

CHAPTER 82

Supply Chain Planning and Management*

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JMA Supply Chain Management

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1.0 INTRODUCTION

In any society, industrialized or nonindustrialized, goods must be physically moved or transported between the place they are produced and the place they are consumed. Except in very primitive cultures, where each family meets its own household needs, the exchange process has become the cornerstone of economic activity. Exchange takes place when there is a discrepancy between the amount, type, and timing of goods available and the goods needed. If a number of individuals or organizations within the society have a surplus of goods that someone else needs, there is a basis for exchange. When many exchanges take place between producers and consumers, the alignment of firms that bring products or services to market has been called the supply chain, the demand chain, or the value chain. In this chapter we will use the term *supply chain* to represent this alignment of firms.

2. SUPPLY CHAIN MANAGEMENT VS. LOGISTICS

Supply chain management is a term that has grown significantly in use and popularity since the late 1980s, although considerable confusion exists about what it actually means. Many people use the term as a substitute or synonym for *logistics*. However, the definition of supply chain management used in this chapter is much broader than logistics.

2.1. Definition of Supply Chain Management

“Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders” (Lambert et al. 1998). There are a number of important differences between this definition of supply chain management and the Council of Logistics Management* definition of logistics.

*The Council of Logistics Management is the leading-edge professional logistics organization, with a current membership of over 15,000.

First and foremost, supply chain management is the management of all key business processes, including customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization, and returns. Key requirements for successful implementation of supply chain management are executive support, leadership, commitment to change, and empowerment. These requirements will be described along with the key processes later in the chapter.

Thus, supply chain management (SCM) is a systems approach that is highly interactive and complex and requires simultaneous consideration of many trade-offs. As shown in Figure 1, SCM spans organizational boundaries, considering trade-offs both within and among organizations regarding where inventory should be held and where activities should be performed.

In addition to the processes involved in supply chain management, this figure illustrates the product flows and information linkages that must take place in a supply chain. Remember that product flows take place only after information flows are initiated.

Due to the dynamic nature of the business environment, management must monitor and evaluate the performance of the supply chain regularly and frequently. When performance goals are not met, management must evaluate possible supply chain alternatives and implement changes. SCM is particularly important in mature and declining markets, during periods of economic slowdown when market growth cannot conceal inefficient practices, and when product life cycles are extraordinarily short. It is also critical in new product/market development, when the organization is making decisions related to supply chain configuration.

2.2. Difference between Logistics and Supply Chain Management*

The term *supply chain management* (SCM) was originally introduced by consultants in the early 1980s (Oliver and Webber 1982) and has subsequently gained tremendous attention (La Londe 1998). Since 1989, academics have attempted to give structure to SCM (Stevens 1989; Towill et al. 1992; Ellram and Cooper 1993; Bechtel and Jayaram 1997).

Until recently, most practitioners (Davis 1993; Arntzen et al. 1995; Lee and Billington 1995; Camp and Colbert 1997), consultants (Scharlacken 1998; Tyndall et al. 1998; Copacino 1997), and

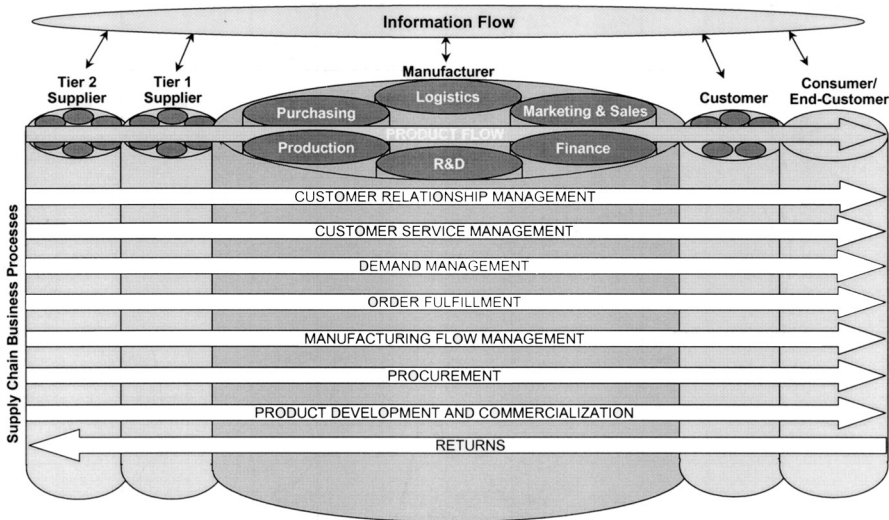


Figure 1 Supply Chain Management: Integrating and Managing Business Processes across the Supply Chain. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

*This section is taken from D. M. Lambert, M. C. Cooper and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, 1998, pp. 2–5.

academics (Fisher 1997; Lee and Billington 1992; Handfield and Nichols 1999; Bowersox and Closs 1996) viewed SCM as not appreciably different from the contemporary understanding of logistics management. That is, SCM was viewed as logistics outside the firm to include customers and suppliers. However, in 1986, the Council of Logistics Management (CLM) defined logistics management as "The process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements."

Logistics as defined by the Council of Logistics Management always represented a supply chain orientation, "from point of origin to point of consumption." Then why the confusion? Probably because logistics is a functional silo within companies and is also a bigger concept that deals with the management of material and information flows across the supply chain. This is similar to the confusion over marketing as a concept and marketing as a functional area. Thus the quote from the CEO: "Marketing is too important to be left to the marketing department." Everybody in the company should have a customer focus. The marketing concept does not apply just to the marketing department. It is everybody's responsibility to focus on serving the customer's needs.

Executives in companies leading the drive to implement SCM visualize the necessity of integrating all key business operations across the supply chain (Giunipero and Brand 1996; Bowersox 1997a). This broader understanding of SCM is likewise the core message in the following statement by James E. Morehouse, Vice President of A.T. Kearney, management consultants. "For companies to survive and prosper, they will need to operate their supply chains as extended enterprises with relationships which embrace business processes, from materials extraction to consumption." Thus, the understanding of SCM has been reconceptualized from integrating logistics across the supply chain to integrating and managing key business processes across the supply chain (Cooper et al. 1997b). Based on this emerging distinction between SCM and logistics, in 1998, CLM announced a modified definition of logistics. The modified definition explicitly declares CLM's position that logistics management is only a part of SCM: "Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point-of-consumption in order to meet customers' requirements" (Council of Logistics Management 1998).

Managing the supply chain is a complicated task and even managing logistics from point of origin to point of consumption is a lot easier to write on a piece of paper than actually to do. Imagine the degree of complexity if you are actually going to manage all suppliers back to the point of origin and all products/services out to the point of consumption. It is probably easier to understand why executives would want to manage their supply chains to the point of consumption, because whoever has the relationship with the end user has the power in the supply chain. Intel has created a relationship with the end user by having computer manufacturers place an "Intel chip inside" label on their computers. This affects the computer manufacturer's ability to switch chip suppliers. But managing all tier 1 suppliers' networks to the point of origin is an enormous undertaking. Managing the entire supply chain is a very difficult and challenging task, as illustrated in Figure 2.

The early marketing channel researchers, such as Wroe Alderson and Louis P. Bucklin, conceptualized the key factors for why and how channels are created and structured (Alderson 1950; Cox and Alderson 1950; Bucklin 1966). From a supply chain standpoint, these researchers were basically on the right track, particularly in the areas of identifying who should be a member of the marketing channel, describing the need for channel coordination, and drawing actual marketing channels. However, for the last 30 years the channels researchers studied power and conflict with questionable results and ignored two critical issues. First, they did not build on the early contributions by including suppliers to the manufacturer, and thus neglected the importance of a total supply chain perspective. Second, they focused on marketing activities and flows across the channel and overlooked the need to integrate and manage multiple key processes across companies.

