PART THREE

Supply Chain Logistics Design

One of the two primary responsibilities of a firm's logistics management, as established in Chapters 1 and 2, is to participate in supply chain logistics design. Part 3 contains three chapters devoted to various logistics design issues. Chapter 12 establishes the global perspective of today's business operations. Few firms enjoy the simplicity of conducting business within a single nation. The complexity of globalization has increased as a result of extended operational reach. Given the dynamic nature of contemporary business, it is not unusual for managers to conduct continuous evaluations of their logistics support structure. Chapter 13 focuses on network design. An integrative model is developed and illustrated that combines the temporal and spatial dimensions of logistics into a single theoretical framework. The integration structure provides the basis for process development, trade-off quantification, and integrative measurement. In Chapter 14, network structure is operationalized in terms of methodology and technique to guide logistical systems design. A step-by-step design process provides a guide to deal with channel structure and strategy design and implementation. Chapter 14 also presents an overview of operational planning and analysis tools to assist managers in dealing with logistics operations.

CHAPTER TWELVE

Global Supply Chains

Chapter Outline

Globalization offers many opportunities and challenges for logistics and supply chain operations and strategies. The opportunities include increasing markets and a wider range of manufacturing alternatives with varying absolute and comparative human and material resource advantages. Some regions of the world can provide significant economies of scale because of their low wages, while other regions offer significant flexibility because of their expertise. The challenges encountered when taking advantage of these benefits include more demanding logistics operating environments, security considerations, and more complex total cost analyses. Chapter 12 discusses the rationale for global supply chains, the stages of global supply chain integration, and concludes with guidelines for making global sourcing decisions.

Global Economies

Regardless of size, most firms today include some dimension of global operations. They have materials or products that are sourced globally or they have global customers wanting to purchase from them. In many cases, firms are involved in both global sourcing and delivery. While many believe that firms operate globally, particularly for sourcing and manufacturing, to obtain the lowest cost, there are many other reasons as well. This section identifies some of the primary reasons that firms develop global capabilities.

Table 12.1 lists the primary objectives firms use to justify globalization. While many believe that the primary motivation for shifting manufacturing and supply chain operations is low-cost resources and labor, the rationale in many cases is one of the others cited in the table. For example, although it is believed that many firms moved production to Asia and India to access lower production wages, their primary motivation was often to

TABLE 12.1
Rationale for Globalization

Objective	Rationale
Increase revenue	• Open up more markets • Expand beyond competitors • Obtain accessibility to markets that limit access without local operations
Achieve economies of scale	• Take advantage of available production capacity
Reduce direct cost	• Take advantage of lower labor rates or real estate expense • Reduce energy requirements by reducing distance or changing transportation mode • Take advantage of differences in production requirements
Advance technology	• Obtain access to advanced technology that may not be available from current locations due to historical investments • Obtain access to specialized expertise or language skills
Reduce firm's global tax liability	• Obtain local or regional tax benefits related to property, inventory, or income • Obtain reductions in Value-added-taxes due to localized production or other value-added services (i.e., packaging, inventory management, customization)
Reduce market access uncertainty	• Source product from location that involves less transportation uncertainty • Source product from location that involves fewer security constraints
Enhance sustainability	• Source products or other resources (including human resources) from locations that have ongoing availability of materials and expertise such as energy or trained workers

obtain access to rapidly growing markets. While many have taken advantage of rapidly increasing demand, the increased demand for production employees is driving up wage rates much more rapidly than in the developed world. As a result, the wage differential is declining and firms are beginning to look for the next low-cost production sources which today includes Vietnam and Cambodia. Firms are also beginning to develop supply chain value-added capabilities in South America and Africa to take advantage of market proximity to the developed world and low-cost production.

Global supply chain operations either directly or indirectly are becoming the norm for most firms. Global sourcing and marketing offers many opportunities to enhance the firm's performance, particularly in terms of revenue, volume, and market share. The following sections describe some of the strategies that firms can employ to achieve these benefits along with some of the challenges that firms are likely to encounter.

Global Supply Chain Integration

Whereas an effective logistics system is important for domestic supply chain integration, it is absolutely essential for successful global sourcing, manufacturing, and marketing. Domestic logistics focuses on performing movement and storage activities to support supply chain integration in a relatively controlled environment. Global logistics must support operations in a variety of different national, political, and economic settings while also

dealing with increased uncertainty associated with the distance, demand, diversity, and documentation of international commerce.

