

PART

I

INTRODUCTION TO SUPPLY CHAIN MANAGEMENT AND SUPPLY CHAIN STRATEGY

Chapter 1: INTRODUCTION TO MANAGING GLOBAL SUPPLY CHAINS

Chapter 2: GLOBAL SUPPLY CHAIN STRATEGY

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Introduction to Managing Global Supply Chains



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LEARNING OBJECTIVES

After studying this chapter, you should be able to

- 1.1 Explain how globalization has affected the management of supply chains.
- 1.2 Define global supply chain management by the goals it intends to achieve.
- 1.3 Explain the structure of global supply chains citing examples of companies that have global supply chains.
- 1.4 Describe the decision-making process in supply chain management.

- 1.5 Explain the importance of an integrated view of supply chains.
- 1.6 Explain how supply chain management has evolved over the years.
- 1.7 Identify some of the emerging trends in supply chain management.

SUPPLY CHAIN PROFILE

JUST DO IT: ON A GLOBAL SCALE, HOW DOES NIKE MANAGE ITS SUPPLY CHAIN?



Nike is investing in robots that use static electricity to assemble its shoes.

David Paul Morris/Bloomberg via Getty Images

Nike, Inc. is the largest seller of athletic footwear and apparel in the world. Originally founded as Blue Ribbon Sports in 1964 with just over \$1,000, the company has grown to achieve revenue of US\$44.5 billion in its fiscal year 2021. Nike is reported to be the world's most valuable sports/fashion brand, offering a variety of products in the categories of running, basketball, football, performance equipment and accessories, training, and sportswear under a portfolio of sub-brands and trademarks such as All Star, Chuck Taylor, Cole Haan, Converse, Jordan Brand, Hurley, Nike Golf, and Umbro Ltd.

Headquartered in Beaverton, Oregon, Nike is a multinational corporation with an extensive global footprint. Nike products are sold in virtually all countries around the world through numerous distribution channels, including Nike-owned retail stores and digital platforms (collectively referred to as "Nike Direct" operations); retail accounts; wholesale customers; and a mix of independent distributors, licensees, and sales representatives. The company owns or leases distribution and customer service facilities in Tennessee, Indiana, and California. Outside the United States, the most significant distribution facilities are located in Belgium, Japan, and Korea.

Nike describes its core business activity as the *design, development and worldwide marketing and selling of athletic footwear, apparel, equipment, accessories and services*. What is notably missing in this description is the *manufacturing* activity. The company owns no factories for manufacturing its footwear and apparel! As one of the earliest adopters of outsourcing, Nike contracted with third parties to carry out its manufacturing operations in low-cost countries. Today, almost all of Nike's products are manufactured by independent contractors, a large majority of which are located overseas. Have a look at the manufacturing map (Figure 1.1), which displays Nike's current suppliers and their locations. An interactive version of the map (available at <http://manufacturingmap.nikeinc.com/>) includes detailed information about the types of products, number of workers, and workforce profile at each location.

As of July 2021, Nike gets its finished products manufactured by 608 factories in 39 countries/regions. Over 1 million workers worldwide are involved in the production of these finished products, with around 5,000 of them located in the United States. The principal materials used in the production of apparel and footwear products are sourced locally in the countries in which the manufacturing facilities are located and include synthetic fabrics and threads, plastic compounds, specialized performance fabrics, natural and synthetic rubber and leather, and nylon.

Managing a supply chain, especially one that has a strong global presence and reliance on outsourcing like Nike's, is no easy task. In fact, Nike witnessed firsthand the challenges of this strategy and the potentially catastrophic damage it can cause to the company. Throughout the 1990s, Nike weathered a huge scandal related to the poor labor practices in its overseas manufacturing sites. To address heavy criticism, widespread protests, and reduced sales, as well as to improve its brand image, the company took several measures such as factory audits and establishment of the Fair Labor Association. Today, Nike's supply chain is recognized as one of the best in the world (see, for

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FIGURE 1.1 Manufacturing Map Showing Where Nike Products Are Made

Source: Retrieved from <http://manufacturingmap.nikeinc.com/>. March 2, 2021. Map Data ©2021 Google, INEGI.

example, Gartner's annual ranking of the Top 25 Supply Chains). How does Nike accomplish the effective management of its global supply chain?

The company puts great emphasis on product quality and partners with suppliers who are committed to supporting Nike's product excellence goals. Nike maintains long-term relationships with its suppliers and holds them to strict standards of sustainability and corporate responsibility. The company makes an effort to keep the number of vendors it works with small, which helps Nike operate a lean supply chain. Furthermore, Nike prioritizes suppliers who can support the company's growth strategy by providing agile and resilient manufacturing with minimum environmental impact and a culture of safety. The company publishes a Code of Conduct, which lays out the requirements for its suppliers, and uses an innovative Sourcing & Manufacturing Sustainability Index to assess their factory performance on sustainability, safety, and labor management. In these factories, lean manufacturing principles are implemented with the goal of eliminating waste through continuous improvement. The focus on combining sustainability with high performance is reflected in the way Nike operates its distribution centers as well. With the opening of its largest distribution center in Memphis, Tennessee, and the expansion of the distribution center in Limburg, Belgium, the company aims to offer short shipping times and high service

capabilities, while also achieving cost efficiencies by the use of renewable energy in operations. Overall, Nike is able to generate significant cost savings by managing its global supply chain effectively, which has given the company a competitive edge in the global marketplace.

What is the plan for the future? Nike wants to speed up its supply chain and make it more responsive to customers' needs. A number of initiatives and strategies are under way, including improving its omnichannel presence through direct-to-customer sales and adopting technology, product innovation, digitization, automation, robotics, and vertical integration of its supply chain. By implementing these strategies, the company aims to onshore or near-shore some of its manufacturing; that is, it aims to bring some of its manufacturing to the United States or to countries near the United States, which will enable the company to respond to customer expectations quickly and maintain its competitive advantage.

Sources: (a) Nike News, 2021, <https://news.nike.com/news/nike-inc-reports-fiscal-2021-fourth-quarter-and-full-year-results>; (b) Gartner press release, 2020, <https://www.gartner.com/en/newsroom/press-releases/2020-05-20-gartner-announces-rankings-of-the-2020-supply-chain-top-25>; (c) Nike letter to shareholders, 2018, https://s1.q4cdn.com/806093406/files/doc_financials/2018/ar/mark_parker_letter.html; (d) From Factory to Footwear: Inside the Nike Supply Chain. Newsletter, 2018, <https://supplychainx.highjump.com/nike-supply-chain.html>

1.1 THE GLOBALIZATION OF BUSINESS

LO 1.1 EXPLAIN HOW GLOBALIZATION HAS AFFECTED THE MANAGEMENT OF SUPPLY CHAINS.

Today's global economy represents a fiercely competitive business environment that emphasizes increasing revenues and lower production costs, while simultaneously requiring speed and flexibility. In addition, the rapid advancements in information technology and the internet, as well as elimination of trade barriers between countries, have led to an interconnected world. As a result, companies and their global customers are able to transcend cultural and language boundaries and can interact in real time. Most companies, regardless of their country affiliation, can now sell their products or services globally, and customers anywhere in the world can purchase a product or service from these companies. For example, consumers in many parts of the world can have direct and easy access to CNN, wear Nike shoes, eat at KFC, or have coffee at Starbucks. The direct interaction between global customers and companies reduced the need for intermediaries such as wholesalers and retailers, and enabled companies to achieve cost savings. Further cost efficiencies have been generated by utilizing the resources in different parts of the world. Overall, global brand awareness, direct access to global markets, and reduced product costs have contributed to the creation of many successful global products such as BMW cars, Pepsi soft drinks, and Airbus and Boeing airplanes.

The concept of **globalization** of businesses refers to the ability of businesses to operate anywhere in the world and serve markets all over the world to meet the needs of customers worldwide. Simply defined, globalization is a process that enables a business to sell in a foreign country, manufacture products in a foreign land, buy materials from an overseas supplier, operate as franchises, or become a partner with a foreign company. Due to globalization, access to global markets is not restricted to only the large multinational companies. Even small businesses with only minimal resources can now meet the needs of consumers in other countries.

Drivers of Globalization

The driving forces for globalization of businesses are lower costs, entry into global markets, ability to respond quickly to changes in demand, reliable sources of supply, and access to the latest trends and state-of-the-art technologies. As mentioned earlier, the collapse of trade barriers and advances in internet technology have provided an impetus for globalization. Major developments allowing the advancement of globalization include the development of the commercial internet in the late 1980s to early 1990s, the formation of the European Union in 1993, the implementation of the North American Free Trade Agreement in 1994, and the commencement of the World Trade Organization in 1995.

Formation of the European Union

The formation of the European Union and the establishment of a common currency not only eliminated trade barriers between European countries, but also led to the requirement of strict quality and environmental standards that companies have to meet in order to do business with member countries. Due to globalization, among global business partners, there has been a proliferation of strategic partnerships, joint ventures, licensing agreements, research consortia, direct marketing agreements, and above all, formation of global supply chains.

Recent events in Europe, however, such as the departure of the United Kingdom (UK) from the European Union (EU) in 2020, known as Brexit, will likely have an impact on the trade relationships. While the UK and EU are still negotiating their future relationships during this transition period, some studies suggest that Brexit will negatively affect income and employment in both the UK and the 27 countries in the EU.¹

North American Free Trade Agreement

The North American Free Trade Agreement (NAFTA) established a free-trade zone in North America among the countries of Canada, Mexico, and the United States. NAFTA facilitated trade among these countries by lifting the tariffs on the majority of goods produced by these three nations. In 2019, however, NAFTA was updated and is now known as The United States Mexico

Zara uses nearshoring as a competitive advantage as it allows the company to quickly get product to market.



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Canada Agreement (USMCA). This agreement includes major changes on auto exports/imports and new policies on labor and environmental standards, intellectual property protections, and some digital trade provisions. After ratification by the United States, Mexico, and Canada, the trade agreement entered into force on July 1, 2020.²

World Trade Organization

The World Trade Organization (WTO) expanded the scope of the rules of international trade

to include services, in addition to goods. Furthermore, the WTO also relaxed the restrictions on and opened the markets for highly regulated industries such as agriculture, textiles, and telecommunications.

Offshoring and Outsourcing

When discussing globalization of businesses in any detail, it's important to understand the meaning of two terms—offshoring and outsourcing. **Offshoring** means a company is getting its production/operations work completed in another country, but the company has complete control of all aspects of the operation. For example, China and Mexico have been the prominent countries for low-cost offshore manufacturing. Benefits of offshoring include lower costs, availability of a larger pool of skilled people, getting work done faster through a global talent pool, and rapidly growing local markets. Risks of offshoring include transfer of jobs to other countries, geopolitical risk, language differences, foreign currency and exchange rate fluctuations, and poor communication. Most of these risks, however, can be mitigated with careful planning. Companies should make decisions on offshore manufacturing only after carefully assessing all of the risks of doing business in another country and proceed only if the rewards truly exceed the risks.

To avoid some of the risks associated with offshoring, many companies have adopted the strategy of nearshoring as an alternative. **Nearshoring** refers to the practice of a company getting its production/operations work completed in another country that is geographically closer to the country where the company is located. The advantages of nearshoring include both the parent company and its provider operating in the same time zone, fewer cultural differences, faster problem solving promoted by closer proximity, and potentially lower costs. The disadvantages of nearshoring include fewer providers, likely higher costs than offshoring, and potential cultural differences.

Many U.S. auto companies that have their production work done in Mexico can be considered examples of companies practicing nearshoring. Similarly, many European companies outsource their production to countries in North Africa, Turkey, and southeastern Europe. Spanish retailer Inditex, the parent company of Zara, for example, embraced nearshoring by making 60% of its garments in Spain and nearby countries. By doing so, the company has been successful in reducing time to market by getting new clothes into stores in less than 2 weeks.³

Outsourcing refers to hiring a third party or an external organization (which can be an overseas company) to control some or all aspects of the operation on a contractual basis. Outsourcing enables a company to entrust to a specialized third-party firm control over production, quality control, and all the administration, while it strictly focuses on its core business processes such as product development, sales, and marketing. India has been the most popular country for business process outsourcing for the past three decades.⁴

Some of the work outsourced to companies in India include business process reengineering, e-commerce, system migration, maintenance of legacy systems, and system integration. A number of leading companies, including Citibank, J.P. Morgan, GE, IBM, and Microsoft, outsource their products and services to Indian companies such as Wipro, Infosys, and others. Although

India and China have been the prominent countries for outsourcing solutions, several countries in Eastern Europe, such as Ukraine, the Czech Republic, Poland, Hungary, Romania, Lithuania, Latvia, and Estonia, have established themselves as solid options for software outsourcing.⁵

A company typically outsources to take advantage of specialized skills, cost efficiencies, and labor flexibility that may be lacking in-house. Outsourcing enables a company to focus its efforts on the company's core competencies (i.e., what the company is good at). By dedicating time to its competitive strengths, such as designing quality products, and outsourcing the peripheral activities, a company can obtain maximum benefit from its talents and resources.