Unlike the marketing channels literature, a major weakness of the SCM literature to date is that the authors appear to assume that everyone knows who is a member of the supply chain. Little effort has been given to identifying specific supply chain members, key processes that require integration, or what management must do to successfully manage the supply chain. The SCM framework presented here encompasses the combination of three closely interrelated elements: the structure of the supply chain, the supply chain business processes, and the supply chain management components (see Figure 3). We believe that the combination of these three elements captures the essence of SCM.

The supply chain structure is the network of members and the links between members of the supply chain. Business processes are the activities that produce a specific output of value to the customer. The management components are the managerial variables by which the business processes are integrated and managed across the supply chain. In combination, the SCM definition and this new framework move the SCM philosophy to its next evolutionary stage.

The implementation of SCM involves identifying the supply chain members, with whom it is critical to link, what processes need to be linked with each of these key members, and what type/level of integration applies to each process link. The objective of SCM is to maximize competitiveness

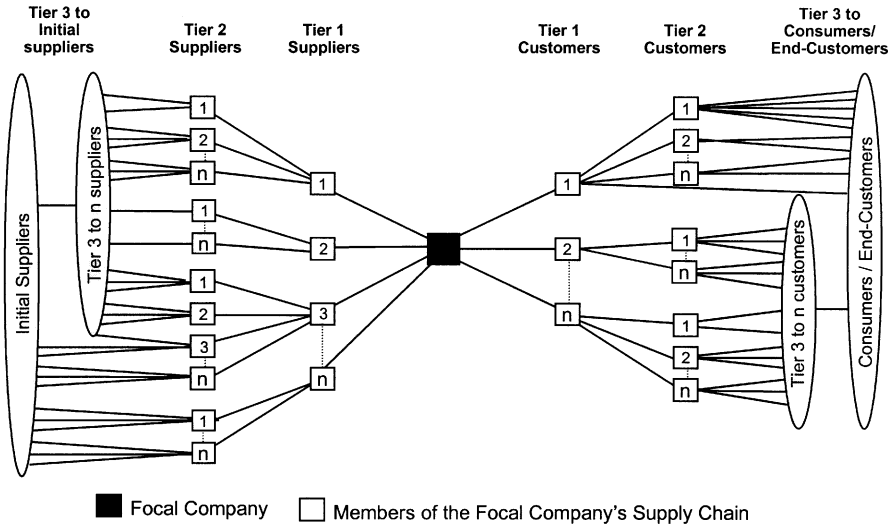


Figure 2 Supply Chain Network Structure. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

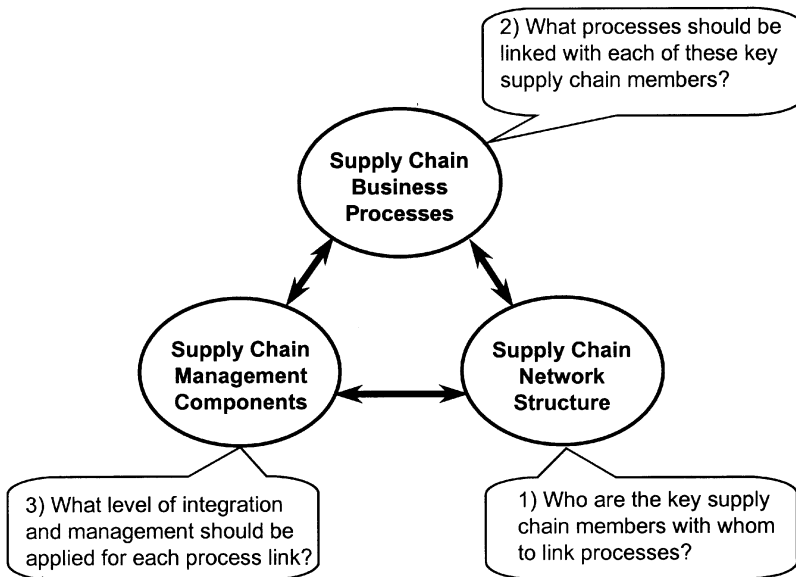


Figure 3 Supply Chain Management Framework: Elements and Key Decisions. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

and profitability for the company as well as the whole supply chain network, including the end customer. Consequently, supply chain process integration and reengineering initiatives should be aimed at boosting total process efficiency and effectiveness across members of the supply chain.

3. CHANNEL STRUCTURE

The theory on channel structure described in the marketing literature provides a useful foundation for studying supply chain structure. According to this literature, channel structure may be viewed as a function of product life cycle, logistics systems, effective communication networks (Michman 1971; Ellram and Cooper 1990), product characteristics (Aspinwall 1958), and/or firm size (Weigand 1963). The most detailed theory of channel structure was developed by Bucklin (1966). He stated that the purpose of the channel is to provide consumers with the desired combination of its outputs (lot size, delivery time, and market decentralization) at minimal cost. Consumers determine channel structure by purchasing combinations of service outputs. The best channel has formed when no other group of institutions generates more profits or more consumer satisfaction per dollar of product cost. Bucklin concluded that functions will be shifted from one channel member to another in order to achieve the most efficient and effective channel structure.

Given a desired level of output by the consumer and competitive conditions, channel institutions will arrange their functional tasks in such a way as to minimize total channel costs. This shifting of specific functions may lead to the addition or deletion of channel members.

In deciding when and where to use channel intermediaries, the firm is really considering the make/buy or "outsourcing" decision. Does the organization need to develop the required skills and capabilities internally, or can it be done faster and more efficiently by using a third party?

3.1. Outsourcing Pieces of the Supply Chain

Approximately \$40 billion of logistics services in the United States are being outsourced. (Piper Jaffray Equity Research 1999). And there are significant opportunities to outsource additional logistics services. Some examples of outsourcing services that are available include:

- A large pharmaceutical company outsources its worldwide distribution, providing on-site pharmacists at some centers to dispense high-value products.
- A third party handles the entire finished goods inventory for a large women's clothing company. When garments are purchased by a retailer, the distributor attaches the store's private label, refreshes the garment, packs it in the store's packaging, and ships to the retailer.
- A mail-order retailer is having FedEx handle not only their shipments, but also storage and management of the inventory and all aspects of distribution.
- In addition to handling store replenishment and delivery of product to consumers for a tool manufacturer, UPS now is going to handle the warehouse. If the retail store needs product, an order that reaches the distribution center by 9:00 p.m. will be at the store by the next morning (Richardson 1994).

Thus, outsourcing represents an opportunity that should be considered in supply chain design and evaluation of existing supply chains. In addition, the role and utility of the distributor are changing. In some cases, consolidation of suppliers and customers has reduced the value and functionality of distributors.

For example, Wal-Mart's large stores, which use direct distribution, replace small stores that may have used distributors. Similarly, advanced technology such as EDI trades information for inventory, reducing the need to hold inventory at distributors as well as at retailers (see Section 6.2). Better information technology and increased service offerings by carriers (such as cross-docking) also reduce the need for distributor's services (Copacino 1994).

3.2. Postponement and Speculation

Bucklin's theory of channel structure is based on the concepts of postponement and speculation (Bucklin 1965). Costs can be reduced by (1) postponing changes in the form and identity of a product to the last possible point in the marketing process and (2) postponing inventory location to the last possible point in time, since risk and uncertainty costs increase as the product becomes more differentiated. Postponement results in savings because it moves differentiation nearer to the time of purchase, when demand is more easily forecast. This reduces risk and uncertainty costs. Logistics costs are reduced by sorting products in large lots in relatively undifferentiated states. Third-party service providers can support postponement by mixing pallets for individual customers as orders are received, repackaging product to fit specific customer or country requirements, and performing final assembly or customization in the field.