The operating challenges of global logistics systems vary significantly in each major global region. The North American logistics challenge is one of an open geography with extensive and flexible transportation options and limited need for cross-border documentation. The European logistician, in contrast, is confronted by relatively compact geography involving numerous political, cultural, regulatory, and language situations. The European infrastructure is also quite congested because of population density and the fact that many of the roads date back centuries. The Pacific Rim logistical challenge faces an island-based environment with relative poor infrastructure, requiring extensive water and air shipments to transcend vast distances. These different characteristics require that firms having global operations develop and maintain a wide variety of capabilities and expertise.

In the past, an enterprise could survive by operating with unique North American, European, or Pacific Rim business strategies. While it was easier to create and operate unique regional strategies, the resulting duplication often resulted in loss of economies of scale and poor asset utilization. While regionalization remains viable for some firms, those desiring to grow and prosper must face the challenges of designing and operating a globally integrated enterprise. Strategic business initiatives must change as a firm and its supply chain become progressively more global.

Logistics in a Global Economy

Global operations increase logistics cost and complexity. In 2002, the last available estimate, logistics cost for industrialized nations exceeded $6.7 trillion, or 13.8 percent of estimated global gross domestic product **(GDP)**. Table 12.2 lists GDP and estimated logistics cost by country. In terms of complexity, global operations, in contrast to domestic operations, are characterized by increased uncertainty, increased variability, decreased control, and decreased visibility. Uncertainty results from greater distances, longer leadtimes, and decreased market knowledge. Increased variation results from unique customer and documentation requirements as well as shifting political environments. Decreased control results from the extensive use of international service firms coupled with potential government intervention in such areas as customs requirements and trade restrictions. Decreased visibility results from longer transit and holding times with less ability to track and determine exactly where shipments are located.

These unique challenges complicate development of an efficient and effective global supply chain strategy. Fortunately, there are forces that both drive and facilitate globalization and necessitate borderless logistics operations.

Stages of International Development

The continuum of global trade development ranges from export/import to local presence to the concept of a globally integrated enterprise. The following discussion describes conceptual and managerial implications of strategic development. Table 12.3 lists the product, marketing, supply chain, management, information technology, and human resource strategies characteristic for each stage of globalization.

Export/Import: A National Perspective

The initial stage of international trade is characterized by exporting and importing. A participating organization typically is focused on its domestic operations and views international transactions in terms of supporting domestic business. Specifically, a firm uses

TABLE 12.2
Estimated 2002 National Logistical Expenditures

Source: Reprinted with permission from Alexandre M. Rodrigues, Donald J. Bowersox, and Roger J. Calantone "Estimation of Global Logistics Expenditures: Current Update," from *Journal of Business Logistics,* Vol. 26, no. 2, 2005, pp. 1–16.

Region	Country	GDP (U.S.$ billion)	Logistics (U.S.$ billion)	Logistics (% GDP)
North America	Canada	925	110	11.9%
	Mexico	905	136	15.0%
	United States	10,308	957	9.3%
	Region	12,137	1,203	9.9%
Europe	Belgium	285	35	12.1%
	Denmark	166	23	13.6%
	France	1,601	186	11.6%
	Germany	2,236	374	16.7%
	Greece	199	26	13.0%
	Ireland	143	21	14.9%
	Italy	1,525	186	12.2%
	Netherlands	470	56	11.8%
	Portugal	186	25	13.4%
	Spain	878	124	14.1%
	United Kingdom	1,549	174	11.3%
	Region	9,238	1,229	13.3%
Pacific Rim	China	5,861	1,052	17.9%
	India	2,800	487	17.4%
	Hong Kong, China	183	24	13.2%
	Japan	3,425	390	11.4%
	Korea, Rep.	807	102	12.7%
	Singapore	100	14	14.3%
	Taiwan, China	406	57	14.1%
	Region	13,582	2,127	15.7%
South America	Brazil	1,355	204	15.0%
	Venezuela, RB	135	16	12.0%
	Argentina	413	52	12.6%
	Region	1,903	272	14.3%
Remaining other countries		11,912	1,902	16.0%
Total		48,771	6,732	13.8%

an export/import strategy to increase the revenues or decrease costs associated with a domestic operation. As Table 12.3 indicates, an export/import strategy typically involves a standardized product manufactured in the firm's home country, focused on a limited customer base, with logistics services required for export/import provided by specialized logistics integrators. The business context is transaction driven, with the common financial statements providing the only level of integration.