Risks of outsourcing include loss of sensitive information and confidentiality, loss of management control of business functions, poor quality, misaligned interests of the company and the third-party provider, excessive reliance on third parties, lack of in-house knowledge of critical business operations, and so on.

Because of continued offshoring and outsourcing, manufacturing in the United States has steadily declined since World War II. In fact, many U.S. and other global companies perceive the United States as a sales market rather than a manufacturing destination. Furthermore, the rate at which other multinational companies are locating their manufacturing facilities in the United States for sales of their products in other countries is much lower than U.S.-based companies establishing offshore manufacturing facilities to supply goods to the U.S. market. Many experts contend that the practices of offshoring and outsourcing engaged in by U.S. companies in certain sectors for the past 25 years along with import competition have led to a decline in the mean payroll share in those sectors, which in turn has had an adverse effect on the U.S. economy. In addition to labor costs, one of the arguments made for the surge in the offshoring phenomenon among U.S. companies is that the U.S. corporate tax code favors offshore manufacturing, profits overseas, and overseas investment with a lower effective tax rate.⁶ In fact, corporate tax cuts introduced with the Tax Cuts and Jobs Act of 2017 and recent tariffs on imports of products such as steel, aluminum, solar panels, and washing machines aim to dissuade U.S. companies from the practice of offshore manufacturing. The effect of such regulatory measures on the offshoring practices of U.S. organizations, however, is not yet determined. It is argued that increased global competition, market pressures, and an ineffective tax system have resulted in an increase in offshoring and outsourcing practices and the decline of manufacturing in the United States and other Western countries.⁷ Despite this decline, Western manufacturers remain competitive because of their higher productivity. Globally, productivity rates continue to remain the highest in North America. One possible approach to arrest the offshoring trend is for the U.S. government to implement policies that reduce costs for companies that bring manufacturing jobs back to the United States.⁸

Reshoring

In the past decade, rising labor costs in China and other emerging economies, problems associated with quality and intellectual property theft, and long supply chains that are vulnerable to disruptions have made offshoring less attractive. As a result, globally, more and more companies are beginning to embrace the concept of **reshoring**. Simply defined, reshoring is the opposite of offshoring, and is the process of bringing back a company's manufacturing operations to its home country. In recent years, the pledge of President Donald Trump to bring manufacturing jobs back to the United States and the exit of Britain from the European Union have lent more traction to the issue of reshoring. Due to low energy costs, the trend toward reshoring appears to be greater in the United States than in Europe as a number of U.S. companies, including General Motors, Boeing, Ford, and Intel, have reshored thousands of jobs to the United States.⁹ Whether this trend toward reshoring will continue or not is open to debate.

1.2 GLOBAL SUPPLY CHAINS

LO 1.2 DEFINE GLOBAL SUPPLY CHAIN MANAGEMENT BY THE GOALS IT INTENDS TO ACHIEVE.

Offshoring, outsourcing, and the more recent trend toward reshoring have had a huge impact not only on trade but also on global supply chains—which is, of course, the subject of this book. Simply defined, a **supply chain** is a chain of interconnected organizations that are involved in activities

Tesla, an automotive and energy company, had supply chain difficulties that made headlines in 2018. Tesla's automobile supply chain is different compared to the other major automakers, as it does not have the same breadth of suppliers. As a result, in 2018, the company faced supplier bankruptcies and difficulties delivering finished vehicles. Clearly, the disruptive car company is still working out the kinks in its supply chain.¹³



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that encompass a product's entire life cycle, beginning with raw materials to its final consumption. These activities include developing, producing, distributing, and selling a product or service to the final consumer. **Global supply chains** are global networks of interconnected organizations that are involved in these activities. For example, if you look at the labels of some items from electronics to white goods, or even clothes, you will find they are manufactured in countries such as

China, Mexico, India, and Bangladesh. Similarly, items that we use every day such as coffee pods, computers, and soft furnishings are shipped to us from factories in Africa, South America, India, and Hong Kong. We have these global suppliers because companies now face the huge task of satisfying demand for their products from markets across continents. As a result, to reduce the manufacturing costs, these global companies are looking to establish manufacturing plants where costs of raw materials and labor are low. In addition, these companies are buying raw materials from globally dispersed suppliers who can supply the right quality and quantity of these raw materials at the right price. In this scenario, what we find is companies procuring raw materials and components globally from various vendors to meet the needs of their factories situated in countries from different continents. The finished goods produced in factories from these different global locations then move through various chains of distribution networks involving warehouses, exports to different countries or local markets, distributors, retailers, and finally to the end customer. Managing all of the above activities simultaneously to manage demand and supply on a global scale is global supply chain management.¹⁰

The primary objective of managing global supply chains is to create net value by building a competitive infrastructure, using worldwide distribution networks efficiently, matching supply and demand, and monitoring global supply chain performance. The organizations comprising any supply chain are primarily involved in value-adding activities, and therefore, a supply chain is frequently referred to as a **value chain**, as value is added to the product, service, or project as it progresses through the various stages of the chain. Supply chains (particularly global supply chains) are more difficult to manage because they involve not just your firm, but also all of the firms with whom you have business relations globally.

In fact, managing global supply chains has become an overwhelming issue for many businesses due to increasing globalization and offshore sourcing and manufacturing. Some of the challenges of managing global supply chains include reconciling the conflicting business objectives and requirements among global supply chain partners, and coordinating the flow of materials, information, and finance through each of the components in the supply chain.¹¹ The global financial turmoil and economic turbulence of 2008 showed how difficult and challenging the job of managing global supply chains is. During that period, the leaders of a number of global firms responsible for managing their supply chains had to deal with several supply chain-related issues such as supplier insolvency, supply disruptions, port closings, volatile commodity prices, and quality issues. More recently, in 2017, airline companies such as Boeing and Airbus were struggling to meet demand for their aircrafts from their customers in the Middle East and Asia. The primary reason was that some of the suppliers for these airlines struggled to keep up with the surge in demand, which led to production delays, halted deliveries, and loss of revenue for these airline giants. For example, Qatar Airlines decided to cancel orders for four Airbus models after months of delays.¹²

The most severe disruption to global supply chains is currently occurring as a result of the COVID-19 (coronavirus) outbreak. The pandemic has struck at the core of global supply chain hub regions, including China, Europe, Japan, and the United States. In particular, China is a prominent country in global supply chains as it is not only the primary producer of high-value products and components, but also a large customer of global commodities and industrial products and a major consumer marketplace. China is also the production hub for many intermediate inputs, and for processing and assembly operations. For example, Foxconn, an electronics contract manufacturer, has its assembly plants in mainland China and is the supplier for many world-leading electronics companies, including Apple, Intel, and Sony. During the early months of the pandemic, in January and February of 2020, industrial production in China fell by 13.5% when compared with the previous year. The initial decline in production and trade in China has had a strong impact on countries further up and down the supply chain since most of the countries have now imposed restrictions on movements to combat the spread of the virus. For example, companies like Apple, Diageo, Jaguar, Land Rover, and Volkswagen, which rely on China's production and consumer market, have been affected by the decline in production and trade in China due to the COVID-19 pandemic.¹⁴

Since the emergence of the pandemic, the subsequent disruptions to manufacturing and global supply chains have wreaked havoc on businesses, consumers, and the global economy. Consequently, businesses in all sectors of the global economy had to take urgent measures to protect their employees; ensure supply security; deal with supply shortages, demand reduction, and price swings; mitigate the financial impact; address reputational risks; and navigate market uncertainty. A recently conducted survey found that more than 90% of the businesses expect the disruptions to global supply chains will have a long-lasting impact on their businesses, and they are concerned about similar consequences due to future waves of infection. The businesses that responded to the survey indicated that the global supply chain disruptions they faced as a result of the pandemic included fluctuations in supplier prices, delayed order fulfillment due to safety restrictions, the need to find alternate suppliers in other geographic regions due to import/export restrictions and bankruptcy of suppliers.¹⁵

SUPPLY CHAIN MANAGEMENT: LESSONS LEARNED

IMPACT OF COVID-19 ON OUTSOURCING AND OFFSHORING BUSINESS PRACTICES



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The COVID-19 pandemic has also directly impacted outsourcing and offshoring business processes. The work-from-home mandates, total shutdown of certain

businesses, and total lockdowns in some foreign countries have disrupted globally normal outsourcing operations. The pandemic has restricted businesses' ability to fully control their resources, no matter where they were located—onshore or offshore. Even if some businesses are ready to resume their normal operations, if they have overseas suppliers, they are held hostage by the foreign governments making decisions about whether or not these suppliers are “essential” and can resume operations. These businesses now acknowledge they underestimated the risk in outsourcing or offshoring jobs overseas, and their reliance on the production of small but crucial parts in some far-off and often unstable country. Specifically, the COVID-19 pandemic has placed the U.S. manufacturing industry at a unique and unprecedented crossroads. Given the rising labor costs in China and other offshore locations, and the comparatively steep costs of global transportation

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and logistics, some U.S. manufacturing businesses that have been considering reshoring have now reached the tipping point, and the case for domestic manufacturing appears stronger.

Furthermore, as countries began shutting down businesses and requiring employees to work from home, many businesses discovered the following unforeseen but important issues:

- For many offshore service providers, in many cases their workers did not have computing equipment or stable, fast network access from home. They did not have internal networks that were strong enough or secure enough to have people work from home. For example, a large investment adviser in the United States did not have a robust network, and it was forced to have the firm's analysts come to the office to work in shifts in order to maintain social distance.
- Outsourced businesses that depended on their client's network found that their throughput was heavily impacted due to the load on the network.
- Disruptions in normal operations were frequent as many of the IT service providers were overwhelmed by the amount of network traffic.
- Most businesses have outsourcing agreements that ensure the service provider has a well-defined and established "business continuity plan" in place, such as alternate

locations within the country or another country, and a backup site as a guard against disruptions. However, none of the businesses were able to predict the impact of the COVID-19 pandemic on entire nations and the world, and the extent of the subsequent supply chain disruptions it caused.

It will take some time (like in the case of natural disasters) for many businesses to resume normal operations, so these businesses may need to consider a shift in strategy and implementation of outsourcing globally.

First, an anticipated increase in the use of automation of labor-intensive activities may enable businesses to bring some functions back onshore while managing the cost of doing so to a reasonable level. Second, some businesses may likely migrate to cloud computing given the flexibility it offers to scale up or scale down operations to cope with external demand shocks caused by pandemics such as COVID-19. Third, businesses may now consider implementing a "portfolio" approach to outsourcing where the services are distributed among different providers with separate locations—on- and offshore.

Sources: (a) Burkart, G., & Steltenpohl, K. (2020, August 19). Rethinking the supply chain during COVID-19—Which manufacturing sectors are most likely to reshore? *Industry Week*. <https://www.industryweek.com/supply-chain/article/21139479/rethinking-the-supply-chain-during-covid19>; (b) Dalal, J. (2020, April 23). *The outsourcing world beyond Covid-19*. <https://www.intelligentsourcing.net/the-outsourcing-world-beyond-covid-19/>; (c) Dixit, A., & North, J. (2020, July 1). *The future of outsourcing in the aftermath of COVID-19*. <https://www.lexology.com/library/detail.aspx?g=4a76b929-bc4b-4cf0-8fad-269c65aa8b4b>

Despite the challenges of managing global supply chains, those companies that do it well can gain a significant competitive advantage over their rivals. Managing supply chains is a major concern of top management and is at the top of the corporate agenda for most companies. Supply chain costs represent a significant percentage of the sales price of a good or service, so any supply chain cost reduction will directly translate into net profits. For example, let us assume a company's net profit on sales is 4%. If this company can reduce its supply chain costs, say, from 10% to 5%, then net profits will more than double. The main advantage is the company's ability to increase profits without having to increase sales. Furthermore, in the face of increasing global competition, reducing supply chain costs by streamlining supply chain activities has become incredibly important.

What Is Global Supply Chain Management?