Companies can use postponement to shift the risk of owning goods from one channel member to another. That is, a manufacturer may refuse to produce until it receives firm orders; a middleman

may postpone owning inventories by purchasing from sellers who offer faster delivery, purchasing on consignment, or purchasing only when a sale has been made; and consumers may postpone ownership by buying from retail outlets where the products are in stock.

An excellent example of postponement is the mixing of paint colors at the retail store. Rather than having to forecast the exact colors that consumers will want to buy, the retailer mixes paint in any color the consumer wishes to acquire at the time of purchase. Other examples include color panels in the front of built-in kitchen appliances that enable the same unit to be any one of a number of colors; the centralization of slow-selling products in one warehouse location; and the assembly of slow-moving items only after orders have been received.

Speculation is the opposite of postponement: that is, a channel institution assumes risk rather than shifting it. Speculation can reduce marketing costs through (1) the economies of large-scale production; (2) the placement of large orders, which reduces the costs of order processing and transportation; (3) the reduction of stockouts and their associated cost; and (4) the reduction of uncertainty. To reduce the need for speculative inventories, managers in many firms are exploring strategies of time-based competition (Handfield 1991; Rafuse 1995; Christopher and Peck 1997). By using time-based competition, management can reduce significantly the firm's time to manufacture products while reducing inventory, improving inventory turns, reducing cost of ownership, and improving customer satisfaction.

3.3. Time-to-Market Pressures

Speed can be used as a source of competitive advantage. This is true in virtually all market sectors: services, manufacturing, and retailing. Retailers have been leaders in the area of time-based competition, relying heavily on advanced computer systems involving bar coding and EDI to support quick response (this will be described further in Section 6.2). The use of such systems is growing among carriers. But computer systems are not enough to create speed-to-market; fundamental changes in operational relationships are required. This includes information sharing among suppliers, manufacturers, and retailers, including lead times, forecasts of sales, production, and purchase needs, shipping, new product plans, and payment information.

Some of the benefits of effective time-based management include:

- Enhanced customer value through better responsiveness
- Reduced inventory requirements due to shorter lead times
- Reduced cost-added/duplicate functions
- Improved quality/product freshness through reduced handling and lower inventories
- Improved competitive position
- Increased responsiveness to changing market needs
- Improved productivity

3.4. Other Issues Affecting Channel Structure

Additional factors that can influence channel structure include:

- Technological, cultural, physical, social, and political factors
- Physical factors such as geography, size of market, location of production centers, and concentration of population
- Local, state, and federal laws
- Social and behavioral variables

For example, social, cultural, political, and economic variables may support channels that are not necessarily as efficient or effective as they should be.

4. SUPPLY CHAIN NETWORK STRUCTURE*

One key element of managing the supply chain is to have an explicit knowledge and understanding of how the supply chain network structure is configured. The three primary structural aspects of a

*This section is taken from D. M. Lambert, M. C. Cooper and J. D. Pagh, "Supply Chain Management: Implementation Issues and Research Opportunities," *International Journal of Logistics Management*, Vol. 9, 1998, pp. 5–9.

company's network structure are the members of the supply chain, the structural dimensions of the network, and the different types of process links across the supply chain. These three issues are all related to the first element: supply chain network structure, shown in Figure 3. Now each issue will be addressed.

4.1. Identifying Supply Chain Members

When determining the network structure, it is necessary to identify who the members of the supply chain are. Including all types of members may cause the total network to become highly complex, since it may explode in the number of members added from tier level to tier level (Cooper et al. 1997a). To integrate and manage all process links with all members across the supply chain would, in most cases, be counterproductive, if not impossible. The key is to sort out some basis for determining which members are critical to the success of the company and the supply chain and thus should be allocated managerial attention and resources.

Marketing channels researchers identified members of the channel based on who takes part in the various marketing flows, including product, title, payment, information, and promotion flows (Stern et al. 1996). Each flow included relevant members, such as banks for the payment flow and advertising agencies for the promotion flow. The channels researchers sought to include all members taking part in the marketing flows, regardless of how much impact each member had on the value provided to the end customer or other stakeholders.

The members of a supply chain include all companies/organizations with whom the focal company interacts directly or indirectly through its suppliers or customers, from point of origin to point of consumption. However, to make a very complex network more manageable, it seems appropriate to distinguish between primary and supporting members. Primary members of a supply chain are defined to be all those autonomous companies or strategic business units who actually perform operational and/or managerial activities in the business processes designed to produce a specific output for a particular customer or market.

In contrast, the supporting members of a supply chain are companies that simply provide resources, knowledge, utilities, or assets for the primary members of the supply chain.

For example, supporting companies include those that lease trucks to the manufacturer, banks that lend money to a retailer, the owner of the building that provides warehouse space, or companies that supply production equipment or print marketing brochures or provide temporary secretarial assistance. These supply chain members support the primary members now and in the future. Resource, knowledge, utility, or asset providers are important, if not vital, contributors to a company and the supply chain, but they do not directly participate in or perform activities in the value-adding processes of transforming inputs to outputs for the end customer.

The same company can perform both primary and supportive activities. Likewise, the same company can perform primary activities related to one process and supportive activities related to another process. An example from one of the case studies is an OEM that buys some critical and complex production equipment from a supplier. When the OEM develops new products, it works very closely with the equipment supplier, and thus the supplier is a primary member of the OEM's product-development process. However, when looking at the manufacturing flow management process, the supplier is a supportive and not a primary member, since supplying the equipment does not in itself add value to the output of the processes, even though the equipment does add value.

It should be noted that the distinction between primary and supporting chain members is not obvious in all cases. Nevertheless, this distinction provides a reasonable managerial simplification and yet captures the essential aspects of who should be considered key members of the supply chain. The approach for differentiating between types of members is to some extent similar to how Porter distinguished between value-adding and support activities in his value chain framework (Porter 1984).

The definitions of primary and supporting members make it possible to define the point of origin and the point of consumption of the supply chain. The point of origin of the supply chain occurs where no primary suppliers exist. All suppliers to the point of origin members are solely supporting members. The point of consumption is where no further value is added and the product and/or service is consumed.

4.2. The Structural Dimensions of the Network

Three structural dimensions of the network are essential when describing, analyzing, and managing the supply chain. These dimensions are the horizontal structure, the vertical structure, and the horizontal position of the focal company within the end points of the supply chain.

The horizontal structure refers to the number of tiers across the supply chain. The supply chain may be long, with numerous tiers, or short, with few tiers. The vertical structure refers to the number of suppliers/customers represented within each tier. A company can have a narrow vertical structure, with few companies at each tier level, or a wide vertical structure with many suppliers and/or

customers at each tier level. The third structural dimension is the company's horizontal position within the supply chain. A company can be positioned at or near the initial source of supply, at or near to the ultimate customer, or somewhere between these end points of the supply chain.

Different combinations of these structural variables are possible. For example, a narrow and long network structure on the supplier side can be combined with a wide and short structure on the customer side. Increasing or reducing the number of suppliers and/or customers will affect the structure of the supply chain. As companies move from multiple- to single-source suppliers, the supply chain will become narrower. Outsourcing logistics, manufacturing, marketing, or product-development activities is another example of decision making that likely will change the supply chain structure. It may increase the length and width of the supply chain and likewise influence the horizontal position of the focal company in the supply chain network.