A national export/import business orientation influences logistical decisions in three ways. First, sourcing and resource choices are influenced by artificial constraints. These constraints are typically in the form of use restrictions, local content laws, or price surcharges. A **use restriction** is a limitation, usually government imposed, that restricts the level of import sales or purchase. For example, the enterprise may require that internal divisions be used for material sources even though prices or quality is not competitive. **Local content laws** specify the proportion of a product that must be sourced within the local economy. **Price surcharges** involve higher charges for foreign-sourced product imposed by governments to maintain the viability of local suppliers. Price surcharges usually exist in the form of duties or tariffs. In combination, use restrictions, local content laws, and price surcharges limit management's ability to select what otherwise would be the preferred supplier.

TABLE 12.3 Differential Characteristics of Global Development

Three Stages of Development	Product Focus	Marketing Strategy	Supply Chain Strategy	Management	Information and Decision Support	Human Resource Development
Export/import	Domestic production and distribution	Specific customers	Agents and third-party logistics service providers	Transaction driven with integrated financials	Home country focused with limited EDI	Management with "home country" focus and limited international experience
International operations: local presence	Local market customization supported by postponement or local production	Focused specific market areas, which may cross national boundaries	Subsidiaries and local distributors with specific business charters and visible local presence	Decentralized management of local operators and strategic alliances with local profit responsibility	Independent database and decision support	Limited top management with international experience and strong "home country" decision focus
Globalization	Global brands	All economic regions	Worldwide flow of key resources to leverage global sourcing and marketing advantages	Centralized planning with locally flexible distribution supported with common systems	Integrated database and decision support	International training and experience required for all upper-level management with some requirements for midlevel management

Second, logistics to support export/import operations increases planning complexity. A fundamental logistics objective is smooth product flow to facilitate efficient capacity utilization. This objective is sometimes difficult in an export/import operation because of transportation uncertainty, infrastructure constraints, and government restrictions.

Third, an export/import strategy extends domestic logistics systems and operating practices to global origins and destinations. While an export/import strategy doesn't introduce much complexity into domestic operations, it likely increases operational complexity, since exceptions are numerous. Local managers must accommodate exceptions while remaining within corporate policy and procedure guidelines. For example, while bribery is both an illegal and unethical practice in most developed countries, such "facilitating" payments may be the only means of getting product moved or cleared through customs in developing countries. As a result, foreign-based logistics management must often accommodate local, cultural, language, employment, and political environments without full understanding at corporate headquarters.

International Operations: Local Presence

The second stage of international development is characterized by establishment of operations in a foreign country. Internal operations may include varied combinations of marketing, sales, production, and logistics. Establishment of local facilities and operations serves to increase market awareness and sensitivity. This is often referred to as establishing **local presence.** The local presence strategy uses local production and distribution often supported by a postponement strategy to customize products. Firms engaged in local presence often restrict their operations to a limited number of geographic areas. At the outset of a local presence strategy, foreign operations will often depend on parent

company management and personnel, values, procedures, and operations. However, over time, business units operating within a foreign market area will have to adopt local business practices.

This adoption typically means developing unique management, marketing, and sales organizations and may include the use of local business systems. As local presence operations expand, the host country philosophy will increasingly emerge; however, the company headquarters' strategic vision remains dominant. Individual country operations are still measured against home country expectations and standards.

Globally Integrated Enterprise

The globally integrated enterprise contrasts sharply to operations guided by either an export/import or international perspective. The original concept of the globally integrated enterprise was popularized in a *BusinessWeek* article two decades ago under the title "The Stateless Corporation."[1] Management of a truely globally integrated enterprise makes market, location, and resource decisions with little or no regard to national boundaries. Globally integrated enterprises maintain operations and develop a headquarters structure to coordinate across area operations. "Unlike the multinational—which creates miniature versions of itself in markets around the world—the globally integrated enterprise locates work, skills, and operations wherever it makes sense, based on access to expertise, on superior economies and on the presence of open environments and technologies. Thus, the enterprise is globally integrated in the sense that no specific home or parent country dominates policy".

