance of power between buyers and sellers. An abundance of competitors and choices have conditioned customers to want higher quality, faster delivery, and products and services tailored to their individual needs at a lower total cost. The widespread use of *social media* through Twitter and blogs spreads information about products and services at an accelerated rate. If a company is not meeting its requirements, consumers will quickly "spread the word" and will find someone who is more accommodating.

In the work environment, *mobile devices* permit constant contact with job activities enabling purchasers to be connected on a 24/7 basis. One of the major facilitators of increased mobility is the dramatic drop in cost of storing and retrieving data. Part of this efficiency is driven by *cloud-based* storage systems that provide all-sized firms

and individuals access to massive amounts of data at very low costs. The lines between work, play, buying, and promotion are both blurred and shifting to the individual. These trends in mobility have significant impact on where and when work is performed in purchasing.

In addition to social media and mobile devices, supply managers have access to sophisticated technologies that will change the way their work is performed. *Blockchain* was initially used for digital currencies such as the Bitcoin. It is now being used for supply chain applications such as product traceability. *Artificial intelligence* (AI) allows purchasers to have digital assistants who learn to perform work similar to humans and act on data that is supplied to them. *Robotics* is another area that will impact supply management. Most of us are familiar with the increased use of robots in warehouses and in manufacturing operations. For example, they are used to paint car bodies in automotive assembly plants and are used to pick and pack items at warehouses operated by companies such as Amazon and DICK's Sporting Goods. A survey by Deloitte and MHI reported that 51 percent of the 900 supply chain professionals surveyed, cited robotics and automation as a source to gain competitive advantage in the supply chain.[2]

Historically, firms have valued *customer loyalty,* despite the slower speed at which information moved. Companies created market strategies to create and capture this loyalty. Successfully implementing these strategies required a strong engineering, design, and manufacturing function to support these market requirements. Design engineers had to translate customer requirements into product and service specifications, which then had to be produced at appropriate levels of quality and cost. As the demand for new products increased, organizations had to become flexible and responsive to meet ever-changing customer needs.

In the 1990s, managers began to realize that material and service inputs from suppliers had a major impact on their ability to meet customer needs. This led to an increased focus on the supply base and the responsibilities of purchasing. Managers also realized that producing a quality product was not enough. Getting the right products and services to customers at the right time, cost, and place and in the right condition and quantity constituted an entirely new type of challenge. The twenty-first century has spawned a whole set of time-reducing information technologies and logistics networks aimed at meeting these new challenges.

The availability of low-cost alternatives has led to unprecedented shifts toward *outsourcing* and *offshoring.* The impact of China as a major world competitor poses tremendous challenges for U.S. firms in both the manufacturing and services sectors. Because the services sector now accounts for over 70 percent of the gross domestic product, new strategies are required for effective supply management in this sector. Recent economic trends in Chinese wages, complexity of supply chains, and well-publicized quality problems have caused firms to reassess the economics of Chinese sourcing strategies. Chinese labor rates increased again in 2018 and are up 64 percent from 2011.[3] These Chinese wage increases coupled with nationalist sentiment in both the United States (trade war with China) and the United Kingdom (Brexit) have temporarily slowed global trade. President Trump imposed tariffs on Chinese goods believing that they were not trading fairly. Secondly, that a fairer trade system would make U.S. products more competitive and bring back jobs to America. Based on these economic and political events, supply strategies must continually evaluate the economics of *re-shoring* and *nearshoring.* **Re-shoring** involves bringing some sourcing back to the United States, while **nearshoring** involves evaluating suppliers located closer to United States. Such suppliers may be located in Mexico and Central and South America.

1-3 Managing the Supply Base

All these changes have made twenty-first century organizations realize how important it is to actively manage their *supply base.* The supply base consists of all the suppliers that provide an organization with its materials and services. In some organizations, this supply base extends to the network of downstream firms responsible for delivery and aftermarket service of the product to the end customer. The realization that competitive advantage could be achieved by managing both upstream (suppliers) and downstream (customers) flows led to a focus on *supply chains* and *supply chain management.*

Several factors are driving an emphasis on supply chain management. First, the *low cost and increased availability of information resources* among entities in the supply chain allow easy linkages that eliminate time delays in the network. Second, the *level of competition* in both domestic and international markets requires organizations to be fast, agile, and flexible. Third, *customer expectations and requirements* are becoming much more demanding. Fourth, the *ability of an organization's supply chain to identify and mitigate risk* minimizes disruptions in both supply and downstream product or services to mitigate the impact on lost sales. As customer demands increase, organizations and their suppliers must be responsive or face the prospect of losing market share. Competition today is no longer between firms; it is between the supply chains of those firms. The companies that configure the best supply chains will be the market winners and gain competitive advantage.

1-4 Why Purchasing Is Important

1-4a Increasing Value and Savings

As companies struggle to increase customer value by improving performance, many companies are turning their attention to purchasing and supply management. Consider, for example, CSX, the company featured at the beginning of this chapter. Almost 45 percent of the total sales of CSX is expended with suppliers for the purchase of materials and services. It does not take a financial genius to realize the impact that suppliers can have on a firm's total cost. Furthermore, many features of products that make their way into final products originate with suppliers. The supply base is an important part of the supply chain. Supplier capabilities can help differentiate a producer's final good or service, increasing their value to the final customer.