Supply chains that burst to many tier 1 customers/suppliers will strain corporate resources and limit the number of process links the focal company can integrate and closely manage beyond tier 1. In general, managers in companies with immediately wide vertical structures actively manage only a few tier 2 customers or suppliers. Some companies have transferred servicing small customers to distributors, thus moving the small customers farther down in the supply chain from the focal company. This principle, known as functional spin-off, is described in the channels literature (Stern et al. 1996) and can be applied to the focal company's network of suppliers as well as to its customers.

Supply chains look different from each company's perspective because management of each company sees its firm as the focal company and views membership and network structure differently. Thus, the perceived supply chain network structure is arbitrary. However, because each firm is a member of the other's supply chain, it is important for management of each firm to understand its interrelated roles and perspectives. This is because the integration and management of business processes across company boundaries will be successful only if it makes sense from each company's perspective (Cooper et al. 1997b).

4.3. Types of Business Process Links

Integrating and managing all business process links throughout the entire supply chain is likely not appropriate. Since the drivers for integration are situational and different from process link to process link, the levels of integration will/should likewise vary from link to link and over time. Thus, some links are more critical than others (Håkansson and Snehota 1995). As a consequence, the task of allocating scarce resources among the different business process links across the supply chain becomes crucial. Four fundamentally different types of business process links can be identified between members of a supply chain (Lambert et al. 1998): managed business process links, monitored business process links, not-managed business process links, and nonmember business process links.

Managed process links. Managed process links are links that the focal company finds important to integrate and manage. This might be in collaboration with other member companies of the supply chain. In the supply chain drawn in Figure 4, the managed process links are indicated by the thickest solid lines. The focal company will integrate and manage process links with tier 1 customers and suppliers. As indicated by the remaining thick solid lines in Figure 4, the focal company is actively involved in the management of a number of other process links beyond tier 1.

Monitored process links. Monitored process links are not as critical to the focal company. However, it is important to the focal company that these process links be integrated and managed appropriately between the other member companies. Thus, the focal company, as frequently as necessary, simply monitors or audits how the process link is integrated and managed. The thick dashed lines in Figure 4 indicate the monitored process links.

Not-managed process links. Not-managed process links are links that the focal company is not actively involved in and are not critical enough to use resources for monitoring. In other words, the focal company fully trusts the other members to manage the process links appropriately, or because of limited resources leaves it up to them. The thin solid lines in Figure 4 indicate the not-managed process links. For example, a manufacturer has a number of suppliers for cardboard shipping cartons. Usually the manufacturer will not choose to integrate and manage the links beyond the cardboard supplier all the way back to the growing of the trees. The manufacturer wants certainty of supply, but it may not be necessary to integrate and manage the links beyond the cardboard supplier.

The three alternatives for integrating and managing links are illustrated in Figure 5. Company A may choose to integrate with and actively manage link 2 (alternative 1). Or company A could choose not to integrate but only to monitor the procedures of companies B and C for integrating and managing link 2 (alternative 2). Both alternatives 1 and 2 necessitate some level of resource allocation from company A. Finally, company A can choose not to be involved and leave the integration and management of link 2 up to companies B and C (alternative 3).

Nonmember process links. Managers understand that their supply chains are influenced by decisions made in other connected supply chains. For example, a supplier to the focal company is also a supplier to the chief competitor. Such a supply chain structure may have implications for the

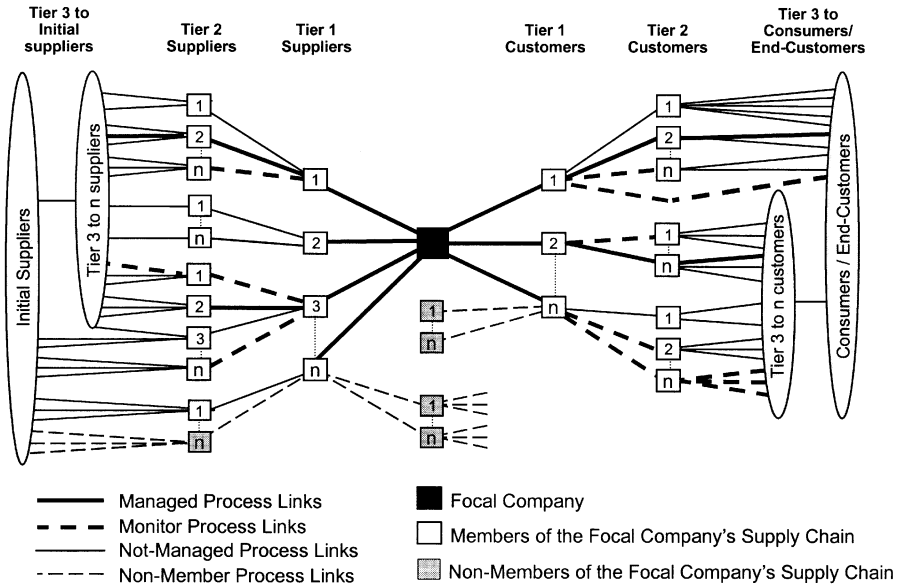


Figure 4 Types of Inter-company Business Process Links. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

supplier’s allocation of manpower to the focal company’s product-development process, availability of products in times of shortage, and/or protection of confidentiality of information. This leads us to identify a fourth type of business link, nonmember process links. Nonmember process links are process links between members of the focal company’s supply chain and nonmembers of the supply chain. Nonmember links are not considered as links of the focal company’s supply chain structure, but they can and often will affect the performance of the focal company and its supply chain. The thin dashed lines in Figure 4 illustrate examples of nonmember process links.

Based on the process links just described, there is variation in how closely companies integrate and manage links farther away from the first tier. In some cases, companies work through or around

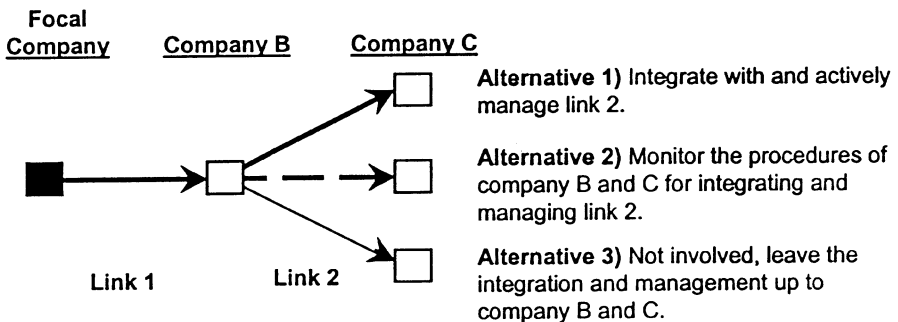


Figure 5 The Focal Company’s Alternatives for Involvement with Link 2. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

other members/links in order to achieve specific supply chain objectives, such as product availability, improved quality, and reduced overall supply chain costs. For example, a tomato ketchup manufacturer in New Zealand conducts research on tomatoes in order to develop plants that provide larger tomatoes with fewer seeds. Their contracted growers are provided with young plants in order to ensure the quality of the output. Since the growers tend to be small, the manufacturer negotiates contracts with suppliers of equipment and supplies such as fertilizer and chemicals. The farmers are encouraged to purchase their raw materials and machinery using the contract rates. This results in higher-quality raw materials and lower prices without sacrificing the margins and financial strength of the growers.

There are several examples of companies who, in times of shortage, discovered that it was important to manage beyond tier 1 suppliers for critical times. One example involves a material used in the manufacture of semiconductors. The manufacturer had six tier 1 suppliers from which to purchase. However, when shortages occurred, it became apparent that all six tier 1 suppliers purchased from the same tier 2 supplier. It turned out that the most critical relationship was with the tier 2 supplier.