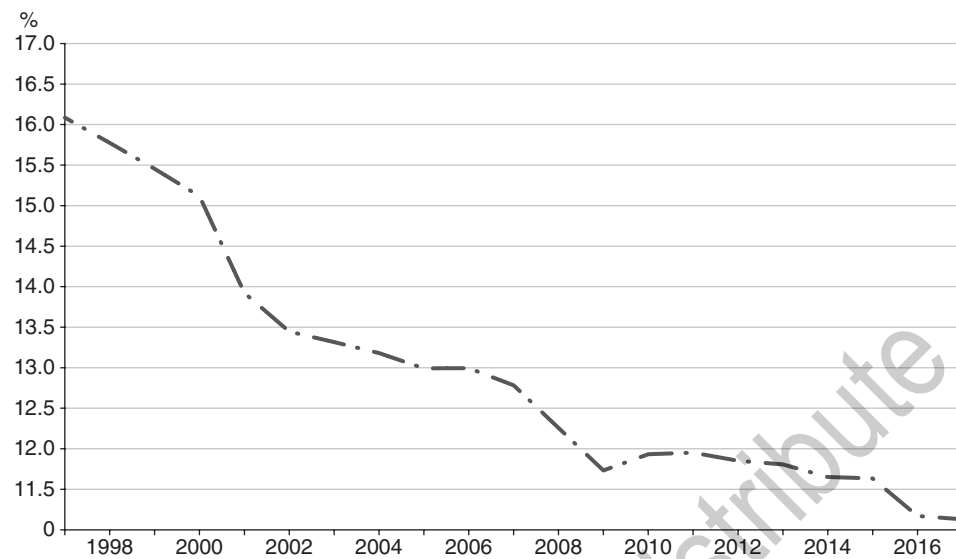
Global supply chain management is a set of approaches utilized to efficiently and fully integrate the global network of all organizations and their related activities in producing, completing, and delivering a product or service so that system-wide costs are minimized while meeting

or exceeding the product or service quality expectations and the customer service-level requirements. This definition implies that a global supply chain is comprised of a sequence of global organizations beginning with the basic suppliers of raw materials and extending all the way up to the final customer. In other words, instead of a local or even national orientation, global supply chain management is concerned with a company's worldwide interests and suppliers. Because a company's global supply chain usually involves a variety of countries, the company has to deal with a variety of new challenges such as overall costs related to doing business overseas, productivity and quality of work of foreign workers, exchange rates, tariffs, extended shipping times, selection of suppliers, and so forth. In addition, a company managing its global supply chain also has to make decisions about its overall outsourcing plan. For example, a number of U.S. companies have outsourced their high-tech services to companies in Bangalore, India, due to the availability of highly qualified and skilled overseas workers who can perform these jobs at a fraction of the price paid to workers in the United States or any other Western country. Furthermore, companies that choose to locate their manufacturing facilities overseas have to contend with a number of logistical issues such as the number of plants needed and where they should be located. These companies should also examine these issues from a global supply chain perspective. For example, if a company uses a number of suppliers around Dacca, Bangladesh, then it makes business sense to locate the manufacturing facilities in or around Dacca, as it will lower not only labor costs, but also the material shipping costs for the company. Similarly, a company may avoid tariffs and generate profit advantages by locating the manufacturing facilities close to its end markets.

The manufacturing share of the global economy of Western countries has been steadily shrinking.¹⁶ The potential for profitable growth for Western manufacturers is in dire straits given their reduced prominence, intense price pressure, and structurally high labor costs. Boston Strategies conducted a study that addressed the question of "How will Western manufacturers survive?"¹⁷ The study was based on an in-depth survey, interviews, and perspectives of several manufacturers, operations management experts, and corporate decision makers worldwide that included both developed Western nations as well as emerging economies. Boston Strategies arrived at several conclusions from this study. First, offshoring is not a new phenomenon, but has been the practice for years. For example, Chinese exports, which had been low and stable until 1990, rose dramatically from 1991 to 2005, particularly after China joined the World Trade Organization. Recognizing the opportunities presented by low-cost Chinese production, many Western manufacturers sourced from China and set up entire business models based on overseas sourcing to cater to the needs of their American and European distribution channels. This phenomenon of foreign sourcing happened in those industries that could benefit from low-cost competitive advantage, such as retail toys and industrial parts distribution. Specifically, manufacturing and procurement have become the key areas for companies for offshoring. Second, offshoring and outsourcing have become established business strategies as large companies, including food-processing companies such as Hershey's and Nestlé, are continuing to outsource and offshore significant portions of their businesses. For example, the total contract value of the outsourcing market in the Americas from 2000 to 2018 increased from US\$40 billion to US\$61.3 billion.¹⁸ Third, because of the continued offshoring and outsourcing, manufacturing in the United States, which used to be around 25% to 30% of the gross domestic product (GDP) after World War II, declined to around 11% by 2017 as shown in Figure 1.2.¹⁹

Despite this decline, Western manufacturers are staying afloat in business due to their higher productivity. Globally, productivity rates continue to remain the highest in North America. In the final analysis, the phenomena of offshoring and outsourcing are deep-rooted and have long-term implications for the survival of businesses. While the pace of these phenomena has slowed down in recent years, the manufacturing infrastructure, organization, and strategies of companies have changed significantly. One desirable outcome of these changes is that many companies have improved their productivity and competitiveness, and now have a much stronger basis for sustaining profitability in the long run. However, in order to not only prosper, but also perhaps even survive in the present global and highly competitive environment, companies can implement the following changes:²⁰

- Build technologies that cannot be duplicated
- Bundle value-added services along with manufactured products to increase profitability and customer loyalty, and exploit the innovative capabilities of the company
- Develop the core product as high-quality producers in-house, while offshoring and outsourcing low-end, repetitive, and labor-intensive work

FIGURE 1.2 Manufacturing Value Added as a Percentage of GDP, 1997–2017

Source: World Bank national accounts data, and OECD National Accounts data files.

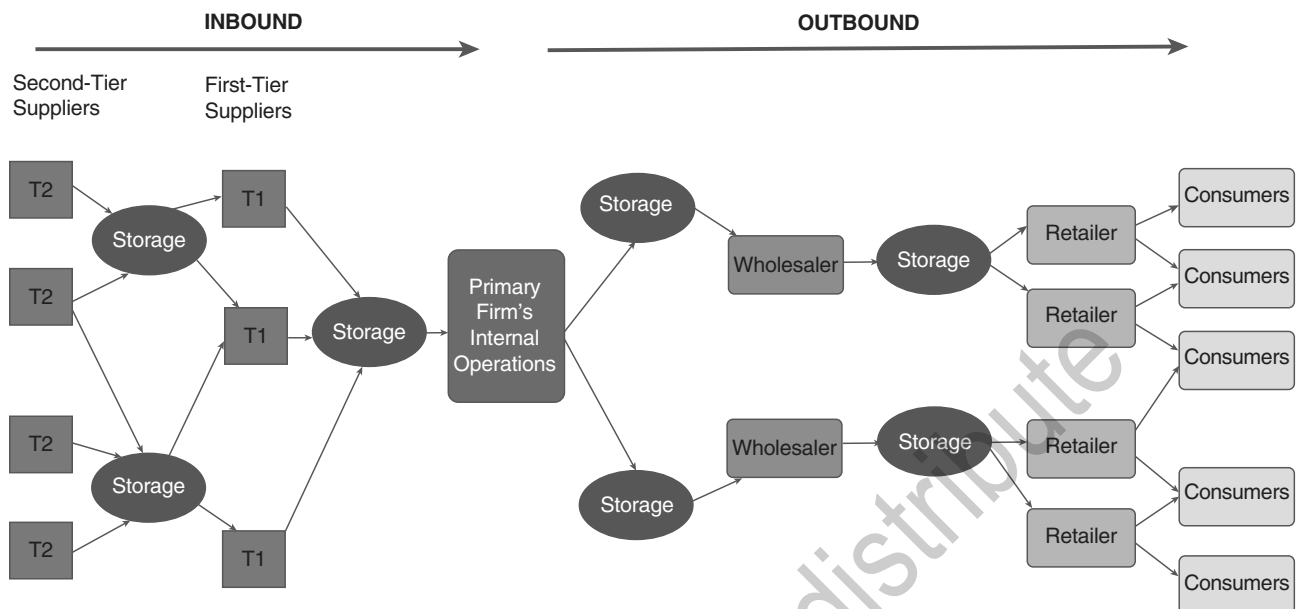
1.3 GLOBAL SUPPLY CHAIN STRUCTURES AND PARTNERS

LO 1.3 EXPLAIN THE STRUCTURE OF GLOBAL SUPPLY CHAINS CITING EXAMPLES OF COMPANIES THAT HAVE GLOBAL SUPPLY CHAINS.

Figure 1.3 shows that each firm in a supply chain has an inbound and an outbound portion. For a company in a global supply chain, the inbound portion can consist of local and/or foreign suppliers. These vendors can be providers of product ideas, product designs, basic raw materials and components, transportation, and warehouses. For example, the Crest SpinBrush (now a product of Arm & Hammer™) quickly became the best-selling electric toothbrush in the world after it hit the marketplace. But Procter & Gamble (P&G), the maker of Crest, didn't actually invent the device. Instead, the company purchased the design from Nottingham Spirk, an external product development company. Purchasing product designs from an external company is a supply chain practice that P&G has used frequently for innovation, and it is consistent with the *open* innovation idea that fosters partnerships outside P&G. The inbound portion of the supply chain ends with the internal operations of the company.

The outbound portion in Figure 1.3 begins when the organization, through its internal operations, delivers its output to its immediate customers in the supply chain. This outbound portion of the supply chain can include globally dispersed wholesalers, retailers, distribution centers, and transportation companies; the consumer; and companies that facilitate the return of products and their disposal. For example, many online businesses often contract with other companies to handle the return of products purchased online by their customers.

From Figure 1.3, you can see that each organization in a supply chain has internal operations it has to manage effectively. The internal operations that are located throughout the supply chain create and enhance the value of products and services by lowering landed cost to the consumer (adds economic value), improving quality of goods and services produced (adds functional value), and improving product appearance and desirability (adds aesthetic value). Managing the internal operations within each company in a supply chain requires planning, organizing, and executing tasks that have both long-term and short-term orientation. In addition, managing the internal operations effectively requires not only cross-functional cooperation within your own company, but also intrafunctional cooperation with other businesses/partners in the supply chain. For example, production and sales departments/functions within the company can cooperate to ensure sufficient production quantities to support a planned sales promotion. Furthermore, each of these functions can cooperate with its counterparts in the inbound and outbound organizations; for

FIGURE 1.3 Typical Global Supply Chain for a Manufacturing Company*

*Note: In a global supply chain, the primary firm may have one or more manufacturing sites located overseas, and many of the inbound and outbound organizations in the chain are typically located overseas.

example, production departments can synchronize their production schedules and sales functions can share their demand forecasts. Next, in the supply chain depicted in Figure 1.3, we will discuss the role of the key players and their relationship to each other.

First-Tier Suppliers

First-tier suppliers provide components, systems, or finished goods and services directly to the primary organization, which can be a manufacturing, retail, or service organization. For example, the worldwide suppliers who produce a wide assortment of shirts for men and women and supply them directly to L.L.Bean represent the first-tier suppliers for L.L.Bean. These first-tier suppliers, however, depend upon a wide assortment of second-tier suppliers at textile mills, cotton plantations, and so on. Therefore, the first-tier suppliers represent just another link in the delivery chain, moving products forward that are sold as goods or services, even though they are directly connected to the primary organization.

Second-Tier Suppliers

Second-tier suppliers are firms that support the first-tier suppliers' manufacturing or service production processes by providing raw materials, basic services, or manufacturing components. The second-tier suppliers acquire these components and raw materials at source often as unfinished or raw goods. Note that the second-tier suppliers may have their own additional layers or suppliers (third tier, fourth tier, and so on).

Storage

Depending on the nature and number of products they sell, companies use warehouses to varying degrees to store their products, components, or materials. For example, firms often use inbound storage of raw materials as a hedge against shortages that could disrupt their manufacturing activities. On the other hand, companies often use outbound storage of finished goods prior to their shipment to a wholesale or retail destination, and as a hedge against demand fluctuations in

An example of a second-tier supplier. One of the basic raw materials used in producing automobile catalytic converters is palladium, which is a metal mined in South Africa and Russia. Palladium, mined as a raw material, is transported to the processing centers of first-tier suppliers producing the catalytic converters for an automobile manufacturer.



iStock.com/Sunshine Seeds

the marketplace. Services cannot be inventoried and do not require storage because they are consumed as and when they are delivered.

Wholesalers and Retailers

Wholesalers are firms who receive goods directly from the manufacturers and eventually sell them to retailers, who in turn sell to end consumers. A manufacturing firm, however, may or may not use a wholesaler or a retailer. The firm

may sell directly to the retailers or may choose to bypass retailers altogether and sell its products directly to end customers. In recent years, computer maker Dell has been selling to retailers such as Best Buy, Walmart, and Target, in addition to selling computers directly to its customers.

In order to meet the increasing demand for convenience by customers, companies have developed **multichannel systems** in which more than one channel of distribution can be used by a customer for product purchase and delivery. One such system is an *omnichannel*, which attempts to provide customers with a seamless shopping experience regardless of how they shop—in a brick-and-mortar store, by telephone, or online through a computer or mobile device (see Chapter 5).

Final Consumers

Final consumers or “end users” of the product are those people and firms who actually consume the goods produced by an organization. Given that the end user, and not the manufacturing or service organization, determines a good’s value, it is the organization’s responsibility to deliver on time to the end users a high-quality and reliable product or service valued by them. Thus, for example, if Samsung produces a new model smartphone that customers find difficult to use, its value is diminished in customers’ eyes even though it may be of high quality.