IBM offers a good example of an organization that is striving for global integration.[2] Senior management likely represents a combination of nationalities. Denationalized operations function on the basis of local marketing and sales initiatives are typically supported by world-class manufacturing and logistics operations. Product sourcing and marketing decisions can be made across a wide range of geographical alternatives. Systems and procedures are designed to meet individual country requirements and are aggregated as necessary to share knowledge and for financial reporting. A truly global firm employs global brands with limited customization to reflect market sensitivities, operates in most global regions, employs a global resource view in terms of production and logistics, and incorporates integrated reporting systems and planning technologies to achieve global operating synergies. Although limited customization is desirable to minimize product complexity, the globally integrated enterprise can discriminate between features that represent a critical market difference and those that do not.

Consider, for example, an enterprise that has its historical origin in Germany, Japan, or the United States, but with a high percentage of its sales, ownership, and assets maintained and managed in China. China is estimated to be the world's third largest economy, but there are many supply chain aspects such as logistics capabilities and infrastructure that are still quite third-world. China's communications, intermodal transport systems, tracking and tracing, and limited highways outside major cities make it very difficult to employ 21st-century supply chain operating practices. For these reasons, a globally integrated enterprise operating in China needs a combination of local management to facilitate local operations and enterprise management that fully understands the implications of developing business systems, a rapid rate of change, and exploding but unbalanced export/import volume.

Examples of firms that fit the specification of globally integrated enterprises are ABB (Switzerland), Coca Cola (United States), Dow Chemical (United States), Hoechst (Germany),

[1] "The Stateless Corporation," *BusinessWeek,* May 14, 1990, p. 98.
[2] Samuel Palmisano, "The Global Consumer Gives Small Companies a Big Reach," *Financial Times,* May 6, 2008, p. 11.

IBM (United States), ICI (Britain), Johnson & Johnson (United States), Nestlé (Switzerland), Novartis (Switzerland), and Philips (Netherlands). These firms are characterized by a combination of global brands produced and marketed globally with integrated systems and management that can synthesize global operations while being sensitive to regional and local considerations.

While most enterprises engaged in international business are operating in stages 1 and 2, to become a global player, a truly international firm must migrate toward global marketing and operations. Such globalization requires a significant level of management trust that transcends countries and cultures. Such trust can grow only as managers increasingly live and work across cultures.

Managing the Global Supply Chain

To enhance a firm's global capabilities, logistics management must consider five major differences between domestic and international operations: (1) performance cycle structure, (2) transportation, (3) operational considerations, (4) information systems integration, and (5) alliances. These considerations must then be incorporated into the firm's global operating strategy.

Performance Cycle Structure

The length of the performance cycle is a major difference between domestic and global operations. Instead of 1- to 5-day transit times and 2- to 10-day total performance cycles, global operational cycles often require weeks or months. For example, it is common for automotive parts from Pacific Rim suppliers to take 60 days from order release until physical delivery at a U.S. manufacturing facility. Similarly, fashion merchandise may take anywhere from 30 to 60 days from the time the manufacturer order is released until it is received at a U.S. distribution warehouse.

The reasons leading to a longer order cycle to delivery cycle are communication delays, financing requirements, special packaging requirements, ocean freight scheduling, slow transit times, and customs clearance. Communication may be delayed by time zone and language differences. Financing delays are caused by the requirements for letters of credit and currency translations. Special packaging may be required to protect products from in-transit damage due to high humidity, temperature, and weather conditions. Once a product is containerized, it must be scheduled for movement to and between ports having appropriate handling capabilities. This scheduling process can require up to 30 days if the origin and destination ports are not located on high-volume traffic lanes or the ships moving to the desired port lack the necessary equipment. Transit time, once the ship is en route, ranges from 10 to 21 days. Port delays are common as ships wait for others to clear harbor facilities. Customs clearance may further extend total time. Although it is increasingly common to utilize electronic messaging to preclear product shipments through customs prior to arrival at international ports, the elapsed performance cycle time is still lengthy. Security issues can create additional delays. Another problem is restricted availability of containers. Movement from Asia to the United States is generally unbalanced as more material is imported into the United States than is exported to Asia. As a result, there is strong demand for containers to move product from Asia to the United States but little motivation to ship the empty containers back. This demonstrates how unbalanced trade, either domestically or internationally, can introduce complexity into logistics operations.

These factors cause international logistics performance cycles to be longer, less consistent, and less flexible than typical in domestic operations. This lack of consistency makes planning and coordination more difficult. Determination of shipment status and anticipation of arrival times also require substantially more effort. The longer performance cycle also results in higher asset commitment because significant inventory is in transit at any point in time.

Transportation

The U.S. initiative to deregulate transportation during the early 1980s has extended globally. Four significant global changes have occurred: (1) intermodal ownership and operation, (2) privatization, (3) cabotage and bilateral agreements, and (4) infrastructure constraints.