In the manufacturing sector, the percentage of purchases to sales averages 55 percent. This means that for every dollar of revenue collected on goods and services sales, more than half goes back to suppliers. It is not difficult to see why purchasing is clearly a major area for cost savings. Cost savings also encompass avoiding incurring additional costs through early involvement with design and proactively responding to supplier requests for price increases.

1-4b Building Relationships and Driving Innovation

As mentioned earlier, savings come in different forms; the traditional approach is to bargain hard for price reductions. A newer approach is to build relations with suppliers to *jointly reduce costs* of the product or service and expect suppliers to contribute innovative ideas that continually add value to a firm's products and services.

Examples of supply managers building these relationships are occurring in many industries. For example, two senior executives, one from Shell and one from Hewlett-Packard (HP), were having a conversation. HP is a strategic supplier of end-user services, service

desk, and hardware to Shell, and as part of Shell's focus on supplier relationship management, the executives meet to discuss business value. Because both companies focus on innovation, the conversation eventually turned to what is new in R&D. The HP executive talked about research into a new wireless printer head the size of a postage stamp that works by picking up vibrations (using sensing technology). The information piqued Shell's interest because its deepwater oil explorations use sensing technology to discover rock formations that could hold oil several miles under the ocean. That simple conversation sparked a collaboration between the two companies to produce a system to sense, collect, and store geophysical data.[4]

David H. Cummins, senior supplier manager, strategic sourcing for Shell Global Projects United States in Houston, says the example proves that dedication to uncovering supplier value and capabilities is a never-ending process. "The value that was uncovered was part of a conversation that had nothing to do with the current services provided," he says. "Finding hidden capabilities is about putting each other's brains to work on challenges and to come up with something that is new and tangible. Very often capabilities are revealed when you are having deep conversations about mutual interests."[5]

For these relationships to work, both the buyer and supplier must receive acceptable paybacks from their investments, and therefore, each realizes positive gain. If the suppliers' strategic intent is to be the customer of choice, then they need to provide necessary technical infrastructure to assist the buyer. As the earlier example illustrates, when both parties cooperate, a climate of trust emerges between the parties setting the stage for innovative ideas.

1-4c Improving Quality and Reputation

Purchasing and supply management also has a major impact on product and service quality. In many cases, companies are seeking to increase the proportion of parts, components, and services they outsource in order to concentrate on their own areas of specialization and competence. This further increases the importance of the relationships among purchasing, external suppliers, and quality. The following example illustrates this important link between supplier quality and product quality. Lululemon Athletica is a provider of high-end yoga pants and other athletic gear for women. The company experienced vibrant growth in its athletic apparel until supplier quality problems created a "brand nightmare." In March of 2013, the apparel maker had to recall its yoga pants as they were too "shear." This sheerness created a "see through" look that did not sit well with high-end consumers who had paid a premium for the product. Lululemon's supplier claimed it was making the pants in accordance with the specifications. The results showed otherwise and eliminating the sheer pants from the market proved more difficult than expected. While steps have been taken to correct the problem, the toll on the company has been significant. In June of 2013 came the announcement that CEO Christine Day would leave her position. Lululemon's stock price was also affected by both these events, and it slid from $79 a share earlier in the year to $61 in late June of 2013.[6] This example illustrates the importance of the supplier quality in the selection process and how a poor quality input affects the entire supply chain, including finished product and brand name reputation. This example further illustrates how lapses in managing supplier quality can potentially tarnish a firm's reputation.

1-4d Reducing Time to Market

Purchasing, acting as the liaison between suppliers and engineers, can also help improve product and process designs. For example, companies that involve suppliers early, compared to companies that do not involve suppliers, achieve an average 20 percent improvement on

materials costs, material quality, and product development times. Development teams that include suppliers as members also report they receive more improvement suggestions from suppliers than teams that do not involve suppliers. Thus, involving suppliers early in the design process is a way purchasing can begin to add new value and contribute to increasing competitiveness.

1-4e Managing Supplier Risk

Every time purchasing places an order with a supplier, a potential risk arises; this risk could be as minor as a late delivery or as major as loss of an entire supplier due to bankruptcy or natural disaster (fire, etc.). The Lululemon example in the previous paragraph illustrates the major impact poor quality can have on an organization. Unfortunately, poor quality is only one supply threat; others include natural disasters, financial instability, operational problems, transportation delays, and so on. These risks are magnified by sourcing strategies that emphasized global sourcing, single sourcing, and JIT inventory. Certainly there were benefits realized from these strategies, however, often the increased vigilance necessary to mitigate and manage these additional risks was not established. For example, the 2011 tsunami that hit Japan left Honda and Toyota with supply shortages for months and cost millions of dollars in sales. The overall cost to Japan was estimated to be $210 billion. Progressive supply managers must continually monitor their supply base for risk and develop business continuity plans to mitigate these risks.

1-4f Generating Economic Impact

The power of organizational purchasers as a group is significant. The **ISM Report on Business** is one of the most closely followed indicators of economic activity. This monthly survey of purchasing managers in both the manufacturing and nonmanufacturing sectors is closely monitored by the financial sector, and the results of both reports have the power to move financial markets. The *ISM Report on Business* is a change index, and generally a rating over 50 indicates the economy is expanding. A full discussion of the *ISM Report on Business* can be found at http://www.ism.ws/ISMReport/.