Logistics

In Figure 1.3, the “arrows” represent linkages among the suppliers, the primary organization, wholesalers, retailers, and consumers. These linkages, known as logistics, refer to managing the flow of goods and supplies involving information, data, and documentation between two nodes or entities in a supply chain. Logistics plays an important role after the procurement of raw materials and after the production of finished goods. These roles involve the delivery of raw materials from the supplier to the manufacturing factory for production, and the delivery of finished goods from the manufacturing factory to the distribution warehouse for delivery to the customer. The flow of goods occurs through a network of transportation modes that may include road, rail, air, or sea shipping, and intermediary warehouses to hold inventories before moving them to downstream supply chain locations. In a global logistics network, in addition to transportation providers, the entire logistics activity involves multitier suppliers, agents, and agencies including freight forwarders, packers, customs, distributors, and logistics service providers.²¹

The above discussion relates to the traditional forward movement of the product through the supply chain network to reach the final customer. However, after the sale of the product, it can also move from the final customer back to the organization at least one step back in the supply chain. For example, if a product is defective or does not satisfy the end customer’s expectations, then the customer returns the product to the point of purchase. In industries where reuse of products is encouraged or enforced, those products move backward in the chain from the point of consumption to the point of origin. This return process involves shipping the defective or used product back to the manufacturer and then testing, dismantling, repairing, recycling, or disposing of the product. Thus, the product travels in reverse through the supply chain network in order to capture any remaining value from the defective product or for proper disposal. This reverse process of

moving goods from their typical final customer to the distributor or manufacturer for the purpose of capturing value (through remanufacturing, refurbishing, repackaging, reusing, reselling, and recycling) or for proper disposal is known as **reverse logistics**.²²

Examples of Global Supply Chains

Let us examine in more detail the global supply chains of two very successful companies—Zara and Apple.

Zara's Supply Chain

One of the most successful global companies in the apparel industry is the Spanish retailer Zara.²³ The secret to Zara's success is its highly responsive supply chain. Figure 1.4 shows how the Zara supply chain is organized.

At the core of the company and its supply chain is a massive and highly automated distribution center called “the Cube,” which is located at Zara's headquarters. Zara's headquarters, which also serves as the company's design and manufacturing center, is located in Arteixo, Galicia, a city in northwestern Spain. Zara's main logistics hub, however, is in a more centrally located facility at Zaragoza. Zara's suppliers send the materials to the Cube, where the manufacturing center turns the digitized patterns developed by the design teams into sewn items. Finished products return to Zara's headquarters and can be shipped directly from its distribution center to specific stores, or they can be transported to the logistics hub in Zaragoza. In the final phase, the finished garments are delivered from Zaragoza to stores around the world by truck and plane. Due to its highly responsive supply chain, Zara can deliver garments to China and the United States in 48 hours, Europe in 24 hours, and Japan in 72 hours. Zara uses trucks to deliver garments to the European stores and airfreight to ship clothes to other global markets. Zara is able to absorb the higher shipping costs as the company rarely discounts its garment prices and spends very little money on advertising. Zara also operates clusters of suppliers in Spain, Portugal, Turkey, Morocco, India, Pakistan, Vietnam, Cambodia, Bangladesh, China, Brazil, and Argentina, which make up the majority of its production.²⁴

FIGURE 1.4 Zara's Supply Chain

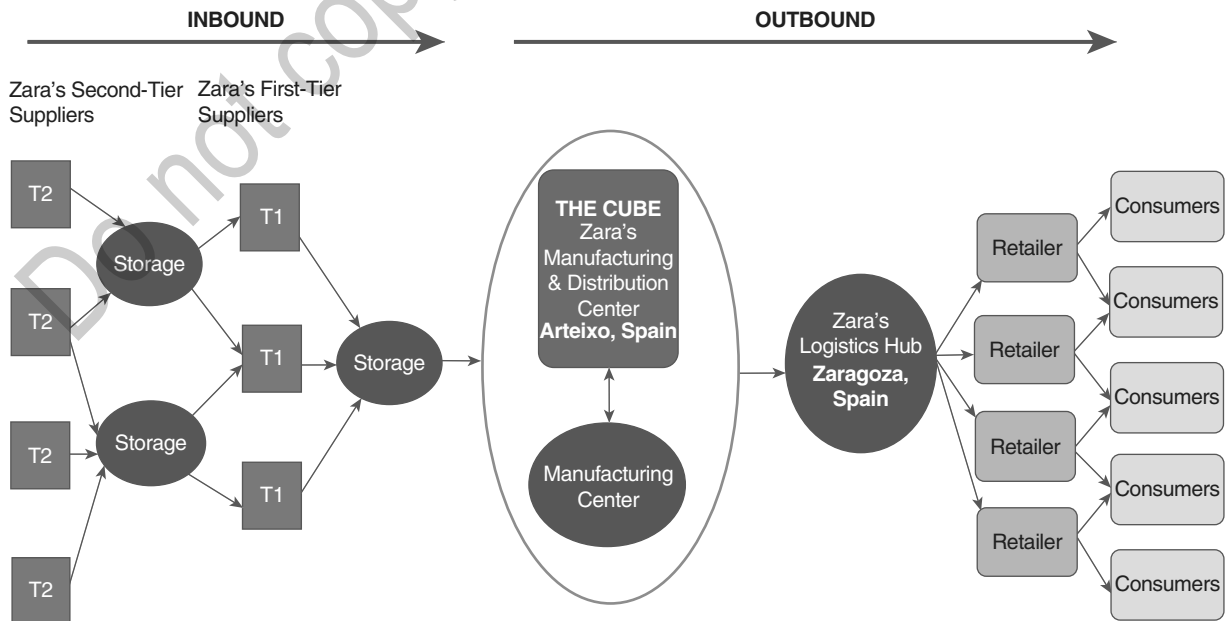
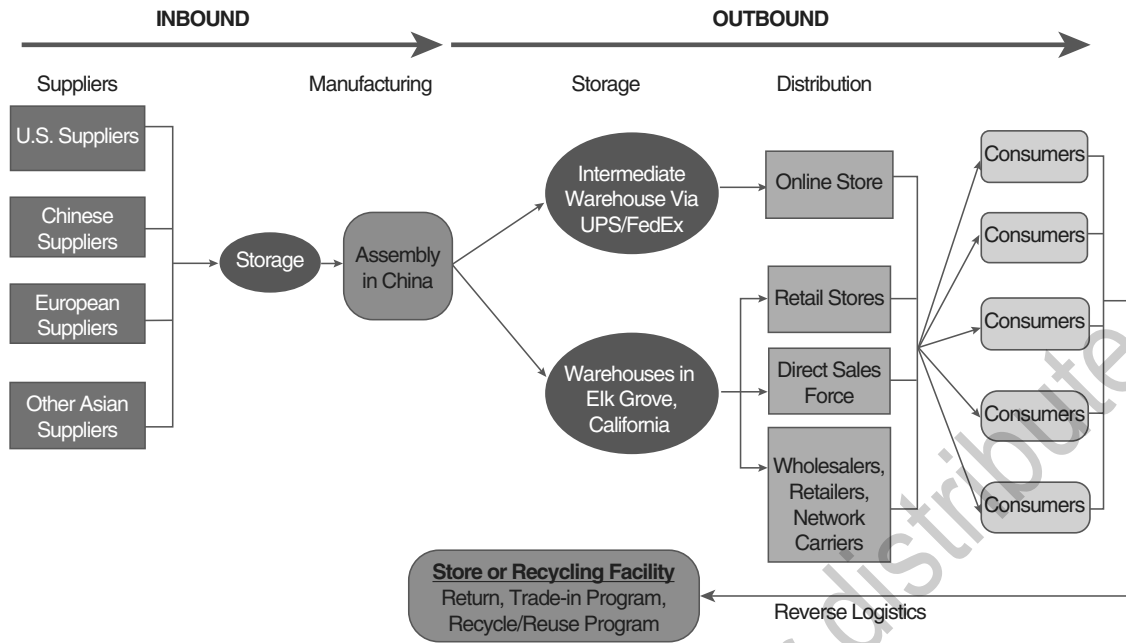


FIGURE 1.5 Apple's Supply Chain



Apple's Supply Chain

The key to Apple's success in the global marketplace, in addition to its ability to design innovative products, is its world-class supply chain capabilities. The company is widely regarded as the leader in the electronics industry due to its ability to quickly meet customer demand by scaling its operations. Strong supplier relationships have provided Apple with the production flexibility to meet demand spikes, particularly during the time when it releases new products. Apple has been able to maintain substantial production capacity due to its profit growth. Figure 1.5 is a visual representation of Apple's supply chain.

Apple purchases raw materials from a variety of global sources. An assembly plant in China receives the purchased raw materials, where they are assembled into finished products. The finished products are then shipped directly to consumers (via UPS/FedEx), who buy from Apple's online store. For other distribution channels such as retail stores, direct sales, and other distributors, Apple supplies the products from its central warehouse facility in Elk Grove, California. Customers have the option of sending the Apple products (for warranty returns or at the end of a product's life) to the nearest Apple store or to dedicated recycling facilities.²⁵

1.4 DECISIONS IN SUPPLY CHAIN MANAGEMENT

LO 1.4 DESCRIBE THE DECISION-MAKING PROCESS IN SUPPLY CHAIN MANAGEMENT.

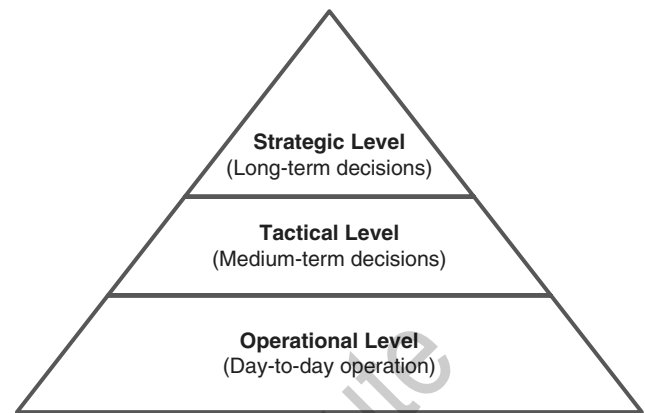
In order to optimize supply chain performance, supply chain management professionals make decisions that can be classified into three categories: the *strategic*, the *tactical*, or the *operational* level. Figure 1.6 shows the three categories of decisions as a pyramid-shaped hierarchy. The decisions at a higher level in the pyramid will set the constraints under which lower-level decisions are made. Strategic decisions have a long-term orientation, while tactical decisions are made for the medium term, and operational decisions are short-term, day-to-day decisions.

- *Strategic decisions.* Strategic decisions define the supply chain network and involve decisions such as plant and warehouse location, supplier selection, outsourcing/offshoring/reshoring, choosing transportation modes and routes, determining capacity levels, and so on.

- *Tactical decisions.* Tactical decisions focus on developing plans and schedules in the supply chain to meet actual demand. Some of these decisions include sales and operations planning, supplier management, distribution, and transportation planning.
- *Operational decisions.* Operational decisions are made to implement and execute the higher-level strategic and tactical plans. Some of these decisions include inventory control, production scheduling, supplier evaluation, performance measurement, and customer relations management.

Consider, for example, Nike's supply chain decisions mentioned in the Supply Chain Profile. The selection of suppliers on Nike's manufacturing map (Figure 1.1) and its ongoing initiatives for increasing omnichannel presence, automation, and vertical integration of its supply chain are all strategic decisions. Nike's efforts in responding to customer expectations quickly by utilizing effective demand planning and inventory management correspond to tactical-level decisions, whereas the company's use of the Sourcing and Manufacturing Sustainability Index to evaluate its suppliers is an operational decision. These decisions are not all-inclusive, and the following points should be made clear. First, strategic decisions are interrelated. Tactical- and operational-level decision-making functions are distributed across the supply chain, and there is no clear demarcation line that separates tactical from operational decisions. For example, the strategic decision of choosing a transportation mode such as rail, water, truck, or air is clearly dependent on the strategic decision of where the manufacturing plants are located. Second, while managing customer relations is a day-to-day ongoing activity, customer relationship planning is often a tactical decision. Thus, decisions in the hierarchy are interrelated and can subsequently affect other downstream decisions that must be made. Finally, we need to examine each of our decisions at the strategic, tactical, and operational levels for *alignment*; in other words, do tactical and operational decisions correlate with and support the higher-order, strategic choices we made? The decision hierarchy requires that choices be naturally linked and internally coherent.

FIGURE 1.6 Hierarchy of Supply Chain Decisions



1.5 INTEGRATED SUPPLY CHAIN MANAGEMENT

LO 1.5 EXPLAIN THE IMPORTANCE OF AN INTEGRATED VIEW OF SUPPLY CHAINS.

Supply chain management involves managing and integrating key business processes; relationships (people); and flows of materials, information, and money with the ultimate goal of creating value to customers and stakeholders. Companies competing in the present-day global marketplace are witnessing lower profit margins, intense competition, and decreasing differentiation among brands. Therefore, more and more companies are integrating their supply chains to compete effectively in the global marketplace.