4.4. Supply Chain Mapping Considerations

The mapping of the supply chain for a focal company is an important step in understanding the interrelationships that impact the success of the business. Several important points need to be kept in mind before proceeding with the mapping of the supply chain network:

- Supply chain mapping should begin from the right side (customer side) of the network, as shown in Figure 2. This will bring the correct focus to why the map is being constructed.
- Once the customer segments are identified, each segment should be evaluated in terms of its importance to the success of the focal company. Factors such as sales, profit, contribution margin, and competitive threat can be used to select the priority that each customer or customer segment has in the supply chain.
- Rather than proceeding with comprehensive mapping from right to left (customers to tier n Suppliers), it is suggested that the mapping proceed for one or two of the highest-priority customer segments. This process will limit the complexity that can quickly develop by building a complete map that may become weighed down by trivial nodes and a need for vast amounts of information.
- At this point, existing processes and performance can be included in the supply chain map.
- Lastly, performance goals should be established for each customer segment. With performance goals in place, the development of revised intermediate performance metrics and adjusted business processes that support the new goals can proceed.

5. SUPPLY CHAIN BUSINESS PROCESSES*

Successful supply chain management requires a change from managing individual functions to integrating activities into key supply chain processes. Traditionally, both upstream and downstream portions of the supply chain have interacted as disconnected entities receiving sporadic flows of information over time.

The purchasing department placed orders as requirements became necessary, and marketing, responding to customer demand, interfaced with various distributors and retailers and attempted to satisfy this demand. Orders were periodically given to suppliers and their suppliers, who had no visibility of demand at the point of sale or use. Satisfying the customer often required expedited operations throughout the supply chain as member firms reacted to unexpected changes in demand.

Operating an integrated supply chain requires continuous information flows, which in turn help to create the best product flows. The customer remains the primary focus of the process. However, improved linkages with suppliers are necessary because controlling uncertainty in customer demand, manufacturing processes, and supplier performance is critical to effective supply chain management (SCM). Achieving a good customer-focused system requires processing information both accurately and in a timely fashion because quick-response systems require frequent changes in response to fluctuations in customer demand.

In many major corporations, such as 3M, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes are:

*This material is adapted from D. M. Lambert, L. C. Guinipero, and G. Ridenhower, "Supply Chain Management: A Key to Achieving Business Excellence in the 21st Century," manuscript. All rights reserved.

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Procurement
- Product development and commercialization
- Returns

These processes were identified in Figure 1. While the specific processes identified by individual firms may vary somewhat from those above, supply chain management must consider five fundamental processes: selling, customer order fulfillment, manufacturing flow, procurement, and product development.

Of course, performance metrics must be changed to reflect process performance across the supply chain, and rewards and incentives must be aligned to these metrics in order to effect change. Each of the eight processes will now be described.

5.1. Customer Relationship Management Process

The first step towards integrated SCM is to identify key customer or customer groups that the organization targets as critical to its business mission. The corporate business plan is the starting point for this analysis. Customer service teams develop and implement partnering programs with key customers. Product and/or service agreements specifying the levels of performance are established with these key customer groups. In many cases, the product/service agreements will be tailored to meet the needs of key individual customers.

New customer interfaces lead to improved communications and better predictions of customer demand, which leads to improved service for customers. Customer service teams work with customers to identify further and eliminate sources of demand variability. Performance evaluations are undertaken to analyze the levels of service provided to customers as well as customer profitability.

5.2. Customer Service Management Process

Customer service provides the single source of customer information. It becomes the key point of contact for administering the product/service agreement. Customer service provides the customer with real-time information on promised shipping dates and product availability through interface with the organizations' production and distribution operations.

Managing customer service in an SCM environment requires an online, real-time system to provide product and pricing information to support customer inquiries and facilitate order placement. After-sales service is also a requirement. Finally, the technical customer service group must be able to assist the customer efficiently with product applications and recommendations.

5.3. Demand Management Process

Hewlett-Packard's experience with SCM indicates that inventory is either essential or variability driven (Davis 1993). Essential inventory includes work-in-process in factories and products in the pipeline moving from location to location. Time-based and periodic-review systems lead to certain amounts of incoming inventory stock. Variability stock is present due to variance in process, supply, and demand. Customer demand is by far the largest source of variability and stems from irregular order patterns. Given this variability in customer ordering, demand management is a key to an effective SCM process.

The demand management process must balance the customer's requirements with the firm's supply capabilities. Part of managing demand involves attempting to determine what and when customers will purchase. A good demand management system uses point-of-sale and key customer data to reduce uncertainty and provide efficient flows throughout the supply chain.

Marketing requirements and production plans should be coordinated on an enterprise-wide basis. Thus, multiple sourcing and routing options are considered at the time of order receipt, which allows market requirements and production plans to be coordinated on an organization-wide basis. In very advanced SCM systems, customer demand and production rates are synchronized to manage inventories globally.

5.4. Customer Order-Fulfillment Process

The key to effective SCM is meeting or exceeding customer need dates. It is important to achieve high order-fill rates either on a line item or order basis. Performing the order-fulfillment process effectively requires integration of the firm's manufacturing, distribution, and transportation plans. As

previously discussed, partnerships should be developed with key supply chain members and carriers to meet customer requirements and reduce total delivered cost to customer. The objective is to develop a seamless process from the supplier to the organization and then on to its various customer segments.

With the growth of Internet-based businesses that are almost virtual in nature (i.e., no manufacturing or fulfillment assets), the process is carried out by contracted specialists. This implies that information integration becomes the key interaction between the supply chain entities.

5.5. Manufacturing Flow Management Process

The manufacturing process in make-to-stock firms traditionally produced and supplied product to the distribution channel based on historical forecasts. Products were pushed through the plant to meet a schedule. Often the wrong mix of products was produced, resulting in unneeded inventories, excessive inventory carrying costs, mark-downs, and transshipments of product.

With SCM, product is pulled through the plant based on customer needs. Manufacturing processes must be flexible to respond to market changes. This requires the flexibility to perform rapid change-over to accommodate mass customization. Orders are processed on a just-in-time basis in minimum lot sizes. Production priorities are driven by required delivery dates.

At 3M, manufacturing planners work with customer planners to develop strategies for each customer segment. Changes in the manufacturing flow process lead to shorter cycle times, meaning improved responsiveness to customers.

5.6. Procurement Process

Strategic plans are developed with suppliers to support the manufacturing flow management process and the development of new products. Suppliers are strategically categorized based on several dimensions, such as their contribution and criticality to the organization. In companies where operations extend world-wide, sourcing should be managed from corporate on a global basis.

Long-term partnerships are developed with a small core group of suppliers. The desired outcome is a win-win relationship where both parties benefit. This is a change from the traditional bid-and-buy system to involving a key supplier early in the design cycle, which can lead to dramatic reduction in product-development cycle times. Having early supplier input reduces time by getting the required coordination between engineering, purchasing, and the supplier prior to design finalization.

The purchasing function develops rapid communication mechanisms such as EDI and Internet linkages to transfer requirements quickly. These rapid communication tools provide a means to reduce time and cost spent on the transaction portion of the purchase. Purchasers can focus their efforts on managing suppliers as opposed to placing orders and expediting.

5.7. Product Development and Commercialization

If new products are the lifeblood of a corporation, then product development is the lifeblood of a company's new products. Customers and suppliers must be integrated into the product-development process in order to reduce time to market. As product life cycles shorten, the right products must be developed and successfully launched in ever-shorter time frames in order to remain competitive.