1-4g Contributing to Competitive Advantage

Many executives will agree that a focus on effective purchasing has become a critical way to gain competitive advantage. An indication of this enhanced status, reputation, and recognition is the higher salaries being paid to purchasing professionals. The most recent *Inside Supply Management* magazine salary survey showed an average annual income of $119,271.

Entry-level professionals averaged $88,729 annually, supply managers $110,956, and those classified as vice presidents $230,103. Having a bachelor's degree counts, as they earned 20 percent more than colleagues with a high school degree and 13 percent more than those purchasers with an associate's degree. Continuing education through certification also fattens the wallet. Those purchasers who attained their Certified Professional in Supply Management (CPSM) earned 9 percent more than those without a CPSM designation.[7] This study also reported that bonuses averaged over 13 percent of base salaries. The bonus was based on a combination of company, department, and individual performance.

Managing talent requires a constant focus on finding, developing, and promoting individuals who will contribute to making the supply management department recognized as a strategic contributor to the organization. One major integrated oil company developed a core training program for its purchasing/supply chain management (PSCM) group to develop talent.

The program consisted of a four-phased approach and recognized experience differences. The four phases were (1) PSCM common buying processes; (2) PSCM curriculum consisting of classes in areas such as contracting, negotiations, strategic cost management, and so on; (3) professional accreditation and education such as the CPSM and MBA programs; and (4) professional leadership development program. This program recognized the differences between those with one to three years of experience and those with four years and above. Finding, developing, and retaining top-tier talent is vital to furthering supply management's impact on company strategies and competitiveness.

1-5 Understanding the Language of Purchasing and Supply Chain Management

Anyone who has written about purchasing and supply chain management has defined the various terms associated with these concepts one way or another, making confusion about the subjects a real possibility. How, for example, is purchasing different from supply management? Are supply chains and value chains the same? What is supply chain management? What is an extended enterprise? It is essential to define various terms before proceeding with this book.

1-5a Purchasing and Supply Management

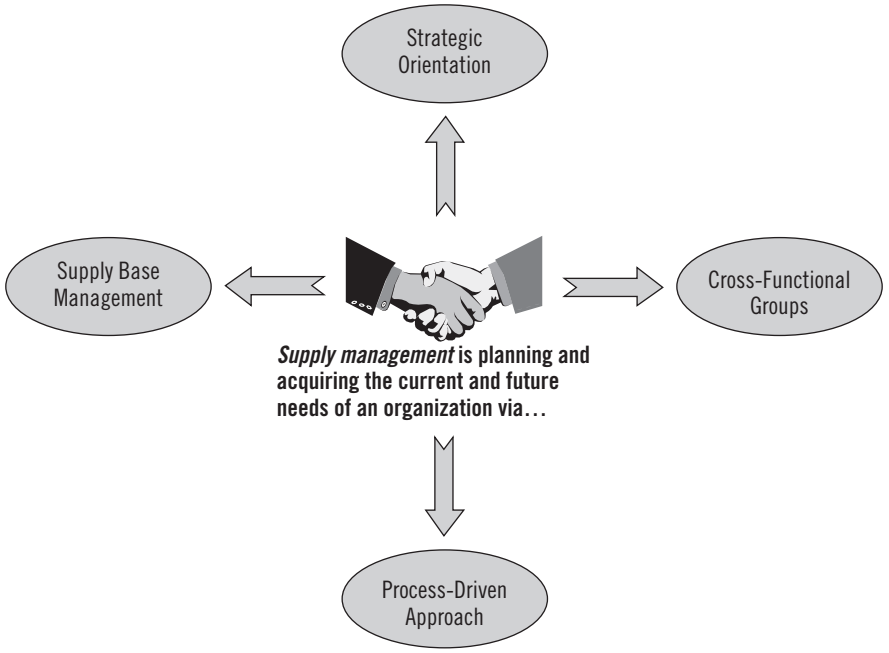
We need to recognize the differences between purchasing and supply management. **Purchasing** is a functional group (i.e., a formal entity on the organizational chart) as well as a functional activity (i.e., buying goods and services). The purchasing group performs many activities to ensure it delivers maximum value to the organization. Examples include supplier identification and selection; buying, negotiation, and contracting; supply market research; supplier measurement and improvement; and purchasing systems development. Purchasing has been referred to as doing "the five rights": getting the right quality, in the right quantity, at the right time, for the right price, and from the right source. In this text, we will interchange the terms "purchasing" and "procurement."

Supply management is not just a new name for purchasing but a more inclusive concept. We feel **supply management** is a *strategic approach to planning for and acquiring the organization's current and future needs through effectively managing the supply base, utilizing a process orientation in conjunction with cross-functional teams (CFTs) to achieve the organizational mission.* Similar to our definition, the Institute for Supply Management defines supply management as *the identification, acquisition, access, positioning, and management of resources and related capabilities an organization needs or potentially needs in the attainment of its strategic objectives.*[8] Exhibit 1.1 depicts the key elements in our definition of supply management.

Supply management requires pursuing **strategic responsibilities** that have a major impact on the long-term performance of the organization. These strategic responsibilities are not pursued in isolation but are aligned with the overall mission and strategies of the organization. Strategies are different from tactical, routine, or day-to-day activities. To function effectively, an organization must perform both strategic and traditional (tactical). Without routine ordering and follow-up, an organization will not receive product in a timely fashion. A strategic activity is the development of a system empowering internal users to order routine supplies.