What Is Supply Chain Integration?

A supply chain can be viewed as a collection of suppliers, with each having the responsibility of producing a product/service to its immediate customer downstream. Thus, each supplier in the chain is a “link” that adds time and money. Hence, supply chain management can also be defined as a collection of methodologies, theories, and practices that has the objective of operating the supply chain smoothly and efficiently for the benefit of most, if not all, of its participants (links). Achieving this objective requires supply chain integration, which is a large-scale business strategy similar to strategic initiatives such as entering a new market, commercializing a new product, or migrating to a new technology. The focus of this integration strategy is to achieve a

close working relationship among the links or partners in the chain in order to improve response time and production time, and to reduce costs and waste. A tight supply chain integration is achieved by merging with another firm in the chain. Dell's supply chain is an example of a tightly integrated supply chain. Dell's supply chain strategy is to focus on its core competencies, which are product design and development and assembly and delivery of final products, and outsource activities it is not good at, such as software development and retail reselling. By vertically integrating everything in its in-house supply chain except for parts procurement, Dell reaped the benefits of low inventory and just-in-time delivery direct to customers, and maintained its competitive edge in the PC market.²⁶

On the other hand, a loose integration is achieved by sharing information and working more exclusively with particular suppliers and customers. In the latter case, the various links in the chain operate almost like a single enterprise to increase efficiency and benefit everyone through steady, reliable business. An example of loose integration is the partnership between Procter & Gamble (P&G) and Walmart in which P&G became an exclusive supplier of some of the product categories they produced for Walmart. The two companies formed a loosely integrated supply chain by integrating their back-end information systems. The loose integration ensured that the two companies could match product stocks perfectly across stores, which reduced excess inventory, enabled subsequent price discounting, and increased their sales eightfold.²⁷

The benefits of integrated supply chains include the following:²⁸

- Cost reduction by eliminating wasted time and materials, and having fewer intermediaries
- Shortened product life cycles by having fewer links in the supply chain and tighter coordination among delivery, warehousing, and transportation
- Faster response to changes in the market, and the ability to enter new markets for an early advantage

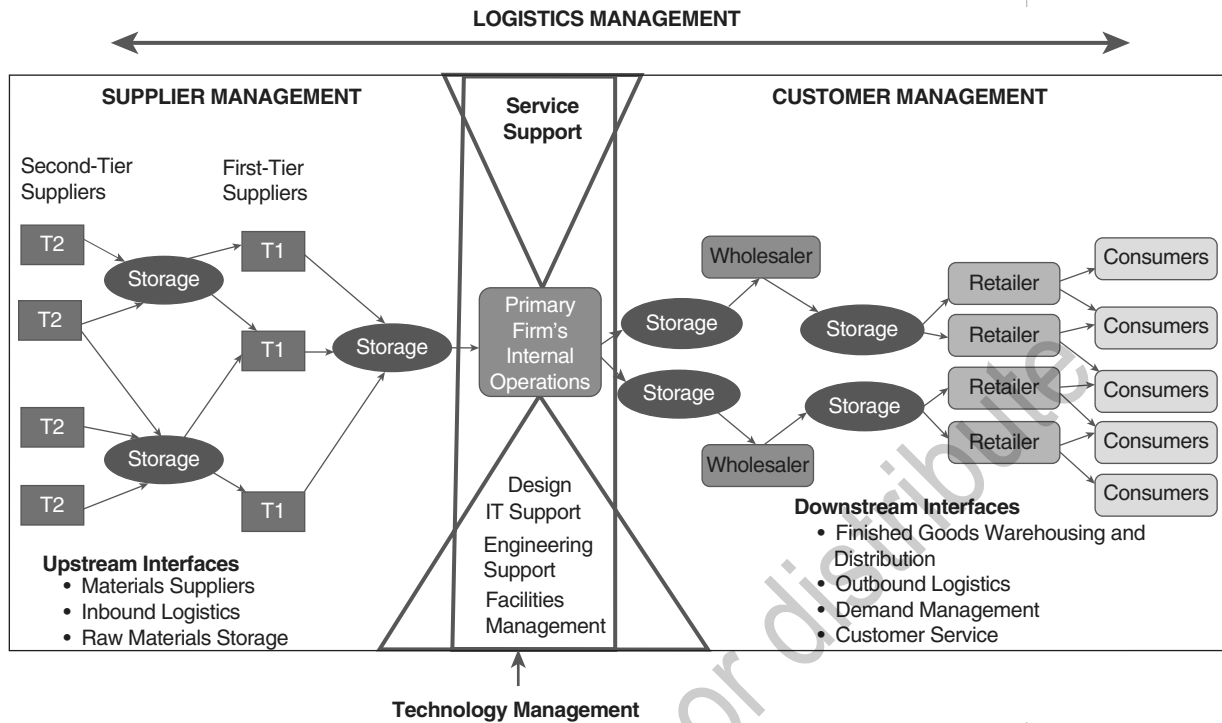
To achieve optimal supply chain performance, the functions and processes among the various links in the supply chain must operate in an integrated manner. Achieving this integration, however, is difficult given the dynamics within each company in the supply chain, and in the marketplace. For example, events such as delayed arrival of materials, production failures, workers' absenteeism due to illness, and loss of customers or order cancellations lead to deviations from the original plan. While some of these events can be addressed locally by a link/partner in the chain, there may be other events where the problem cannot be resolved locally. In such cases, plans and schedules may have to be revised and coordinated across many links in the supply chain.²⁹ In this section, we will focus our discussion on how to integrate a firm's internal operations with its supply chain. We will discuss how this integration is done for firms that produce both goods and services. To integrate, we first need to understand the interrelationships or interfaces between a company's internal operations and its supply chain.

Internal Operations Interfaces in a Product Supply Chain

Figure 1.7 provides a more detailed view of the interrelationship between a company's internal operations and its supply chain activities. Note that this is an expanded version of Figure 1.3. It shows the elements of a company's internal operations that contribute to its supply chain success.

Effective integration of a firm's internal operations with its supply chain requires effectively managing the following three major sets of "interfaces," or interrelationships.

- *Upstream interfaces: **Supplier management.*** The upstream interfaces of a firm's internal operations typically include suppliers that provide raw materials, components, and parts required in the downstream operations process. The management activities in this interface include prequalification and selection of suppliers, negotiation of contracts with them, and materials storage and planning—that is, purchasing the materials, managing their inbound transportation, and inspecting and warehousing them. For example, as discussed in Nike's Supply Chain Profile, the company's supplier

FIGURE 1.7 Expanded Supply Chain With Operations Interfaces

management is focused on maintaining long-term relationships with the suppliers and prioritizes factors such as alignment with its product quality requirements, growth strategy, and sustainability commitment in its contract negotiations with them.

- **Downstream interfaces: Customer management.** The downstream interfaces include individuals or companies that buy and use the finished products of a company. These customers could be internal to the firm, external intermediate customers, or the final consumer of the firm's product. Consider, for example, P&G, a manufacturer of a wide variety of consumer products. For P&G's Head & Shoulders dandruff shampoo, P&G's distribution center is an internal customer; a retail store such as Walmart is an external intermediate customer; and you, as the potential buyer of that shampoo, are the final consumer. Although each of these consumer groups is important in its own right, a firm's internal operations has to identify which consumer groups are critical and target these groups as they have the most significant impact on product sales, design, and future growth. This process is part of demand management used to anticipate and manage customer demand for a product or service. In addition, the internal operations group also interacts with other trading partners who may provide additional services downstream such as outbound transportation, packaging, warehousing, and storage.
- **Vertical interfaces: Technology management and service support.** A firm's internal operations group interfaces vertically with suppliers who provide the necessary technology and the skilled labor resources needed for product and process design and other services such as information technology services or facility management to support the company's processes. Vertical interfaces of a company's internal operations also include suppliers that provide the company with support such as equipment maintenance, recycling, disposal, and repair services. For example, the information technology support services can enable a firm's internal operations to interface with both upstream suppliers and downstream customers through technology options (e.g., enterprise resource planning, warehouse management systems, and transportation management systems).

Let's illustrate the nature of operational interfaces in a product supply chain by using a practical example. Let us assume we are an aircraft production company. Our company requires fuselages to facilitate aircraft production. To avoid bottlenecks or production delays, it is critical that we create and maintain a supply chain ensuring the timely arrival of these fuselages when we need them. Therefore, we might contract with a fuselage manufacturer (first-tier supplier) to ensure timely delivery of these fuselages. The fuselage manufacturer, in turn, would contract with its suppliers to make sure that they had sufficient quantities of subassemblies, components, and raw materials needed to produce and supply the fuselages to us when needed. For example, the fuselage manufacturer may need carbon fiber sheets as raw materials to manufacture fuselages. When the critical supplies of carbon fiber sheets arrive at the manufacturer's warehouse, it may store a certain amount of these carbon fiber sheets to guard against unexpected disruptions in the carbon fiber sheet supplier's deliveries. Similarly, we as an aircraft manufacturer may store certain major subassemblies to guard against delivery delay from our first-tier suppliers. All of the above activities are part of supplier management and focus on upstream processes of the supply chain.

Many functions need to be managed in the aircraft production company. For example, a number of technology management and service support functions must be managed. The reason technology management and service support functions are emphasized is because they interface with the supplier and customer parts of the supply chain. These vertical interfaces may include companies that design and produce electronic communications and cabin management systems needed by both crew and passengers. These systems include cabin intercommunication data systems used to control cabin functions, and the passenger service units for passenger seating system controls.

Note that, with technology management, we are continuously looking for ways to improve the design of facilities and engineer our processes to make our production more efficient. Perhaps, for example, we decide that the current layout of our aircraft production facilities is inefficient and leads to long delays or bottlenecks. We may redesign the facilities to correct these deficiencies by co-locating key contributing functions like engineering, procurement, and quality to integrate operations and reduce production delays, or redesign the production process by acquiring state-of-the-art equipment to make it more efficient. In addition, vertical interfaces also include service support such as maintenance, repair, and overhaul. In aircraft production, for example, service support includes maintenance tasks that ensure airworthiness of an aircraft. These tasks include inspection; rebuilding; alteration or defect rectification; and the supply of spare parts, accessories, and other raw materials.

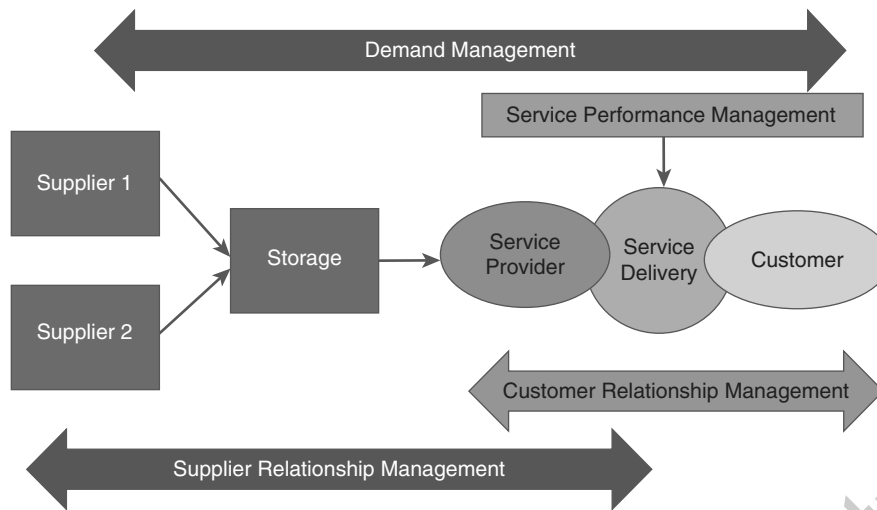
Finally, we must attend to the critical downstream processes as part of our customer management to ensure our customers (the airline companies) have our finished products when and where they are needed. At the same time, we use logistics and distribution strategies to improve the flow of inbound raw materials, components, and subassemblies. For example, we are also concerned with ensuring that no critical shortages of fuselages occur during our production process, so we design a supply system that ensures on-time deliveries of these fuselages.

In summary, Figure 1.7 demonstrates the complexity of integrating a firm's internal operations with its supply chain through identifying the variety of critical interfaces that organizations must address. These challenges range from supply chain issues related to upstream and downstream activities, and the vertical interfaces that form critical elements of a firm's supply chain management.

Internal Operations Interfaces in a Service Supply Chain

Let's now look at a service organization—its relationships and its internal operations interfaces with its service supply chain. A **service supply chain** is defined as a network of interconnected organizations that utilize resources and transform their inputs (skills and knowledge) into service offerings with varying degrees of flexibility and customization.³⁰

Figure 1.8 shows a service supply chain model of a typical service organization's internal operations, and its interfaces and relationships with its supply chain. From this figure, we can see that the interfaces and activities such as supplier relationship management, demand management, and customer relationship management are identical to those in a product supply chain. The only significant difference is the overlapping oval symbols that indicate a direct interaction between the service provider and the customer, as the service is provided and consumed simultaneously.