Managers of the product-development and commercialization process must:

- Coordinate with customer relationship management to identify customer articulated and unarticulated needs
- Select materials and suppliers in conjunction with procurement
- Develop production technology in manufacturing flow to assess manufacturability and integration into the best supply chain flow for the product/market combination

5.8. Returns Process

Managing the returns channel as a business process offers the same opportunity to achieve a sustainable competitive advantage as managing the supply chain from an outbound perspective (Cledenin 1997). Effective process management of the returns channel enables identification of productivity-improvement opportunities and breakthrough projects.

At Xerox, returns are managed in four categories: equipment, parts, supplies, and competitive trade-ins. "Return to available" is a velocity measure of the cycle time required to return an asset to a useful status. This metric is particularly important for those products where customers are given an immediate replacement in the case of product failure. Also, equipment destined for scrap and waste from manufacturing plants is measured in terms of the time until cash is received.

5.9. SCM Process Summary

Focusing efforts on these key business processes, which extend from the end users to original suppliers, provides the foundation for a supply chain management philosophy. The goals or outcomes of these processes are to:

- Develop customer-focused teams that provide mutually beneficial product and service agreements to strategically significant customers
- Provide a point of contact for all customers that efficiently handles their inquiries
- Continuously gather, compile, and update customer demand to match requirements with supply
- Develop flexible manufacturing systems that respond quickly to changing market conditions
- Manage supplier partnerships that allow for quick response and continuous improvement
- Fill 100% of customer orders accurately and on time
- Minimize the return to available cycle time

A responsive, flexible integrated supply chain can accomplish these objectives. Because as previously mentioned, these processes cut across business functions, it is important to examine or re-engineer each key process using a systematic approach.

6. BUSINESS PROCESS CHAINS*

Thousands of activities are performed and coordinated within a company, and every company is by nature in some way involved in supply chain relationships with other companies (Bowersox 1997b; Stigler 1951; Coase 1937). When two companies build a relationship, certain of their internal activities will be linked and managed between the two companies (Håkansson and Snehota 1995). Since both companies have linked some internal activities with other members of their supply chain, a link between two companies is thus a link in what might be conceived as a supply chain network. For example, the internal activities of a manufacturer are linked with and can affect the internal activities of a distributor, which in turn are linked with and can have an effect on the internal activities of a retailer. Ultimately, the internal activities of the retailer are linked with and can affect the activities of the end customer.

6.1. Linking Members of the Supply Chain

Håkansson and Snehota (1995) stress that “the structure of activities within and between companies is a critical cornerstone of creating unique and superior supply chain performance.” Executives in leading companies believe that competitiveness and profitability can increase if internal key activities and business processes are linked and managed across multiple companies. Thus, “successful supply chain management requires a change from managing individual functions to integrating activities into key supply chain business processes” (Lambert et al. 1997).

Companies in the same supply chain may have different activity structures. Some companies emphasize a functional structure, some a process structure, and others a combined structure of processes and functions. Companies with processes often have different numbers of processes consisting of different activities and links between activities. Further, different names are used for similar processes and similar names for different processes. This lack of intercompany consistency is a cause of significant friction and inefficiencies in supply chains. At least with functional silos, there is generally an understanding of what functions like marketing, manufacturing, and accounting/finance represent. If each firm identifies its own set of processes, how do we communicate and link these processes across firms? A simplified illustration of such a disconnected supply chain is shown in Figure 6.

A process can be viewed as a structure of activities designed for action with a focus on end customers and on the dynamic management of flows involving products, information, cash, knowledge, and/or ideas.

In an exploratory study involving 30 successful supply chain redesign practitioners, Hewitt found that companies identified between 9 and 24 internal business processes. The two most commonly identifiable processes were order fulfillment and product development (Hewitt 1994).

A prerequisite for successful SCM is to coordinate activities within the firm. One way to do this is to identify the key business processes and manage them using cross-functional teams. In some cases the internal business processes have been extended to suppliers and managed to some extent between the two firms involved. This may imply that when a leadership role is taken, a firm’s internal business processes can become the supply chain business processes. The obvious advantage when this is possible is that each member of the band is playing the same tune.

The number of business processes that it is critical and/or beneficial to integrate and manage between companies will likely vary. In some cases it may be appropriate to link just one key process, and in other cases it may be appropriate to link multiple or all key business processes. However, in

*This section is taken from D. M. Lambert, M. C. Cooper and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, 1998, pp. 9–11.

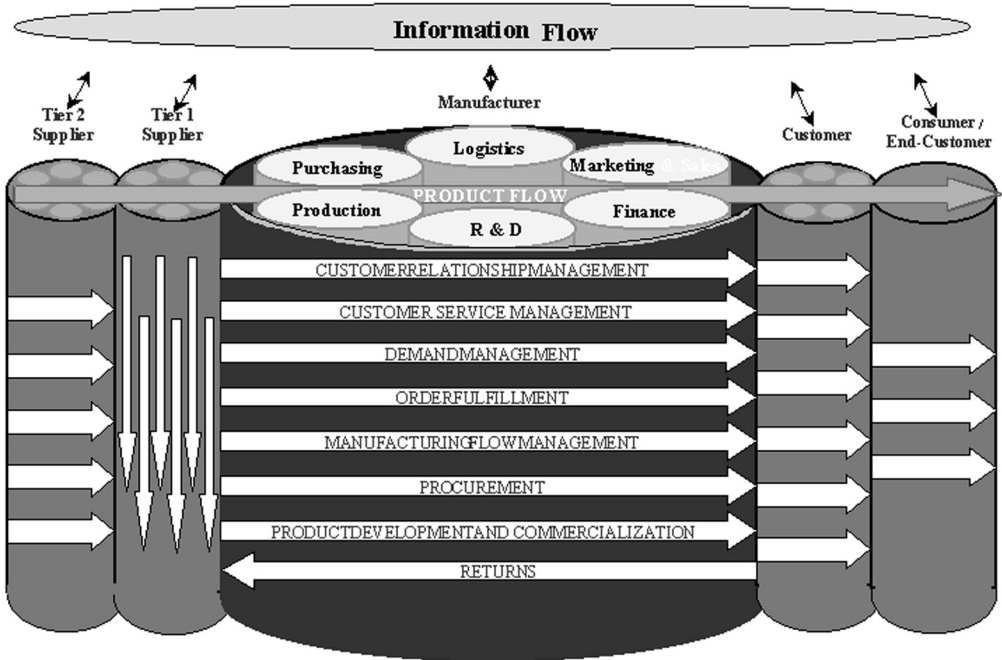


Figure 6 Supply Chain Management: The Disconnects. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, “Supply Chain Management: Implementation Issues and Research Opportunities,” *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

each specific case it is important that executives thoroughly analyze and discuss which key business processes to integrate and manage. The major components for integrating and managing a supply chain network are addressed next.

6.2. Information Flow Enablers

Process integration between members of the supply chain is dependent on the timely flow of the information that is identified as critical in the process mapping. Information can be exchanged in many forms, such as a telephone call or a paper report. In today’s world of time-based competition, information exchange is normally based on computer-to-computer interaction. For many years, electronic data interchange (EDI), was the most common vehicle for exchanging information between computer systems, primarily between different companies. EDI is simply an agreed-to standardized format for a specific type of business transaction. Several organizations, such as the American National Standards Institute (ANSI), were instrumental in developing these standards. The standards are flexible, which is both a strength and a weakness. Specific details need to be worked out between the supply chain members for each type of transaction (e.g., purchase order or transportation information). This specificity adds cost for systems development as the number of entities is increased. The transmission of EDI information is usually facilitated by a value-added network (VAN) company that acts as an intermediary between the firms.