Supply management is a broader concept than purchasing. Supply management is a progressive approach to **managing the supply base** that differs from a traditional arm's-length

Exhibit 1.1 Defining Supply Management



or adversarial approach with sellers. It requires purchasing professionals to work directly with those suppliers that are capable of providing world-class performance to the buyer. Think of supply management as a strategic and supercharged version of purchasing.

Supply management utilizes a **process approach** to obtaining required goods and services. We can describe supply management as the process of identifying, evaluating, selecting, managing, and developing suppliers to realize supply chain performance that exceeds that of competitors. We will interchange the terms "purchasing," "supply management," and "strategic sourcing" throughout this book.

Supply management is **cross-functional**, meaning it involves purchasing, engineering, supplier quality assurance, the supplier, and other related functions working together as one team, early on, to further mutual goals. Instead of adversarial relationships, which characterize traditional purchasing, supply management features a long-term, win-win relationship between a buying company and specially selected suppliers. Except for ownership, the supplier almost becomes an extension of the buying company. Supply management also recognizes the mutual benefits to both parties, through shared information, provisions for on-site resources, and frequent help to suppliers in exchange for dramatic and continuous performance improvements, including steady price reductions. In short, supply management is a new way of operating, which synchronizes internal operations and external suppliers to achieve (1) efficiencies in cost management, (2) innovative product development, (3) reduced cycle times, and (4) world-class quality control.

Organizationally, leading and coordinating strategic supply management activities have largely become the responsibility of the functional group called "purchasing." Practicing professionals often use the terms "supply management" and "purchasing" interchangeably. Through the previous discussion, we have sought to clarify some of the differences while

recognizing that good purchasing and supply management practices can have significant impact on the organization's overall performance.

1-5b Supply Chains and Value Chains

Over time, researchers and practitioners have developed dozens of definitions to describe supply chains and supply chain management. One group of researchers has indicated that defining supply chain management both as a philosophy and as a set of operational activities creates confusion.[9] These researchers break down the concept into three areas: (1) supply chains, (2) supply chain orientation, and (3) supply chain management.

A **supply chain** is a set of three or more organizations linked directly by one or more of the upstream or downstream flows of products, services, finances, and information from a source to a customer. It is important to acknowledge that anytime business is conducted a supply chain will exist. A **supply chain orientation** is a higher-level recognition of the strategic value of managing operational activities and flows within and across a supply chain. **Supply chain management** then endorses a supply chain orientation and involves proactively managing the two-way movement and coordination of goods, services, information, and funds (i.e., the various flows) from raw material through end user. According to this definition, supply chain management requires the coordination of activities and flows that extend across boundaries. Organizations that endorse a supply chain orientation are likely to emphasize supply chain management.[10]

Regardless of the definition used, we should recognize that supply chains are composed of interrelated activities that are *internal* and *external* to a firm. These activities are diverse in their scope; the participants who support them are often located across geographic boundaries and often come from diverse cultures.

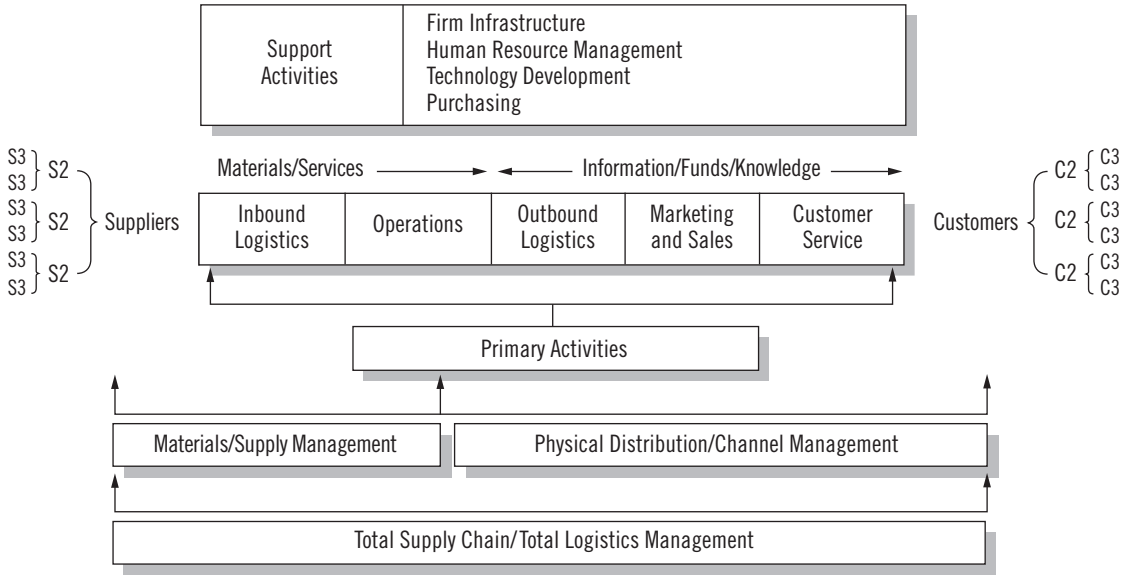
Although many activities are part of supply chain management (which a later section discusses), one perspective visualizes supply chains as composed of processes rather than discrete, often poorly aligned activities and tasks. A *process* consists of a set of interrelated tasks or activities designed to achieve a specific objective or outcome. New-product development (NPD), customer order fulfillment, supplier evaluation and selection, and demand and supply planning are examples of critical organizational processes that are part of supply chain management.