FIGURE 1.8 A Service Supply Chain Model

Source: Baltacioglu, T., Ada, E., Kaplan, M. D., Yurt, O., & Kaplan, Y. C. (2007). A new framework for service supply chains. *Services Industry Journal*, 27(2), 105–124.

Service businesses are a rapidly growing (and, in fact, dominant) sector of many Western European and North American economies. Understanding the nature of their operations is a crucial element in this text and must be directly incorporated into our discussions of operations management and supply chains.

Let us consider a hospital to illustrate the nature of operational interfaces in a service supply chain. The hospital requires equipment; drugs; and supplies such as scalpels, forceps, needles, and so on for its day-to-day use to treat patients. Because a hospital cannot run out of these critical supplies needed for high-quality patient care, it creates and maintains a supply chain that ensures the timely arrival of equipment, drugs, and supplies when it needs them. Therefore, the hospital might contract with pharmaceutical firms and hospital equipment manufacturers to ensure timely delivery of these items. When these critical items arrive at the hospital, the hospital may store a certain amount of some of these items to guard against unexpected disruptions in suppliers' deliveries. The activities discussed above are part of supplier relationship management and focus on upstream processes of the hospital supply chain.

Within the hospital, we must manage the critical human resource inputs such as doctors and nurses, technology, and the other service support functions. These constitute the vertical interfaces of our hospital supply chain. To continuously improve patient care and efficiency, the hospital may look for ways to reduce patient waiting time and duration of hospital stay. For example, the hospital may acquire state-of-the-art equipment, redesign the layout of the current facilities, or redesign the existing patient scheduling system to improve efficiency and patient care. The activities discussed above are part of the service performance management and customer relationship management functions of a hospital supply chain.

Finally, the hospital must focus on the critical downstream processes as part of customer relationship management to ensure that its external customers (patients) and its internal customers (doctors and nurses) are satisfied. In addition, to improve efficiency and patient care, the hospital can use demand management strategies such as appointments and reservations.

1.6 EVOLUTION OF SUPPLY CHAIN MANAGEMENT

LO 1.6 EXPLAIN HOW SUPPLY CHAIN MANAGEMENT HAS EVOLVED OVER THE YEARS.

Although the importance of supply chain management was recognized over 100 years ago when the first assembly line was created, the term *supply chain management* was first coined in 1982.

From an initial focus on improving labor-intensive processes, supply chain management has evolved into managing present-day complex global supply chain networks. The evolution of supply chain management can be classified into five eras: creation, the early years, logistics, the technology revolution, and globalization of supply chains.³¹

The features of supply chain management during the first three eras varied from improvement of manual loading processes and cost reduction programs; through improvements in materials handling and warehouse design and layout; to optimization of supply chain design and distribution planning; and a greater emphasis on logistics for the integration of inbound, outbound, and reverse flows of products, services, and related information. Later, during the technology revolution era, important technological developments in the 1990s such as electronic data interchange systems (discussed in Chapter 9); enterprise resource planning systems (discussed in the online chapter); and advanced planning and scheduling enabled supply chain evolution to focus on value-adding and cost reduction approaches through integration. Finally, during the globalization era, developments in supply chain management included supply chains transcending national boundaries and expanding into other countries and continents, and the importance given to global supplier relationships. The primary focus of globalization of supply chain management in organizations during this era was to enhance their competitive advantage by adding value and reducing costs through global sourcing.

1.7 CURRENT AND EMERGING ISSUES IN GLOBAL SUPPLY CHAIN MANAGEMENT

LO 1.7 IDENTIFY SOME OF THE EMERGING TRENDS IN SUPPLY CHAIN MANAGEMENT.

Although the field of supply chain management has been evolving continuously over the past several decades, the pace of change has been particularly rapid in the last decade. Every aspect and phase of supply chains—from design to new product introduction through sourcing to final customer delivery—has been impacted by this change. The growth of e-commerce and omnichannel retail, among others, has contributed to rapid change. Amazon has been the leader in initiating many of these supply changes by using analytics and also technology such as the Internet of Things, artificial intelligence, cloud computing, process automation, fulfillment center management, and last mile transportation and delivery optimization.³²

Global supply chains are complex, and most companies competing in the global marketplace do not have the necessary resources and the preparation to manage them. The global supply chains of most companies typically were designed to manage stable, high-volume production to take advantage of the low labor cost opportunities that existed in countries such as China and other emerging economies. In recent years, however, with increasing global competition, companies are seeing that features such as the availability of labor and ability to produce in high volumes at low costs, which made these foreign locations attractive, are likely to change in the future. In other words, these foreign locations may not be as profitable as they used to be.

Challenges such as a global economic downturn and turbulent trade relations, such as the one that we are currently witnessing between the United States and China, are likely to become perennial problems in managing global supply chains. In addition, finding reliable, low-cost suppliers will be more difficult for many of these global companies due to the improving wealth and standard of living of workers in many of the developing countries, especially those in central and Eastern European countries. While many of the challenges just mentioned are beyond a company's control, supply chain executives responsible for formulating supply chain strategies should still be aware of the risks of making critical decisions that could become unprofitable.³³

Therefore, to meet these challenges and mitigate the risks associated with making the wrong decisions, companies operating in the global marketplace should recognize and capitalize on the following trends in supply chain management.

The Continuous Optimization of Resources

In the internal operations of every supply chain participant, the trend toward eliminating waste and maximizing productivity will continue through optimization of raw materials and labor usage. In both product and service supply chains, companies will continue to use the popular

techniques of lean and agile manufacturing along with Six Sigma quality programs. The Korean steel manufacturer POSCO (Seoul, South Korea), for example, combined lean manufacturing and Six Sigma methodologies to establish itself in the global marketplace as the leading provider of innovative steel products and services. In addition to optimizing inventory levels throughout their supply chains, firms will also focus on optimizing usage of their other resources, such as transportation and production equipment. Managers in charge of the internal operations of every company in the supply chain have the responsibility to balance the supply and demand of resources.³⁴ Through continuous optimization of resources, companies and their supply chain partners will be able to reduce the total supply chain cost and realize the benefits of the profit leverage effect.

Greater Supply Chain Risks and Supply Chain Restructuring

In recent years, there has been a dramatic increase in supply chain risks due to higher levels of outsourcing and offshoring, production of more complex products and services, fluctuation in energy prices, and increased financial volatility. In particular, companies with global supply chains are facing the greatest risks in terms of obtaining labor and other resources, and the challenge of integrating their IT systems with those of the other companies in their supply chains. Even though these risks exist, very few companies have well-thought-out strategies to address them.³⁵ In order to respond effectively and quickly to these risks and to changes in the marketplace, companies should invest in supply chain management capabilities like Zara has done.³⁶

Some organizations are responding to these challenges by restructuring their old supply chains. First, these organizations are **splintering** their traditional supply chains into smaller and more agile supply chains that can better respond to higher levels of business complexity, save money, and improve customer service. Second, these companies are reconfiguring their manufacturing facilities to respond to a range of potential market scenarios. Essentially, the firms are using their supply chains to hedge against uncertainty in the marketplace. Consider the example of a U.S.-based consumer durables manufacturer that manufactured most of its products in China. Because the delivery of the products from China took a long time, the company had to maintain high inventory levels. As a result, the firm was rapidly losing ground to competitors. To regain its market share, the company split its traditional one-size-fits-all supply chain into four smaller supply chains, or splinters. Products for which there was high, stable demand were assigned to the first splinter and continued to be manufactured in China. Products for which there was low, volatile demand were assigned to the second splinter and manufactured in the United States. The manufacturing of products with low, regular demand was split between the United States and Mexico and assigned to the third and fourth splinters. These changes helped the company reduce its cost of goods sold by 15%. Furthermore, the company was able to improve its quality levels across its full range of products; receive its products faster; and, most importantly, improve its customer service levels by having the right goods available for customers to purchase at the right times.³⁷

Role of Technology and Data Analytics

In the next decade, several new and emerging technologies that can have both an incremental and a transformational impact, if judiciously deployed, can improve supply chain visibility and performance. For example, prudent use of these technologies can provide a competitive edge to companies across many industries, including manufacturing, automobile, health care, energy, oil and gas, retail, pharmaceuticals, e-commerce, construction, and heavy engineering. The degree of investment in these technologies and the extent of usage, however, will vary from industry to industry. In this section, we discuss briefly some of the technologies and automation solutions that can affect global supply chains in varying degrees.³⁸ A more comprehensive discussion on this topic is presented in Chapter 15.

Internet of Things

Internet of Things (IoT) is the concept of connecting any device to the internet and/or to each other with an on-off switch. IoT can include any number of products or components such

A drone dropping off a parachuted box containing vaccines from a height of about 80 meters to a small lawn quadrangle inside the New Tafo Government Hospital in New Tafo, Ghana.



CYRIL NDEGEYA/AFP via Getty Images

as washing machines, mobile phones, kitchen appliances, jet engines, and so forth. IoT can help companies to improve their products and their overall customer experience. By using this technology, companies can gather a vast amount of information about their products, including where and how the products are being used, and at any given time, which of the company's customers are using them. Thus, with a product connected to the IoT, a company will be alerted if its product is defective, and with this advance

knowledge, the company can contact its customers to report the problem and seek to address it before it becomes a bigger issue.³⁹

3-D Printing

3-D printing is the process of making three-dimensional solid objects from a digital file. This technology has helped companies improve their supply chain performance. Amazon has filed a patent for a mobile 3-D printing delivery truck that would print out customers' orders on the fly and deliver them instantly. This technological innovation would help Amazon not only get the items to shoppers more quickly, but also save money by eliminating the need to import items and reducing its warehouse space.⁴⁰

Drones and Autonomous Vehicles

Despite the restrictions placed on them by the Federal Aviation Administration, drones represent yet another technology that can provide significant opportunities for affordable and flexible solutions in the asset monitoring and delivery side of a company's supply chain. Amazon, for example, plans to use the Amazon Prime Air Drone to deliver packages up to 5 lbs. in 30 minutes or less using small drones. Similarly, in industries such as agriculture, oil and gas, and mining, drones are used for the purposes of asset monitoring and survey work and have contributed to significant cost savings in these industries. Through the use of drone technology, DHL (Bonn, Germany), the logistics firm, has been able to establish regular delivery services to remote German islands in the North Sea.⁴¹

Logistics operators in many African cities and rural areas face the challenge of "last mile delivery" as the road networks in many African countries are either underdeveloped or poorly maintained. Zipline, an American medical product delivery company founded in 2014, is addressing this challenge by using drones. The company started its drone delivery operations in Rwanda in 2016 for delivering blood and blood products during emergencies. The company has now expanded its operations to include Ghana and is delivering more health products, including routine vaccines.⁴²

Autonomous vehicles, also known as driverless or self-driving vehicles, are vehicles that are able to operate without human drivers. Their operation relies on integration of technologies such as advanced sensors, cameras, and navigational mapping. In recent years, most major global auto manufacturers as well as technology giants and well-funded startups have started actively exploring the use of autonomous vehicle technology and unmanned vehicles in their supply chain and logistics systems. For example, Ocado and Oxbotica conducted the trial of unmanned delivery vehicles in London. Building on the technology developed by Google's self-driving car project, Waymo has launched a pilot program to use driverless trucks to deliver freight in Atlanta. The steady growth of e-commerce is an important driver for companies' race to the development of autonomous trucks. Morgan Stanley estimates that autonomous vehicles can save the U.S. freight industry \$168 billion annually, mainly from reduced labor costs, improved fuel consumption, and improved productivity. Other potential benefits are increased freight capacity, reduced accidents,

and lower environmental damage. Once the technology matures and the use of autonomous vehicles becomes widespread in delivery and line haul logistics, organizations can enjoy reduced transportation costs and may also consider restructuring their supply chains.⁴³

Big Data Analytics

Another emerging trend in the field of supply chain management is the use of data analytics. In particular, **big data analytics**, which involves the analysis of huge, rapidly growing, and very messy unstructured datasets, is becoming very important in every industry's supply chain. The use of advanced analytics can help managers to identify supply chain performance issues, develop strategies to deal with supply chain disruptions, and improve delivery service and speed to customers. For example, a global life sciences company uses advanced analytics for its replenishment and inventory planning. By analyzing the pattern of customer clicks on the company's website in a country or region, a supply chain team member can adjust inventories prior to customers placing orders. The net result is that the company holds the right amount of inventory in the right locations, reducing the lead time promised to customers, which, in turn, increases the likelihood of customers placing orders.⁴⁴