EDI is still used in many industries. The Internet has also become a transmission medium for transactions; however, newer methods are quickly becoming available for internet data communication. The most promising of these is extensible markup language (XML). The Internet is rapidly becoming the medium of choice for business-to-business e-commerce, and XML is becoming the language of this communication. The flexible structure of the language will allow for more trading partners to establish Internet links economically. At this time, the development of XML is moving so quickly that a good single reference for the reader is available on the Internet at www.xml.com. This source will provide the reader with references that will address the most timely status of XML specification and application.

6.3. Software Packages

Computer software is available for analysis, planning, and operation of various aspects of the supply chain. Since this Handbook will serve as a reference for several years before the next edition, it is not reasonable to mention specific software packages. However, the Council of Logistics Management provides an annual review of commercially available software. This catalog can serve as an important resource for finding potential software tools (Anderson Consulting 1999). Additional information regarding the Council of Logistics Management can be found at its website, www.clm1.org.

7. THE MANAGEMENT COMPONENTS OF SUPPLY CHAIN MANAGEMENT

The SCM management components are the third element of the SCM framework (see Figure 3). An essential underlying premise of the SCM framework is that certain management components are common across all business processes and members of the supply chain (Cooper et al. 1997b). We believe these common management components to be critical and fundamental for successful SCM because they essentially represent and determine how each process link is integrated and managed. The level of integration and management of a business process link is a function of the number and level, ranging from low to high, of components added to the link (Lambert et al. 1996a, b; Cooper et al. 1997a). Consequently, adding more management components or increasing the level of each component can increase the level of integration of the business process link.

The literature on SCM, business process reengineering, and buyer–supplier relationships suggests numerous possible components that must receive managerial attention when managing supply relationships (Cooper et al. 1997b; Lambert, et al 1996a, b; Olsen and Ellram 1997; Turnbull 1990). Each component can have several subcomponents, whose importance can vary depending on the process being managed. But the primary components are planning and control methods; work flow/activity structure; organization structure; communication and information flow facility structure; product flow facility structure; management methods; power and leadership structure; risk and reward structure; and culture and attitude. Each component is briefly described next.

7.1. Planning and Control Methods

Planning and control of operations are keys to moving an organization or supply chain in a desired direction. The extent of joint planning is expected to bear heavily on the success of the supply chain. Different components may be emphasized at different times during the life of the supply chain, but planning transcends the phases (Cooper and Ellram 1993). The control aspects can be operationalized as the best performance metrics for measuring supply chain success.

7.2. Work Flow/Activity Structure

The work flow/activity indicates how the firm performs its tasks and activities. The level of integration of processes across the supply chain would be a measure of organizational structure. All but one of the literature sources examined cites work structure as an important component.

7.3. Organization Structure

Organizational structure can refer to the individual firm and the supply chain. The use of cross-functional teams would suggest more of a process approach. When these teams cross-organizational boundaries, such as in-plant supplier personnel, the supply chain should be more integrated.

7.4. Communication and Information Flow Facility Structure

The information flow facility structure is key. The kind of information passed among supply chain members and the frequency of information updating has a strong influence on the efficiency of the supply chain. This may well be the first component integrated across part or all of the supply chain.

7.5. Product Flow Facility Structure

Product flow facility structure refers to the network structure for sourcing, manufacturing, and distribution across the supply chain. With reductions in inventory, fewer warehouses would be needed. Inventory is necessary in the system, but some supply chain members may keep a disproportionate amount of inventory. Since it is less expensive to have unfinished or semifinished goods in inventory than finished goods, upstream members may bear more of this burden. Rationalizing the supply chain network has implications for all members.

Product structure issues include how coordinated new product development is across the supply chain and the product portfolio. Lack of coordination in new product development can lead to inefficiencies of production, but there is also the risk of giving away corporate competence. The com-

plexity of the product will likely affect the number of suppliers for the different components and the challenge of integrating the supply chain.

7.6. Management Methods

Management methods include the corporate philosophy and management techniques. It is very difficult to integrate a top-down organization structure with a bottom-up structure. The level of management involvement in day-to-day operations can differ across supply chain members.

7.7. Power and Leadership Structure

The power and leadership structure across the supply chain will affect its form. One strong leader will drive the direction of the supply chain. In most supply chains studied to date, there are one or two strong leaders among the firms. The exercise of power, or lack of it, can affect the level of commitment of other supply chain members. Forced participation will encourage exit behavior, given the opportunity (Macneil 1980; Williamson 1975).

7.8. Risk and Reward Sharing

The anticipation of sharing of risks and rewards across the supply chain affects the long-term commitment of its members. The recent fire at a Toyota supplier demonstrated Toyota's commitment to its suppliers and the assistance from other members of the chain.

7.9. Culture and Attitude

The importance of corporate culture and its compatibility across supply chain members cannot be underestimated. Meshing cultures and individuals' attitudes is time consuming but is necessary at some level for the supply chain to perform as a coordinated network. Aspects of culture include how employees are valued and incorporated into the management of the firm.

Figure 7 illustrates how the management components can be divided into two groups, to point out some basic differences. The first group is the physical and technical group, which includes the most visible, tangible, measurable, and easy-to-change components. Much of the literature on change management (Jaffe and Scott 1998; Andrews and Stalick 1994; Hammer 1990; Hammer and Champy

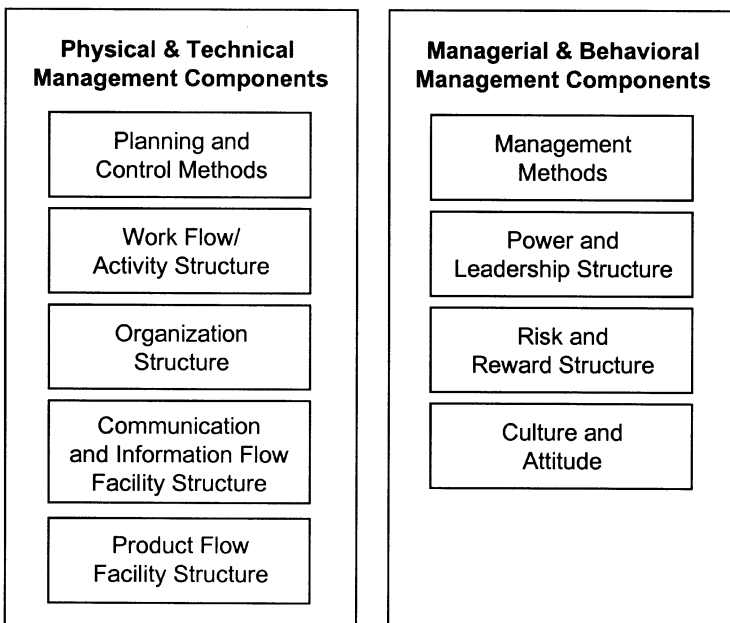


Figure 7 Supply Chain Management: Fundamental Management Components. (From D. M. Lambert, M. C. Cooper, and J. D. Pagh, "Supply Chain Management: Implementation Issues and Research Opportunities," *International Journal of Logistics Management*, Vol. 9, No. 2, 1998, pp. 1–19. Reprinted with permission)

1993; Towers 1994) shows that if this group of management components is the only focus of managerial attention, managing the supply chain will most likely be doomed to fail.

The second group is composed of the managerial and behavioral components. These components are less tangible and visible and are often difficult to assess and alter. The managerial and behavioral components define the organizational behavior and influence how the physical and technical management components can be implemented. If the managerial and behavioral components are not aligned to drive and reinforce an organizational behavior supportive of the supply chain objectives and operations, the supply chain will likely be less competitive and profitable. If one or more components in the physical and technical group are changed, management components in the managerial and behavioral group likewise may have to be readjusted. Consequently, the groundwork for successful SCM is established by understanding each of these management components and their interdependence. Hewitt states that true intra- and intercompany business process management, or redesign, is likely to be successful only if it is recognized as a multicomponent change process, simultaneously and explicitly addressing all SCM components (Hewitt 1994).