Recalls of products such as automobiles, toys, peanut butter, and dog food have placed increasing emphasis on effectively managing the **reverse supply chain**. The objective of a reverse supply chain is to rapidly identify and return defective products back through the supply chain and then return them to customers defect-free. Toyota's much publicized quality breakdowns that created acceleration and braking problems led to massive recalls and forced Toyota to temporarily suspend the sales of certain models. In September of 2019, General Motors announced it was recalling almost 3.5 million SUVs and pickup trucks because of a braking problem. In both these cases, the creation of a reverse supply chain was necessary to fix the defective parts and restore confidence in the brands.

Value Chains versus Supply Chains

A question that often arises, and has no definite answer, involves the difference between a value chain and a supply chain. Michael Porter, who first articulated the value chain concept in the 1980s, argues that a firm's **value chain** is composed of primary and support activities that can lead to competitive advantage when configured properly. The accumulation of these activities results in the total value added by the firm. Exhibit 1.2 presents a modified version of Porter's value chain model. This exhibit also defines some important supply chain-related terms and places them in their proper context.

Exhibit 1.2 The Extended Value Chain



One way to think about the difference between a value chain and a supply chain is to conceptualize the supply chain as a subset of the value chain. All personnel within an organization are part of a value chain. The same is not true about supply chains. The primary activities, or the horizontal flow across Exhibit 1.2, represent the operational part of the value chain or what some refer to as the supply chain. At an organizational level, the value chain is broader than the supply chain, because it includes all activities in the form of primary and support activities. Furthermore, the original value chain concept focused primarily on internal participants, whereas a supply chain, by definition, is both internally and externally focused.

To reflect current thinking, we must expand the original value chain model, which focused primarily on internal participants, to include suppliers and customers who reside well upstream and downstream from the focal organization. Multiple levels of suppliers and customers form the foundation for the **extended value chain** or the **extended enterprise** concept, which states that success is a function of effectively managing a linked group of firms past first-level suppliers or customers. In fact, progressive firms understand that managing cost, quality, and delivery requires attention to suppliers that reside several tiers from the producer. The extended enterprise concept recognizes explicitly that competition is no longer between firms but rather between coordinated supply chains or networks of firms.

Notice that Exhibit 1.2 identifies purchasing as a support activity. This means that purchasing provides a service to internal customers. Although purchasing is the central link with suppliers that provide direct materials, which is the upstream or left-hand side of Exhibit 1.2, purchasing can support the materials and service requirements of any internal group.

Purchasing's acquisition of goods and services can be divided into two major groups, direct materials and indirect goods and services. *Direct materials* are those items used directly in the creation of a product or service. Purchasing is also responsible for sourcing *indirect goods and services* required by internal groups. Examples of indirect items include personal computers,

office and janitorial supplies, health care contracts, transportation services, advertising and media, and travel. Although indirect items are not required in the production of a good or service, they are still vital to support production and the administrative staff to effectively support their activities. The right-hand side of Exhibit 1.2 illustrates the customer, or downstream, portion of the supply chain. Because meeting or exceeding customer expectations is the lifeblood of any organization, it should become the focal point of supply chain activities.

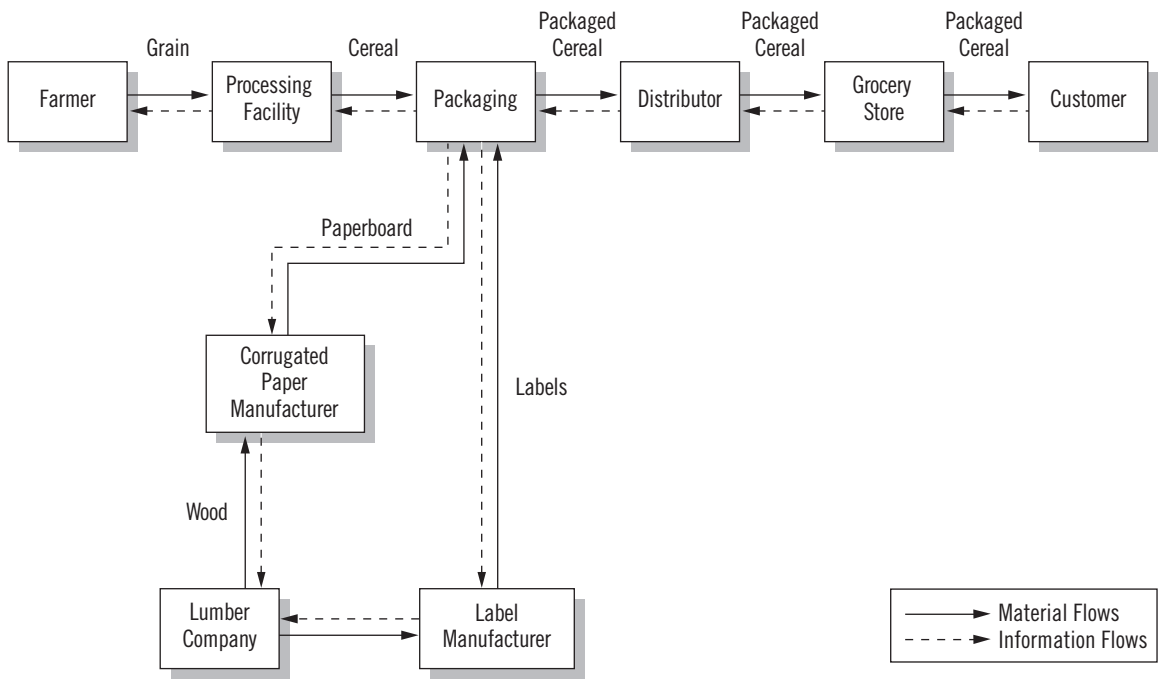
The relatively straightforward and linear view of the value and supply chain, illustrated in Exhibit 1.2, is often more complex in practice. First, the flows of materials, information, funds, and knowledge across a supply chain are often fragmented and uncoordinated. The "hand-off" points from one group to the next or from one organization to the next usually provide opportunity for improvements. Second, the value chain model shows suppliers linking with inbound logistics and then operations. Although this is usually the case with direct materials, indirect items and finished goods can be delivered to any part of the supply chain.