Artificial Intelligence

Artificial intelligence (AI) refers to intelligence demonstrated by machines that makes it possible for them to learn from experience, adjust to new inputs, and perform human-like tasks. The key building blocks of AI are machine learning; natural language processing; speech; expert systems; planning, scheduling, and optimization; robotics; and vision. Each of these building blocks can improve supply chain performance and efficiency. For example, an expert system, which is a database of expert knowledge that encompasses all the key supply chain management functions, can help managers make effective decisions. Similarly, the building block of planning, scheduling, and optimization is a collection of tools and techniques that can be effectively used for advanced supply planning, demand planning and forecasting, inventory optimization, facility location, and distribution network optimization.⁴⁵

Blockchain

A **blockchain** is a time-stamped list of records, called blocks, linked to each other using cryptographic principles. The list of records in a blockchain is managed by a cluster of computers and is not owned by any single entity. Blockchain technology is popular due to its three main properties of decentralization, transparency, and immutability.⁴⁶

Blockchain technology has many applications in global supply chain management, such as the transfer of funds anywhere in the world without the use of a traditional bank. For example, Tomcar, the Australian vehicle manufacturer, pays its supplier through the blockchain technology application of Bitcoin.⁴⁷

Companies in the food industry, such as Nestlé, Tyson, and Dole, also use blockchain for ensuring that solid records are available so that the company can trace each product it deals with to its source. Walmart, for example, uses blockchain to keep track of the pork it sources from China. Through blockchain records, Walmart can track where each piece of meat came from, where it was processed and stored, and its sell-by date.⁴⁸

The Need for Resilience in Global Supply Chains and Ways to Achieve It

The frequency and intensity of risks to global supply chains and the global economy caused by events such as natural disasters, cybersecurity breaches, and supplier bankruptcies are increasing. The COVID-19 pandemic has exposed not only the complex interdependency but also the vulnerability of global supply chains. For example, when Chinese suppliers shuttered their businesses in early 2020 to contain the coronavirus outbreak, the steady flow of vital parts and materials to global supply chains either slowed or stopped. The impact of this disruption was felt by companies throughout the globe as their supply chains were inextricably linked to these Chinese suppliers. This global supply chain disruption was acute in many industries, including electronics and

auto industries; pharmaceuticals; metals; and a wide range of consumer and industrial products, such as surgical gowns and masks. Many of the manufacturers in these critical industries were scrambling to find alternative suppliers to keep their factories running. Clearly, the coronavirus pandemic has exposed how vulnerable global supply chains have become, and their disruption is likely to continue for many more months. Consequently, supply chain executives need to consider the extraordinary costs they are incurring and take the necessary actions to improve the resiliency of their firms' supply chains. With resilient and more flexible supply chains, businesses will be better equipped to tackle disrupting events such as the COVID-19 pandemic that increase supply chain risks and obstruct the global flow of goods.⁴⁹

To build resilient supply chains, businesses first need to reassess their supply chain risk. For example, firms need to reevaluate risks associated with supply chain dependencies given multiple tiers in global supply chains, and the delays associated with ocean container shipping. Similarly, companies need to reevaluate risks associated with supply chain fragmentation and lean production as these situations can lead to severe product shortages in the event of crises such as a pandemic, hurricanes, earthquakes, and so forth. Incorporating supply chain flexibility such as rapid raw material sourcing, product design, development and testing, and distribution can play a critical role in reducing strategic supply chain vulnerabilities. To improve the resiliency and flexibility of firms' supply chains, the following courses of action are available to supply chain managers.⁵⁰

Designing Agile Supply Chain Networks

To react quickly to supply chain disruptions, businesses should design a flexible ecosystem of suppliers and partners who can address sudden product shortages or even produce new products. Such a level of flexibility implies that businesses should set up alternative manufacturing sites and assembly locations. They should use state-of-the-art technology tools such as advanced analytics, artificial intelligence, and 3-D printing to optimize cost, improve visibility across the network, and accelerate reaction times. Also, the COVID-19 crisis has exposed the vulnerability of outsourcing and offshore manufacturing. Hence, businesses that have offshore production should consider regionalized manufacturing by manufacturing closer to their core markets and localizing their supply base. For example, to support production in its manufacturing plant in Georgetown, Kentucky, Toyota practices localization by having more than 350 suppliers located within the United States, and more than 100 inside the state of Kentucky.⁵¹

Develop Alternate Sources or Maintain Extra Safety Stocks

Despite the added costs, having alternate supply sources and maintaining extra safety stocks provide greater supply chain resilience when supply chain disruptions occur. For example, given the critical role insulin plays in managing diabetes, Novo Nordisk, the largest global supplier of insulin, maintains a 5-year safety stock at its facility in Kalundborg, Denmark. Finding alternate suppliers, however, presents serious challenges, particularly suppliers with unique capabilities. For example, Taiwan Semiconductor Manufacturing Company (TSMC), the sole supplier of advanced chips to companies like Apple and Qualcomm, is totally dependent on a single Dutch supplier for its advanced lithography systems. Developing an alternate supply source for this system is beyond the scope of TSMC. Therefore, in order to develop alternate supply sources to reduce dependency for critical items, businesses may need help from their country's governments. In addition, to develop alternate supply sources, businesses need to make long-term purchasing commitments, as such commitments will enable the new suppliers to learn and give them incentives to make production investments.⁵²

Reevaluate Scale of Production and Product Mix

Many companies have relied on focused factories that manufacture a limited set of model variants on a single platform. This focused factory approach has been popular in many industries, such as fast-moving consumer goods or electrical appliances, due to high production efficiency and minimal costs. BMW, for example, adopts a focused factory approach in building a number of its X Series models in its factory in Spartanburg, South Carolina, and then ships the finished products to different countries around the globe. To build supply chain resiliency, these businesses need to figure out how to handle a broader mix of products within individual factories. This will not only enable businesses to rapidly change configuration across different product lines and provide more optionality when disruption strikes, but also support regionalized manufacturing.⁵³

Leveraging Technology

Supply chain visibility and resiliency can be greatly enhanced by deploying technological tools such as cloud-based supply chain applications, collaborative platforms, and other technology tools that promote information sharing. These technology-based supply chain applications also improve the quality and speed of decision making within an organization and its suppliers and other external stakeholders in a secure environment. In fact, during the COVID-19 pandemic crisis, manufacturers have demanded greater visibility into the supply chains of their suppliers. To ensure business continuity when supply chain disruptions occur, in addition to adding local suppliers, many leading companies are deploying technological tools such as robotics, 5G, and blockchain to achieve more supply chain visibility, agility, and resilience. Companies can also stay a step ahead of supply chain disruptions by improving their ability to rapidly analyze internal data and external sources of big data. This can be accomplished by using tools such as machine learning, artificial intelligence, and predictive and prescriptive analytics as these tools have the capabilities to generate early-warning, model risk scenarios and develop preprogrammed responses. Armed with insights generated by these technology tools, decentralized teams can react quickly to create the rapid recovery capabilities that will help companies navigate smoothly in times of disruption.⁵⁴

Sustainability

Demand from customers for businesses to operate in a socially responsible manner and produce products that do not harm the environment has been increasing. Therefore, when companies formulate supply chain strategies, in addition to focusing on costs and time efficiency, they should also emphasize responsible labor practices, practices that minimize harm to the environment, and prudent use of the world's resources. These initiatives, taken together, are referred to as **sustainability**, or the use of methods, systems, and materials that won't deplete resources or harm natural cycles.⁵⁵

Companies should integrate sustainability principles both in their internal operations and through all tiers of their supply chains, including their suppliers in developing countries. McDonald's, for example, forged closer relationships with its suppliers and provided them with a tool called the "environmental scorecard." The suppliers were expected to improve their sustainability practices over time by measuring their use of water, use of energy, production of waste, and air emissions. Such sustainable sourcing practices have not only improved McDonald's sales, but also helped reestablish the McDonald's brand. The company placed ninth on the 2020 Interbrand Best Global Brands list.⁵⁶

Companies that took a creative and proactive approach to incorporating sustainability into their internal operations and supply chains improved their reputation among customers, in addition to driving down costs, mitigating risks, discovering innovative approaches to developing products and services, and sharing the risks and rewards among their supply chain partners. For example, by incorporating sustainability into its company strategy, cosmetics company Aveda Corporation not only improved its reputation among consumers, but also allowed the company to charge premium prices for its products. Patagonia, Inc., a seller of outdoor clothing and equipment, is yet another company known for its sustainability initiatives and enjoys its reputation as an enlightened employer and champion of the environment. The company has a very simple but challenging goal: to produce the highest-quality products with minimum possible harm to the environment. The company donates 1% of its total sales or 10% of its profit, whichever is greater, to environmental groups. Since 1985, Patagonia has donated more than US\$80 million to thousands of local organizations, including giving its entire \$10 million profit from its 2016 "Black Friday" sales to charity. The company's products are priced higher than those of its competitors, and even after taking into account the donations made, the firm's operating margins typically are high for its industry.⁵⁷

In the past decade, there has been a steady increase worldwide in the number of businesses adopting practices that reflect a greater degree of **corporate social responsibility (CSR)**. CSR is the process of incorporating the interests of the public into a company's core business. The core principle of CSR is that companies should make decisions that emphasize the triple bottom line, which consists of people (social value), the planet (environmental value), and profits (economic value). Sony, for example, approaches CSR from two different perspectives. The first relates to the way it procures its materials. In March 2002, Sony established a set of "management

Patagonia, a seller of outdoor clothing and equipment, has been a leader in sustainability initiatives. With a mission statement to “build the best product, cause no unnecessary harm, use business to inspire and implement solutions to the environmental crisis,” Patagonia has set a high bar and has a reputation as an enlightened employer and a champion of the environment.



Robert Alexander/Getty Images

regulations for environment-related substances to be controlled which are included in parts and materials.”⁵⁸ These internal regulations require identification of environment-related substances that are banned or to be reduced along with applications where they are used. The second perspective relates to the environment, human rights, and labor conditions. In supporting this initiative, Sony closely monitors and manages the chemicals used in its products at all stages of the manufacturing cycle, from the

raw materials and components through the final shipment. To promote its social agenda, Sony procures parts and materials only from those suppliers designated as green partners.

CHAPTER SUMMARY

LO 1.1 Explain how globalization has affected the management of supply chains.

A company managing its global supply chain faces numerous challenges, such as the costs of doing business in a foreign country, the productivity and quality of the work of foreign workers, long shipping times, and the difficulty of selecting suppliers that a firm isn't familiar with or familiar suppliers that don't always perform well. Firms that can handle these challenges well have a competitive edge in the global marketplace. Clearly, managing global supply chains is the next great competitive frontier.

LO 1.2 Define global supply chain management by the goals it intends to achieve.

Global supply chain management is a set of approaches utilized to efficiently and fully integrate the global network of all organizations and their related activities in producing, completing, and delivering a product or service so that system-wide costs are minimized while meeting or exceeding quality of the product or service and the customer service-level requirements.

LO 1.3 Explain the structure of global supply chains citing examples of companies that have global supply chains.

Supply chain management involves managing and integrating key business processes; relationships; and flows of materials,

information, money, and people, with the ultimate goal of creating value for a firm's customers and stakeholders. An organization's global supply chain can be made up of tiers of suppliers (inbound partners) and customers (outbound partners) geographically dispersed across the globe. Each supply chain partner has to be managed for a firm to maximize its performance. Apple, Boeing, and Walmart are some examples of companies with global supply chains.

LO 1.4 Describe the decision-making process in supply chain management.

In order to optimize supply chain performance, supply chain management professionals make decisions that can be classified into three categories: the strategic, the tactical, or the operational level. The decisions at a higher level, such as strategic decisions, will set the constraints under which lower-level tactical and operational decisions are made. Strategic decisions have a long-term orientation; tactical decisions are made for the medium term; and operational decisions are short-term, day-to-day decisions.

LO 1.5 Explain the importance of an integrated view of supply chains.

Critical decisions made to manage a company's internal operations as well as its supply chain management at the strategic, tactical, and operational levels impact each other as the two

are interrelated. First, upstream interfaces or relationships between a company's internal operations and suppliers must be managed effectively to ensure the right quality materials are obtained at the right quantity and at the right time. Second, the downstream interfaces—the relationships that the firm's operations have with its customers—have to be managed effectively to improve the firm's product sales and growth. Finally, the vertical interfaces—the relationships the firm has with suppliers that provide the technology and the skilled labor needed to design the firm's products, processes, and other services—have to be managed effectively to promote efficiency of operations, produce quality products, and minimize disruptions in production and the delivery of the final products to customers.

LO 1.6 Explain how supply chain management has evolved over the years.

Since the creation of the first assembly line about 100 years ago, supply chain management has evolved from very labor-intensive processes through improved materials handling and logistics. In

the 1990s, the advent of electronic data interchange and enterprise resource planning systems led to further evolution of supply chain management, with increases in value-adding and cost reduction approaches through integration. In the 21st century, increased globalization has led to a proliferation of strategic partnerships, joint ventures, licensing agreements, research consortia, and direct marketing agreements—but above all, the formation of global supply chains.

LO 1.7 Identify some of the emerging trends in supply chain management.