Historically, there have been regulatory restrictions regarding international transportation ownership and operating rights. Transport carriers were limited to operating within a single transportation mode with few, if any, joint pricing and operating agreements. Traditionally, steamship lines could not own or manage integrated land-based operations such as motor or rail carriers. Without joint ownership, operations, and pricing agreements, the operation and tracking of international shipping was very complex. International shipments typically required multiple carriers to perform a single freight movement. Specifically, government rather than market forces determined the extent of services foreign-owned carriers could perform. Although some ownership and operating restrictions remain, marketing and alliance arrangements among countries have substantially improved transportation flexibility. The removal of multimodal ownership restrictions in the United States and in most other industrialized nations served to facilitate integrated movement. In response to some of these changes in national ownership requirements, an increasing number of global service providers have been established such as DeutschePost, FedEx, TNT, and United Parcel Service.

A second transportation influence on global operations is increased carrier privatization. Historically, many international carriers were owned and operated by national governments in an effort to promote trade and provide national security. Government-owned carriers are typically subsidized and often place surcharges on foreign enterprises that use these services. Artificially high pricing and poor service often made it costly and unreliable to ship via such government-owned carriers. Inefficiencies and inflexibility also resulted from strong unionization and work rules. The combination of high operating cost and low efficiency caused many government-owned carriers to operate at a loss. A great many such carriers have been privatized and must operate in a competitive environment. Carrier privatization has resulted in increased availability of efficient international carriers.

Changes in cabotage and bilateral service agreements are the third transportation influence impacting international trade. Cabotage laws require passengers or goods moving between two domestic ports to utilize only domestic carriers. For example, water shipment from Los Angeles to New York was required to use a U.S. carrier. Similar cabotage laws restricted Canadian drivers from transporting a backhaul load to Detroit once a shipment originating in Canada was unloaded in Texas. Cabotage laws were designed to protect domestic transportation industries even though they also served to reduce overall transportation equipment utilization and related efficiency. The European Community has relaxed cabotage restrictions to increase trade efficiency. Such reduced cabotage restrictions will save U.S. corporations 10 to 15 percent in intra-European shipping costs. While the United States has not rescinded its cabotage laws relating to Canada and Mexico, some of the restrictions have been reduced to enhance equipment utilization and to reduce the environmental impact.

Many regions, both developed and undeveloped, are experiencing major constraints on their physical infrastructure. Global operations are significantly increasing the demand specifically on port and airport capacities. Since much of the infrastructure in the world was developed over 50 years ago, it was designed for substantially less capacity and without extensive growth capability in terms of surrounding land. Although information and handling technology has facilitated rapid movement of goods through ports and airports, the volume increase still results in substantial congestion.[3] At the same time, tight local, state, and federal budgets have limited the reinvestment that can be made in the existing

[3] Christopher Norek and Monica Isbel, "The Infrastructure Squeeze on Global Supply Chains," *Supply Chain Management Review,* October 2005, pp. 18–24.

infrastructure. As a result, logistics managers are being driven to seek out alternative suppliers, carriers, or port locations.

Operational Considerations

There are a number of unique operational considerations to support global supply chains. First, international operations typically require multiple languages for both product and documentation. A technical product such as a computer or a calculator must have local features such as keyboard characters and language on both the product itself and related manuals. From a logistics perspective, language differences dramatically increase complexity since a product is limited to a specific country once it is language-customized. For example, even though Western Europe is much smaller than the United States in a geographic sense, it requires relatively more inventory to support marketing efforts since separate inventories may be required to accommodate various languages. Although product proliferation due to language requirement has been reduced through multilingual packaging and postponement strategies, such practices are not always acceptable. Some consumers are reluctant to accept products not labeled in their native tongue. In addition to product language implications, international operations may require multilingual documentation for each country through which the shipment passes. Although English is the general language of commerce, some countries require that transportation and customs documentation be provided in the local language. This increases the time and effort for international operations, since complex documents must be translated prior to shipment. These communication and documentation difficulties can be somewhat overcome through standardized electronic transactions.

The second global operational consideration is unique national accommodations such as performance features, technical characteristics, environmental considerations, and safety requirements. Performance feature differences include specific product functionality such as speed or process constraints. Technical characteristics include power supplies, documentation, and metrics. Environmental considerations include chemicals that can be used or the types and amount of waste generated. Safety requirements include automatic shutoffs and specialized documentation. While they may not be substantial, the small differences between country requirements may significantly increase required SKUs and subsequent inventory levels.