1-5c Supply Chains Illustrated

The increasing importance of supply chain management is forcing organizations to rethink how their purchasing and sourcing strategies fit with and support broader business and supply chain objectives. Supply chains involve multiple organizations as we move toward the raw material suppliers or downstream toward the ultimate customer. Simple supply chains pull materials directly from their upstream suppliers, process them, package them, and ship them to consumers.

A good example of a simple supply chain involves cereal producers (see Exhibit 1.3). A cereal company purchases the grain from a farmer and processes it into cereal.

Exhibit 1.3 A Cereal Manufacturer's Supply Chain



The cereal company also purchases the paperboard from a paper manufacturer, which purchased the trees to make the paper, and labels from a label manufacturer, which purchased semi-finished label stock to make the labels. The cereal is then packaged and sent to a distributor, which in turn ships the material to a grocer, who then sells it to an end customer. Even for a simple product such as cereal, the number of transactions and of material and information flows can be considerable.

Once the cereal is packaged, there is an extensive distribution network that gets the packaged cereal to the final customer. Within the *downstream* portion of the supply chain, logistics managers are responsible for the actual movement of materials between locations. One major part of logistics is *transportation management,* involving the selection and management of external carriers (trucking companies, airlines, railroads, and shipping companies) or the management of internal private fleets of carriers. *Distribution management* involves the management of packaging, storing, and handling of materials at receiving docks, warehouses, and retail outlets.

For products such as automobiles, which feature multiple products, technologies, and processes, the supply chain becomes more complicated. The materials, planning, and logistics supply chain for an automotive company is shown in Exhibit 1.4, which illustrates the complexity of the chain, spanning from automotive dealers back through multiple levels or tiers of suppliers. The automotive company's supplier base includes the thousands of firms that provide items ranging from raw materials, such as steel and plastics, to complex assemblies and subassemblies, such as transmissions, brakes, and engines.

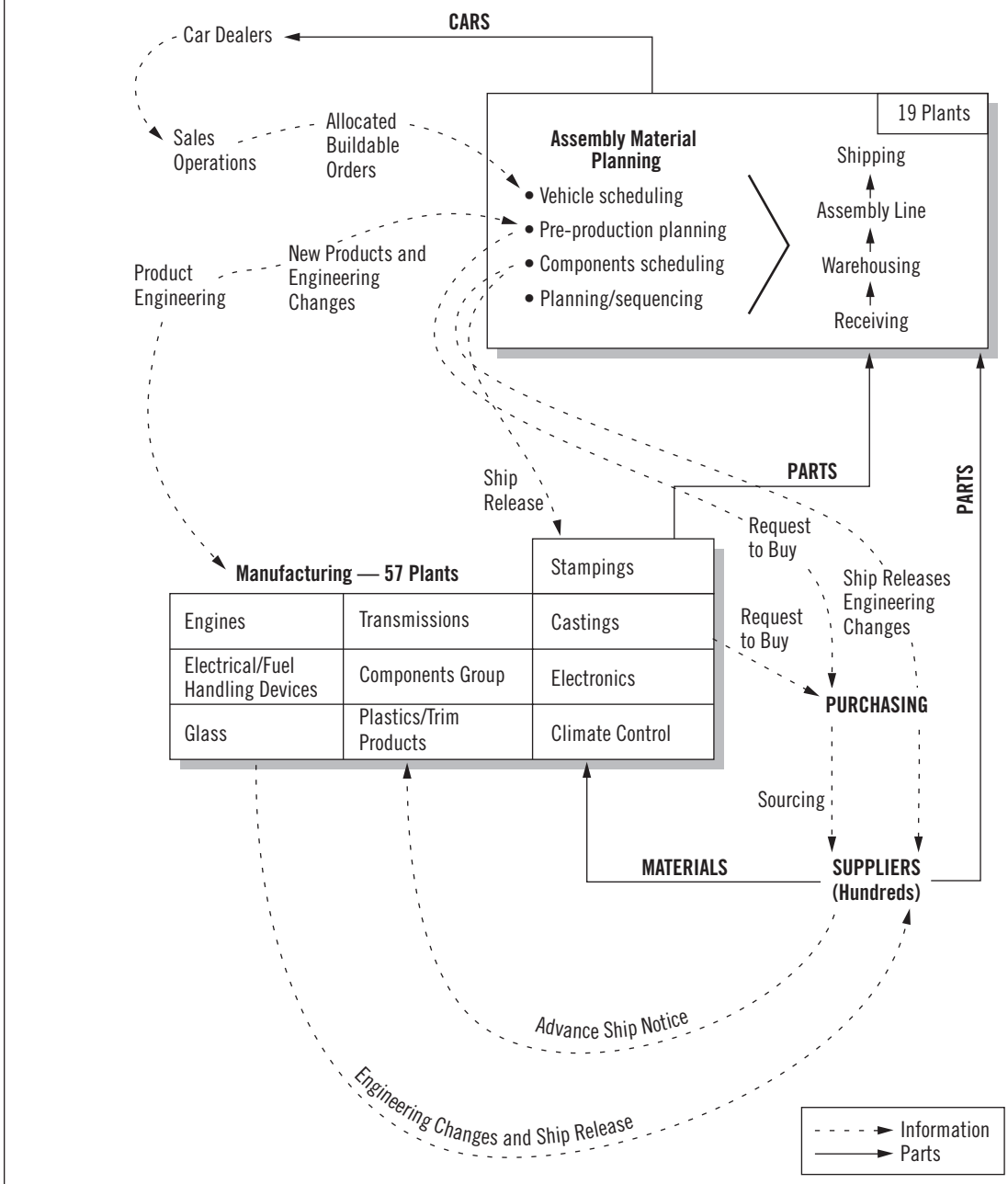
Participants in a supply chain are willing to share such information only when there is trust between members. Thus, the management of relationships with other parties in the chain becomes paramount. Effective supply chain organizations are built on *relationships* (sometimes called "partnerships" or "alliances") that require shared resources. For instance, organizations may provide dedicated capacity, specific information, technological capabilities, or even direct financial support to other members of their supply chain so that the entire chain can benefit.