The trend toward optimizing the use of resources such as raw materials and labor by eliminating waste and maximizing productivity will continue. Greater supply chain risks; the restructuring of supply chains; and the use of emerging technologies such as artificial intelligence, blockchain, and data analytics are likely to continue, as are the trends toward sustainability and corporate social responsibility.

KEY TERMS

Artificial intelligence (AI) 25

Big data analytics 25

Blockchain 25

Corporate social responsibility (CSR) 27

Customer management 19

Global supply chain 8

Global supply chain management 10

Globalization 5

Internet of Things (IoT) 23

Multichannel systems 14

Nearshoring 6

Offshoring 6

Outsourcing 6

Reshoring 7

Reverse logistics 15

Service supply chain 20

Splintering 23

Supplier management 18

Supply chain 7

Sustainability 27

3-D printing 24

Value chain 8

DISCUSSION AND REVIEW QUESTIONS

1. What are some key reasons why a firm should consider offshoring or outsourcing its work? Imagine you are the head of operations for Adidas. Which functions would it make sense to offshore or outsource, and which activities might you consider maintaining in-house? Why?
2. Define global supply chains. What are the inherent challenges that companies face in managing them?
3. One product of The Campbell Soup Company (Camden, NJ) is condensed canned soup. Create a supply chain showing the movement of materials and information for this product from the basic raw materials suppliers to you as the final consumer.
4. Suppose you were considering hiring a supplier for a critical good your firm needs to make its products. Your final choices came down to three companies: one in Nigeria, one in Sri Lanka, and one in Cambodia. Using the Corruption Perceptions Index from Transparency.org (<https://www.transparency.org/en/cpi/2020/index/nzl>), which company would seem the safest choice? Why? What type of decision is this?
5. Consider the supply chain interfaces shown in Figure 1.7. Research the Spanish retailer Zara on the internet. What interfaces in Figure 1.7 does Zara manage well? Why?
6. Why is sustainability so critical for successful supply chain management in modern organizations?
7. Why is it dangerous to use a single-source supplier when you are a company like Apple, which depends heavily on its ability to dazzle consumers with new products? How could employing multiple suppliers minimize Apple's risk in case one of its suppliers went out of business? What are the pros and cons of using cutting-edge materials or technologies in new products for a company like Apple?

CASE STUDY 1.1: SUPPLY SHORTAGE TESTS THE RESILIENCE OF BMW'S SUPPLY CHAIN

BMW Group is one of the largest-selling manufacturers of premium automobiles and motorcycles in the world. Headquartered in Munich, Germany, BMW is a multinational company operating 30 production and assembly facilities in 14 countries. The company maintains a global sales network with representations in over 140 countries.

In May 2017, BMW's supply chain experienced a breakdown due to a parts shortage. The part that was in short supply was an electric steering gear, a critical component used in BMW's 1-Series, 2-Series, 3-Series, and 4-Series compact cars. In response, the company had to slow or halt production in its factories located in Germany, China, and South Africa.

The steering gear was being supplied by Bosch, the world's largest automotive parts supplier and a Tier-1 supplier to BMW. Bosch said the problem stemmed from the shortage of aluminum casings that are manufactured by one of its own suppliers, Albertini Cesare (AB), in Italy. AB was not able to provide sufficient numbers of casings due to production bottlenecks and delays, and Bosch said it was working urgently in a task force together with BMW and AB to rectify the issue and minimize the impact. It has been reported that the financial instability of AB contributed to the production problems. In an effort to gain better control over its supply chain and ensure a reliable supply of casings, Bosch purchased AB 1 month after the parts shortage.

Pointing to the interconnected nature of supply chains, Markus Duesmann, BMW board member in charge of purchasing and supplier network, explained, "Automotive value chains are international. An interruption in delivery of parts from a partner in Europe can therefore also have implications in China." He noted that the company's just-in-time approach to production and delivery contributed to the problem. "The vehicle is not complete until all parts, most of which are supplied 'just-in-time,' are installed. It is, therefore, understandable how a missing part—even if only a small one, as in this case—can have a major impact," said Mr. Duesmann. Just-in-time systems maintain low levels of inventory and rely on the supply chain to provide the materials when they are needed.

BMW expected that the break in production was going to create financial damage for the company and could also affect other suppliers in the channel. The company could lose sales, and once the shortage issue was resolved, it would need extra shifts to ramp up production. If other suppliers continued shipping deliveries, BMW could suffer from large inventory accumulations. All of these situations could have significant financial implications: It has been estimated by independent analysts that production stoppage for BMW 1- to 4-Series cars might reduce revenues by as high as €550m per week. BMW stated that it would seek compensation from Bosch.

Supply chain disruptions due to parts shortages are not uncommon in the automotive industry. Only a year earlier, another German automaker, Volkswagen, was forced to halt

production at six of its plants when its supplier group making seat covers and cast iron parts for gearboxes refused to send deliveries due to a dispute over a cancelled order. Volkswagen eventually canceled all of its contracts with this supplier group. Manufacturers in other industries are also not immune to supply problems. In fact, computer electronics giants Apple and Sony experienced highly publicized supply problems related to their key components, which exposed both companies to significant risks.

Although disruptions like the one BMW experienced are common, industry experts were surprised about BMW's lack of visibility into its supply chain. Today's procurement professionals are expected to understand all facets of their supply chain and build strong relationships with their suppliers. In selecting new partners, they must assess the suppliers based on their financial and operational stability in addition to product and service capabilities. This is especially important for suppliers in the lower tiers, such as AB in BMW's chain. These suppliers' profit margins are squeezed, leaving little slack in their system to cope with production problems. First- and second-tier suppliers need to work closely with suppliers farther down the chain to ensure they are capable of meeting demands and quality standards. These companies could also consider dual sourcing where appropriate.

More and more companies are operating in complex and interconnected global supply chains. High customer expectations and uncertainty from geopolitical factors are making the marketplace increasingly challenging. It is in the best interest of the supply chain partners to collaborate and maintain long-term relationships with a deep understanding of the distinct challenges posed by the specific industry and the marketplace.⁵⁹

Questions

1. What characteristics of the automotive industry make it vulnerable to supply chain breakdowns, and what role do they play?
2. What are some arguments either in favor of or against the following view? A large manufacturer can buy insurance to protect itself from the financial consequences of supply chain breakdowns; therefore, it can allocate its financial resources to a better insurance policy rather than supply chain disruption and risk management tools.
3. What practical strategies would you suggest that BMW adopt so the company is better prepared for a future supply shortage? Explain why these strategies will be effective.
4. In what ways can companies gain visibility into their supply chains, and what are the benefits?

CASE STUDY 1.2: RISING HEALTH CARE COSTS AND THE ROLE OF OUTSOURCING AND OFFSHORING IN THE U.S. HEALTH CARE SECTOR

Centers for Medicare & Medicaid Services (CMS) is a federal agency within the U.S. Department of Health and Human Services that provides health coverage through Medicare, Medicaid, the Children's Health Insurance Program, and the Health Insurance Marketplace. CMS uses the National Health Expenditure Accounts as the official estimates of total health care spending in the United States, which includes expenditures for health care goods and services, public health activities, government administration, the net cost of health insurance, and investment related to health care. According to these estimates, U.S. health care spending reached \$3.5 trillion in 2017, which translates to \$10,739 per person and 17.9% of the nation's gross domestic product (GDP). The latest preliminary estimates by independent federal actuaries show that the spending has further grown to \$3.65 trillion in 2018, 59% of which was for hospital, doctor, and clinical services. The total spending is larger than the GDPs of countries such as Brazil, the United Kingdom, Mexico, Spain, and Canada, and it is estimated to grow at an average annual rate of 5.5% from 2018 to 2027. Despite high spending, the United States lags behind comparable countries on a number of health care quality measures such as overall mortality rate, premature death, life expectancy at birth, mortality amenable to health care, disease burden, wait times for primary/urgent care visits, and cost-related access barriers.

The question of which factors are driving the health care costs higher in the United States than in peer countries is often a subject of discussion and debate. The complex and highly fragmented nature of the U.S. health care system as well as differences in the measurement of quality/intensity of care across different countries make it especially hard to find definitive answers. The cost of state-of-the-art medical technologies and prescription drugs, rising chronic diseases, and high administrative costs are often cited as contributing factors. Other arguments are that the United States uses more health care services, has too many specialists, provides too much inpatient hospital care, and spends too little on social services, although a recent Harvard study finds the "prices of labor and goods, including pharmaceuticals, and administrative costs appear to be the major drivers of the difference in overall cost between the United States and other high-income countries." The new paradigm of value-based care is one effort that has been initiated with the goal of improving quality of care while reducing health care costs. Value-based care has a focus on overall value of care, and it is replacing the conventional fee-for-service financial model that is focused on patient volume.

Meanwhile, hospitals are facing increasing pressure on their operating margins, and many of them are experiencing stagnating or declining margins. A study that has analyzed for-profit and nonprofit provider networks found that average operating margins decreased from 4.15% in 2015 to 2.56% in 2017, representing an almost 39% decline. Hospitals that are facing deteriorating margins are having problems in two main areas: revenue growth and cost control. Particularly, the study showed that hospitals' expenses grew 3 percentage points faster

than revenue. It is therefore not surprising that a recent national survey of hospital executives identified cost control as the new number one issue facing hospitals. Initiatives related to supply chain and labor cost/productivity improvements are reported to be two of the most commonly used measures undertaken by hospitals to control and reduce costs.

As cost reduction is put high on hospitals' agendas, there is a renewed interest in outsourcing as a possible solution to achieving cost efficiencies. A 2018 survey on health care outsourcing reveals that 98% of health care leaders from more than 700 hospitals and inpatient organizations are considering outsourcing options in both clinical and nonclinical functions. Although it has been a common practice for hospitals to outsource their non-core, nonclinical functions, the emergence of value-based care is one reason why outsourcing is being considered for clinical expertise as well. In fact, outsourcing has already found its place in a variety of areas such as diagnostic imaging service lines and operating room efficiency. If you ever have an MRI or CT scan, it is very likely that your scans are going to be read by an overseas radiologist due to an outsourcing practice called teleradiology. Likewise, if you have a surgical procedure, the anesthesia service may be provided by a third-party vendor. While outsourcing vendors typically have certain specializations, they can also offer bundled services for hospitals, including, for example, IT, clinical services, and analytics. The survey concludes, "As hospitals look for ways to reduce costs, outsourcing is a valid strategy to achieve a financially healthier organization."

Outsourcing is not the only development that the health care sector should be paying attention to. Globalization makes it possible for businesses to operate and serve in markets all over the world—and the health care business is no exception. A striking example of this phenomenon comes from a recent partnership between India-based Narayana Health and America's largest nonprofit hospital network, Ascension. The joint venture has opened a hospital in the Cayman Islands, located 430 miles south of Miami, Florida. Narayana has already established itself as a low-cost, high-quality health care provider in India, and this mission holds true for the Cayman Islands hospital, which is its first development outside India. The hospital is offering surgical procedures at less than half the average U.S. price while achieving quality outcomes that match or exceed the best U.S. hospitals. The approach to obtaining low prices lies in its commitment to quality, operational excellence, and advanced technology. The hospital leverages its network of suppliers in India to achieve volume discounts for FDA-approved medical equipment and medicine. All of its back-office operations have been outsourced to low-cost but high-skilled employees in India. High-performing doctors from India were transferred to the new hospital in the Cayman Islands. Is it possible that American health care will be offshored to hospitals and health care providers like the one in the Cayman Islands? It is too early to tell. However, considering the recent developments in globalization of health care,

including the booming medical tourism sector, the business model of Narayana has the potential to disrupt U.S. health care, and U.S. health care providers should take notice.⁶⁰

Questions

1. What are the advantages and disadvantages of adopting outsourcing in health care?

CRITICAL THINKING EXERCISE

In the article titled “Disruptive Technologies Shake Up Outsourcing” (<https://deloitte.wsj.com/cio/2018/12/04/disruptive-technologies-shake-up-outsourcing/>), the author argues that organizations are increasingly using a *disruptive outsourcing* strategy to deliver competitive advantage. This strategy allows them to transform the ways they operate and makes them more agile, efficient, and effective. Disruptive outsourcing involves solutions that incorporate emerging technologies such as cloud and robotic process automation. Read the article and answer the questions that follow.⁶¹

1. How can disruptive outsourcing help organizations improve speed/time to market?

2. How can outsourcing help hospitals achieve improvements in their supply chain management?
3. What are some arguments either in favor of or against the view that health care offshoring to facilities like the one in the Cayman Islands is a threat to the U.S. health care industry.

2. How can organizations achieve innovation with disruptive outsourcing endeavors?
3. How can organizations achieve cost savings by integrating interdependent outsourced services?
4. What are some concerns organizations might have while adopting disruptive outsourcing solutions such as cloud and robotic process automation?
5. The article mentions that the majority of executives in all business functions plan to increase their outsourcing levels in the future. How do you think the COVID-19 pandemic will affect these plans?

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