The third operating consideration is the sheer amount of documentation required for international operations. While domestic operations can generally be completed by using only an invoice and bill of lading, international operations require substantial documentation regarding order contents, transportation, financing, and government control. Table 12.4 lists and describes common forms of international documentation.

The fourth operating consideration is the high incidence of countertrade and duty drawback found in some international situations. While most established firms prefer cash transactions, countertrade is important. Countertrade, in essence, is when a seller agrees to accept products as payment or purchase products from the buyer as part of a sales agreement. While such agreements have financial consequences, they also have major implications for logistics and marketing in terms of disposal of goods received as payment. Duty drawback describes situations when a firm pays a duty to import goods into a foreign country but the duty paid can be drawn back or returned if the items or a comparable designate is exported. For example, Pepsi supplies syrup to the Soviet government, which bottles and markets the soft drink with practically no control from Pepsi. In return, Pepsi is paid for the syrup by receiving exclusive rights to distribute Russian Stolichnaya vodka in the United States. This exclusive right requires marketing and logistics support.

TABLE 12.4
Common Forms of International Logistics Documentation

- *Export irrevocable commercial letter of credit.* A contract between an importer and a bank that transfers liability or paying the exporter from the importer to the (supposedly more creditworthy) importer's bank.
- *Bank draft (or bill of exchange).* A means of payment for an import/export transaction. Two types exist: transaction payable on sight with proper documents *(sight draft*) and transaction payable at some fixed time after acceptance of proper documents (*time draft*). Either type of draft accompanied by instructions and other documents (*but no letter of credit*) is a documentary draft.
- *Bill of lading.* Issued by the shipping company or its agent as evidence of a contract for shipping the merchandise and as a claim to ownership of the goods.
- *Combined transport document.* May replace the bill of lading if goods are shipped by air (*airway bill*) or by more than one mode of transportation.
- *Commercial invoice.* A document written by the exporter to precisely describe the goods and the terms of sale (similar to a shipping invoice used in domestic shipments).
- *Insurance certificate.* Explains what type of coverage is utilized (fire, theft, water), the name of the insurer, and the exporter whose property is being insured.
- *Certificate of origin.* Denotes the country in which the goods were produced to assess tariffs and other government-imposed restrictions on trade.

Information Systems Integration

A major challenge in globalization is information systems integration. Since firms typically globalize by acquisition and merger, the integration of systems typically lags. Operational integration requires the ability to route orders and manage inventory requirements electronically throughout the world. Development of supportive technology integration represents substantial capital investment. As discussed in Chapter 5, two types of system integration are required to support global operations. The first is a global transaction or ERP system. The global ERP system is necessary to provide common data regarding global customers, suppliers, products, and financials. It is also necessary to provide common and consistent information regarding order and inventory status regardless of the location from which a global customer is inquiring or where the shipment is to be delivered. The second system integration requirement is a global planning system that can maximize overall manufacturing and delivery asset utilization while meeting customer service requirements. Few firms have fully integrated global information systems or capability.

Alliances

A final international operations consideration is the growing importance of third-party alliances. While alliances with carriers and specialized service suppliers are important in domestic operations, they are essential for international commerce. Without alliances, it would be necessary for an enterprise operating internationally to maintain contacts with retailers, wholesalers, manufacturers, suppliers, and service providers throughout the world. International alliances provide market access and expertise and reduce the inherent risk of global operations. The number of alternatives, breadth of activities, and complexity of globalization require alliances.

In summary, globalization is an evolving frontier that increasingly demands more extensive supply chain integration. As firms expand their focus toward international markets, demand for logistical competency increases because of longer supply chains, more variation, increased uncertainty, and more documentation. While the forces of change push toward borderless operations, supply chain logistics management still confronts market, financial, and channel barriers. The barriers are exemplified by distance, demand, diversity, and documentation. The challenge is to position an enterprise to take advantage of the

benefits of global marketing and manufacturing by developing world-spanning logistical competency.[4]

Global Sourcing

One of today's major business challenges specificly impacting logistical management is the dramatic increase in international sourcing, particularly from low-cost countries such as China and Malaysia. Firms in virtually all durable goods industries are investigating Asia, Eastern Europe, Latin America, and Africa as potential sources for finished goods or, at least, component parts. This section reviews the rationale for international sourcing from low-cost countries, identifies some of the specific challenges, and offers some guidelines regarding sourcing strategy.