1-6 Achieving Purchasing and Supply Chain Benefits

When the pieces come together, can the assumption of a supply chain orientation with the right kinds of activities really produce the results envisioned by proponents? Consider the rebirth of Apple computer, which had *BusinessWeek* asking in 1997, "Is Apple mincemeat?"[11] Over 20 years have passed since that article appeared and Apple has made a great comeback through an impressive, steady stream of new and innovative products such as the iPod, iPod Nano, iPhone, iPad, Apple Watch, AirPods, and the new iPhone 11s. Apple has reengineered itself from being considered "mincemeat" to now once again being a great company. While recent increased competition from android phones and other mobile devices has slowed Apple's growth, the company is still a powerhouse. It was ranked by Gartner as the number 1 supply chain company for the sixth straight year. The ratings are based on five criteria: Gartner analysts' opinion, peer opinion, three-year weighted return on assets, inventory turns, and three-year weighted revenue growth.[12]

Apple has developed of an impressive array of purchasing and supply chain activities to manage product demand, inventory investment, channel distribution, and supply chain relationships. The company consistently maintains a manageable product line, forecasts sales weekly with daily adjustments to production, and expects suppliers to manage

Exhibit 1.4 An Automotive Supply Chain: The Role of Materials Planning and Logistics in the Production and Delivery System



inventory for standard parts and components. Apple also formalized a partnership with a supplier to build components close to Apple facilities with just-in-time (JIT) delivery, created a direct ship distribution network through the Web, and simplified its finished goods distribution channel.

1-7 The Supply Chain Umbrella-Functional Activities

A large set of functional activities besides purchasing are part of supply chains. As previously discussed, management's ability to align, coordinate, integrate, and synchronize these activities and the physical, information, and monetary flows is supply chain management. What are the activities that are part of this concept called supply chain management? The management activities that are covered by the supply chain umbrella are illustrated in Exhibit 1.5 and briefly described in the following paragraphs.

1-7a Purchasing

Most organizations include purchasing as a major supply chain activity. Because purchasing is the central focus of this book, there is no need to provide more detail here.

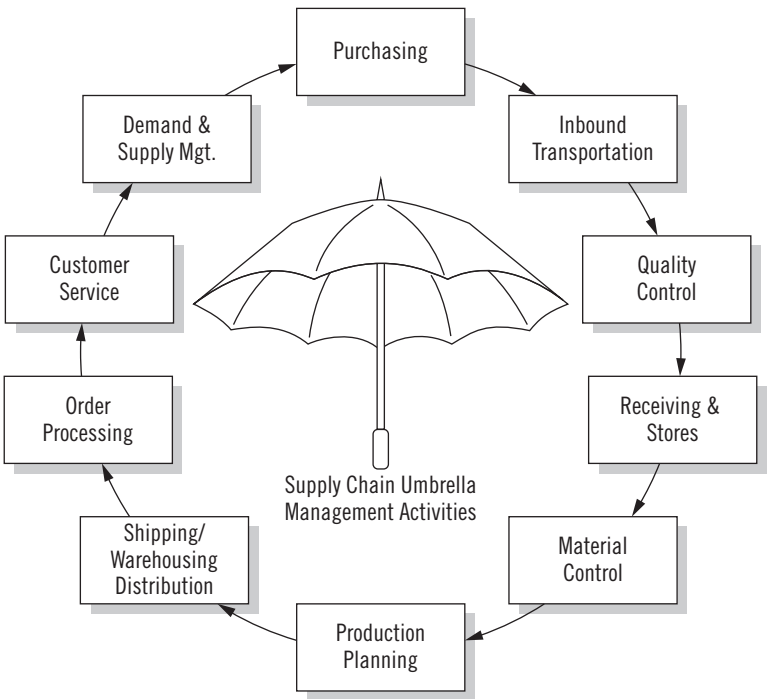
1-7b Inbound Transportation

Larger organizations usually have a specialized traffic and transportation function to manage the physical and informational links between the supplier and the buyer. Transportation is a major cost for many organizations; as a result there are usually opportunities to coordinate the purchase of transportation services.

1-7c Quality Control

As previous examples have shown, quality control is vital to all organizations. Today's focus on supplier quality has shifted from detecting defects at the time of receipt or use to prevention early in the materials-sourcing process. Progressive organizations work directly

Exhibit 1.5 The Supply Chain Umbrella



with suppliers to develop proper quality control procedures and processes to minimize the costs of incoming inspection.

1-7d Demand and Supply Planning

Demand planning schedules the quantity and timing of a firm's output. This includes forecasts of anticipated demand, inventory adjustments, orders taken but not filled, as well as the spare-part and aftermarket requirements. Supply planning is the process of taking demand data and developing a supply, production, and logistics network capable of satisfying demand requirements.

1-7e Receiving, Materials Handling, and Storage

All inbound material must be physically received as it moves from a supplier to a purchaser. In a non-JIT environment, material must also be stored or staged. Receiving, materials handling, and storage are responsible for the physical control over inventory. Receipts from users indicating that services have been performed are also run through receiving to trigger invoice payment.

1-7f Materials or Inventory Control

The terms "materials control" and "inventory control" are sometimes used interchangeably. Within some organizations, however, these terms have different meanings. The *materials control* group is often responsible for determining the appropriate quantity to order based on projected demand and then managing materials releases to suppliers. This includes generating the materials release, contacting a supplier directly concerning changes, and monitoring the status of inbound shipments. The *inventory control* group is responsible for determining and managing the inventory level of both incoming goods from suppliers and finished goods required to support customer requirements. In some organizations, these groups are split between upstream (supplier and inbound materials) and downstream (customer and physical distribution) responsibilities.

1-7g Order Processing

Order processing helps ensure that customers receive material when and where they require it and represents the key link between the producer and the external customer.

Problems with order processing have involved (1) accepting orders prior to determining if adequate production capacity is available, (2) not coordinating order processing with order scheduling, and (3) using internal production dates rather than the customer's preferred date to schedule the order.

1-7h Production Planning, Scheduling, and Control

These activities involve determining a time-phased schedule of production, developing short-term production schedules, and controlling work-in-process production. The production plan often relies on forecasts from marketing to estimate the volume of materials that are required over the near term. Because operations is responsible for carrying out the production plan and meeting customer order due dates, order processing, production planning, and operations must work together closely.

1-7i Shipping/Warehousing/Distribution

The *shipping* activity involves physically getting a product ready for transportation to the customer. Shipping activities include (1) proper packaging to prevent damage, (2) attaching

any special labeling requirements, (3) completing all required shipping documents, and (4) arranging transportation with an approved carrier. For obvious reasons, shipping and outbound transportation must work together closely.

Before a product is shipped to the customer, it may be stored for a period in a warehouse or distribution center. This is particularly true for companies that produce according to a forecast in anticipation of future sales. Many companies now attempt to make a product only after receiving a customer order. As information systems become more sophisticated and forecasting and scheduling more accurate, this part of the supply chain may require less capital investment.

1-7j Outbound Transportation

Outbound Transportation involves goods flowing out of the business either to final customers or elsewhere in the distribution system. Many organizations have outsourced the transportation link to their customers. Full-service transportation providers called **third-party logistics providers (3PLs)** are designing and managing entire distribution networks for their clients. Firms operating in this space include familiar names such as UPS, DHL, CH Robinson, and Ryder.

1-7k Customer Service

Customer service provides support to the customer (1) before (pretransaction), (2) during (transaction), or (3) after a purchase (post-transaction). It includes a wide set of activities that attempt to keep a customer satisfied with a product or service. The three primary elements of customer service are pretransaction, transaction, and post-transaction activities.

1-8 Four Enablers of Purchasing and Supply Chain Management

Now that we have a better understanding of the terminology surrounding purchasing and supply chain management, we must realize that excellence in these areas does not just happen. A commitment to the four enablers of purchasing and supply chain excellence permits firms to achieve real benefits (see Exhibit 1.6). These enablers provide the support that makes the development of progressive strategies and approaches possible. Later chapters present these four areas in detail.

The four enablers model shows that firms have certain guiding philosophies and business requirements that form the foundation of all supply chain activities. These guiding philosophies and requirements may relate to areas such as globalization, automation, customer responsiveness, or supply chain integration. The four enablers, in turn, support the development of strategies and approaches that not only align with an organization's philosophies and requirements but also support the attainment of purchasing, supply chain, and organizational objectives and strategies.

1-8a Capable Human Resources

The key to the success of any company is the quality of its employees. This is certainly true for purchasing. Exhibit 1.6 identifies, from previous research, the various kinds of knowledge and skills demanded of today's supply chain professional. Data from two previous research indicated key knowledge areas for purchasers should include (1) supplier relationship management, (2) data and analytics, (3) total cost analysis, (4) social and collaborative technologies, and (5) supplier and competitive market analysis.[13, 14]

Exhibit 1.6 Four Pillars of Purchasing and Supply Chain Excellence