Rationale for Low-Cost-Country Sourcing

Increased need for global competitiveness is driving many firms, particularly those in durable and fashion industries, to identify and establish relationships with suppliers in low-cost countries. There are a number of justifications for such sourcing initiatives. First, sourcing from countries with low wage rates typically reduces manufacturing cost. While such strategies may reduce manufacturing cost, some firms do not consider the total cost impact of international sourcing particularly with respect to the logistics cost components of transportation and inventory. Second, seeking out suppliers in low-cost countries can also increase the number of possible sources and thus increase the competitive pressure on domestic suppliers. Third, low-cost-country sourcing can increase the firm's exposure to state-of-the-art product and process technologies. Without pressure from global suppliers, there may be reluctance on the part of domestic suppliers to investigate or invest in new technologies because they have significant assets tied up in older technologies. Conversely, global suppliers may place significant focus on new technologies to establish a competitive position in foreign markets even given the issues discussed earlier regarding extended supply chains. A final rationale for low-cost-country sourcing is to establish a local presence to facilitate sales in the international country. For example, while the U.S. automobile industry is significantly increasing sourcing from low-cost countries to reduce component cost, it is also seeking to facilitate automobile sales in the local country. Because of political or legal constraints, it is often necessary for a firm to have local relationships and production operations to be allowed to sell their product in the local country. The combination of these makes a strong case for sourcing from a low-cost country, but it is necessary to also consider the challenges.

Challenges for Low-Cost-Country Sourcing

While the rationale for low-cost-import sourcing is substantial, there is also a long list of issues and challenges related to such sourcing strategies. These issues and challenges are further complicated by the fact that the benefits and costs related to low-cost-country sourcing accrue to different organizational units. Procurement or manufacturing may receive the benefits through lower-cost materials or components. Many of the costs and the challenges to ship and guarantee delivery of the materials are the responsibility of logistics. Benefits

[4] The Council of Supply Chain Management Professionals (CSCMP) has produced a number of *Global Perspectives* reports that describe the logistics characteristics and challenges confronted in over 20 specific countries. The reports are available free to members in paper and electronic form from the Web site at www.cscmp.org. For a more comprehensive discussion, see Greg Cudahy, Narendra Mulani, and Christophe Cases. "Mastering Global Operations in a Multipolar World," *Supply Chain Management Review,* March 2008, pp. 22–29.

and costs must be integrated across the full supply chain process in order to make the correct sourcing decision.

The first challenge is the identification of sources capable of producing the materials in the quality and quantity required. While it is becoming easier to achieve the quality objective, ensuring that the potential supplier has the ability to meet volume and seasonal fluctuation demands in a suitable time frame often remains a challenge.

The second challenge considers the protection of a firm's intellectual property as products or components are produced and transported. The suppliers and countries involved need to have legal constraints in place to protect product designs and related trade secrets.

The third challenge relates to understanding import/export compliance issues. There may be government regulations regarding the volume of a commodity that can be imported before duties or other restrictions are enforced. The percentage of materials that are foreign-sourced may also restrict a firm's ability to sell to select customers. Government contracts may require a specific level of domestically made components. For example, if the contract requires that the product is "Made in the U.S.A.," 95 percent of the material must be of domestic origin.

The fourth challenge relates to communication with suppliers and transportation companies. While the procurement negotiation with low-cost countries is not easy, there is often a greater difficulty in dealing with carriers, freight forwarders, and government customs as a result of time zone, language, and technology differences.

The fifth challenge is the need to guarantee the security of the product while in transit. Not only does supply chain security require that the product is secure, the process must also secure containers and vehicles involved both full and empty.

The sixth challenge concerns the inventory and obsolescence risk associated with extended transit times. With the longer transit times associated with low-cost-country sourcing, it is not uncommon for the firm to have one or two months' supply of product in transit, which must be counted as an asset and incur related inventory carrying cost. Extended leadtimes also increase the potential for obsolescence, as orders have longer leadtimes and there is generally little flexibility for change. Such extended leadtimes also can impact recovery when a quality issue develops. It is not unusual for firms to fly components from offshore suppliers to recover from unexpected quality problems or delayed shipments.

The final challenge, which synthesizes the previous ones, focuses on the need to understand the difference between piece price and total cost. While the piece price may include the material as well as direct and indirect labor, the total cost perspective needs to consider other cost elements, including freight, inventory, obsolescence, duties, taxes, recovery, and other risk considerations.

Guidelines for Sourcing

The decision to source material and components domestically or from a low-cost country is a complex one. While direct and indirect product costs represent one major factor, there are many other factors that must be considered and weighed appropriately. Products and components that have extended times between manufacturing changeovers are ideal for low-cost-country sourcing. A counterexample would be the life cycle for an electronics component, which is typically quite short and so would generally trend toward domestic sourcing. Products and components that have numerous variations should also generally be domestically sourced because the extended leadtimes associated with low-cost-country sourcing make it difficult to forecast the precise mix of product that will be demanded. Products or components with high labor content should take advantage of the typically low labor rates in low-cost counties. Products or components with high intellectual property

TABLE 12.5
Sourcing Guidelines

Criteria	Domestic Sourcing	Low-Cost-Country Sourcing
Product life cycle length	Short	Long
Product variations in size, color, or style	Many	Few
Labor content	Low	High
Intellectual property content	High	Low
Transport cost	High	Low
Product value	High	Low
Security or import constraints	High	Low
Transport uncertainty	High	Low

content should be sourced domestically, as the legal systems in many of the low-cost countries do not provide adequate trade secret protection. Domestic sourcing is generally appropriate for products and components with relatively high transport cost such as those that are bulky or damage easy. Due to increasing energy prices, many firms are beginning to reconsider more localized sourcing. Products or components with relatively low value are ideal for low-cost-country sourcing, as the inventory carrying cost while it is in transit is not significant. Products and components that are constrained for security or other types of import restrictions by a domestic government should tend toward domestic sourcing. For example, there may be customs delays in importing electronic goods when the supplier does not have the trust of the importing government because of the potential for importing contraband. Finally, products or components that have a high degree of transport uncertainty because of relatively low volumes or location on trade lanes with limited service would suggest domestic sourcing.

There is no simple answer regarding which products or components should be domestically sourced, as a number of the criteria are somewhat qualitative. Table 12.5 lists the general sourcing criteria.[5] The final determination depends on the specific item and the firm's expertise. As firms increase their global operations and marketing efforts, logistics managers should be increasingly involved to provide a realistic assessment of the total cost and performance implications.

As a supply chain strategy becomes more global, increased complexities are encountered. These complexities result from longer distances, demand differentials, cultural diversity, and complex documentation. Nevertheless, firms will increasingly confront the need to expand operations into the global arena. Strategies to achieve a share of the rapidly expanding world market range from export/import to local presence to true globalization. Regardless of the strategic focus, success will, to a large extent, be dependent upon a firm's logistical capabilities.

Summary

Global operations are becoming more of the norm for logistics and supply chain executives. Decisions regarding global sourcing and marketing require more complex trade-off analyses than traditionally required for domestic logistics. Both the quantitative and qualitative factors are more complex. While transportation, inventory, and warehousing costs are very substantial for global operations, other cost components, including taxes, tariffs,

[5] For a more detailed discussion regarding sourcing in Asia and China specifically, see Robert Handfield and Kevin McCormack, "What You Need to Know about Sourcing from China," *Supply Chain Management Review,* September 2005, pp. 28–36.

duties, documentation, and import restrictions, can also have a substantial impact on true total cost. However, in addition to the quantitative considerations, international operations introduce a number of other variables that are much more difficult to quantify. Many of these variables relate directly to logistics operations. The major qualitative considerations include relationship management, infrastructure consistency, production and transit reliability, and security. With increased global marketing and manufacturing operations, logistics management needs to be more involved in developing and implementing global strategies.

Challenge Questions

1. Compare and contrast domestic and global logistics operations.
2. Discuss how logistics management must evolve to reflect the differing needs for each stage of international development.
3. Discuss the logistics operational considerations for operating in a global environment.
4. Discuss the role that federal, state, and local government play in supply chain design and operating decisions.
5. Describe the logistics characteristics of a firm moving toward a globally integrated enterprise.
6. Describe some of the strategies that firms can use to overcome the challenges related to transportation infrastructure congestion.
7. Discuss the rationale and challenges related to sourcing from low-cost countries.
8. Describe the factors that should be considered by logistical management in the total cost analysis for global sourcing and marketing
9. Discuss how product variations, security and import constraints, and transportation uncertainty should impact global sourcing and marketing decisions.
10. Compare and contrast export/import operations to local presence. What are the logistics ramifications of each stage of international development?