The physical and technical components are best understood and applied/managed the farthest up and down the supply chain. For example, in one case, the focal company had integrated its demand management process across four links by applying the following components: planning and control methods, work flow/activity structure, communication and information flow facility structure, and product flow facility structure. The managerial and behavioral management components are, in general, less well understood, and more difficulties are encountered in their implementation.

8. SUPPLY CHAIN DESIGN

Even though leading-edge firms are doing more planning of their supply chains, evidence suggests that the majority of supply chains were not designed but developed over time. For example, companies like Hewlett-Packard (Lee and Billington 1992; Davis 1993) and Digital Equipment (Arntzen et al. 1995) plan new channels/supply chains and use supply chain management strategies to modify existing networks. However, these examples appear to be the exception rather than the rule.

Current practice reveals a lack of planning by most firms. Better management of supply chains can create many benefits. For example, in many cases not all supply chain alternatives are known when structural arrangements are initially negotiated; these decisions may later prove to be less than optimal. Identifying suboptimal supply chain arrangements and making structural changes will lead to increased profitability.

In addition, unanticipated changes in the environment may make it necessary to reconsider the supply chain and reevaluate partnership arrangements. Environmental factors may include changes in end-consumer needs, markets, products and product lines, the competitive situation, the economic environment, and government regulation and incentives.

Supply chain strategy must be aligned with overall corporate strategy. Supply chain performance goals must be stated in operational terms, such as projected market coverage, sales and service support, sales volume, profitability, inventory turns, cash-to-cash cycle times, and return on investment. The supply chain strategy includes decisions regarding intensity of distribution, use of direct or indirect channels, the services of intermediaries in each geographic area, and implementation plans.

A firm must become involved in the supply chain design process when it is considering entering the market with a new product or when existing supply chains are falling short of performance objectives. The supply chain design process consists of the following steps (Lambert 1978):

1. Establish supply chain objectives.
2. Formulate a supply chain strategy.
3. Determine supply chain structure alternatives.
4. Evaluate supply chain structure alternatives.
5. Select supply chain structure.
6. Determine alternatives for individual supply chain members.
7. Evaluate and select individual supply chain members.
8. Measure and evaluate supply chain performance.
9. Evaluate supply chain alternatives when performance objectives are not met or attractive new options become available.

The manufacturer, wholesaler, or retailer may lead the design process, depending on the relative market power, financial strength, and availability of desired supply chain members.

8.1. The Manufacturer's Perspective

A manufacturer has market power when customers demand its product. When consumers demand a manufacturer's brand, retailers and consequently wholesalers are anxious to market its existing and

new products because such products will draw customers. Increasingly the consolidation of manufacturers, wholesalers, and retailers on a national and global basis has resulted in a power shift to retailers since they have access to consumers. The consolidation of manufacturers results in a reduced set of global suppliers that produce brands which are increasingly viewed as substitutable by consumers. The store brands of retailers such as Wal-Mart become national and some cases global brands themselves, which has further contributed to the weakening of traditionally strong manufacturer brands.

A small manufacturer of a little-known brand may find it difficult to attract supply chain members for its existing or new product offerings. Such a manufacturer lacks market power when entering supply chain negotiations. Also, since financial resources determine a manufacturer's ability to perform marketing functions internally, small manufacturers usually cannot afford to distribute directly to retailers or geographically dispersed industrial customers and must rely on wholesalers. Furthermore, in some locations acceptable middlemen may not be available in every line of trade. Firms in this situation include some manufacturers of electrical supplies and small hand tools.

Even the manufacturer of a full line of products who has geographically concentrated customers may find direct channels less profitable than indirect channels for some of the products and customers. For example, many pharmaceutical companies have increased their use of wholesalers, even in concentrated market areas, because of the high customer service levels required.

8.2. The Wholesaler's Perspective

Wholesalers make it possible to provide possession, time, and place utility efficiently. Wholesalers are economically justified because they improve distribution efficiency by breaking bulk, building assortments of goods, and providing financing for retailers or industrial customers.

Wholesalers' market power is greatest when retailers order a small amount of each manufacturer's products or when the manufacturers involved have limited financial resources. For some products, such as Whirlpool appliances and some lines of jewelry and fashion apparel, per-unit prices and margins may be large enough to enable the manufacturer to sell directly to retailers, even when the number of items sold to each retailer is small. But manufacturers of low-value or low-margin items such as cigarettes and some food items may find it profitable to sell only through wholesalers, even though each retailer may order in relatively large quantities.

Wholesalers' and distributors' financial strength determines the number of services they can perform. Each service represents a profit opportunity as well as an associated risk and cost. The presence or absence of other firms offering comparable services influences the market power of individual wholesalers. Traditionally, wholesalers have been regional in scope. In some industries, such as pharmaceutical, wholesaler mergers have occurred. Cardinal Heath, McKesson, and Bergen Brunswick are large pharmaceutical wholesalers that have become national in scope. Together they control over one-half of the drug store wholesale business in the United States.

8.3. The Retailer's Perspective

Retailers exist when they provide convenient product assortment, availability, price, and image within the geographic market served. The degree of customer preference (loyalty due to customer service and price/value performance) that a retailer enjoys in a specific area directly affects its ability to negotiate supply chain relationships. The retailer's financial capability and size also determine its degree of influence over other supply chain members.

9. SUPPLY CHAIN DESIGN CONSIDERATIONS

Among the factors management must consider when establishing a supply chain are market coverage objectives, product characteristics, customer service objectives, and profitability (Bowersox et al. 1980).

9.1. Market Coverage Objectives

In order to establish market coverage objectives, management must consider consumer/customer buying behavior, the type of distribution required, supply chain structure, and the degree of control necessary for success.

9.1.1. Customer Buying Behavior

The buying motives of potential customer segments must be determined in order to design a supply chain that can perform most efficiently and effectively. This analysis enables the designer to determine the retail segment or segments most capable of reaching the target market or markets. Industrial marketers also must identify potential users and determine how these customers will make the purchase decision. The industrial purchaser's decision-making process depends on whether the firm is a user, an OEM, or a distributor.

9.1.2. Type of Distribution

There are basically three types of distribution that can be used to make product available to consumers: intensive distribution, selective distribution, and exclusive distribution. In intensive distribution, the product is sold to as many appropriate retailers or wholesalers as possible. Intensive distribution is appropriate for products such as chewing gum, candy bars, soft drinks, bread, film, and cigarettes, where the primary factor influencing the purchase decision is convenience. Industrial products that may require intensive distribution include pencils, paper clips, transparent tape, file folders, typing paper, transparency masters, and screws and nails.

In selective distribution, the number of outlets that may carry a product is limited, but not to the extent of exclusive dealing. By carefully selecting wholesalers and/or retailers, the manufacturer can concentrate on potentially profitable accounts and develop solid working relationships to ensure that the product is properly merchandised. The producer may also restrict the number of retail outlets if the product requires specialized servicing or sales support. Selective distribution may be used for product categories such as clothing, appliances, televisions, stereo equipment, home furnishings, and sports equipment.

When a single outlet is given an exclusive franchise to sell the product in a geographic area, the arrangement is referred to as exclusive distribution. Products such as specialty automobiles, some major appliances, some brands of furniture, and certain lines of clothing that enjoy a high degree of brand loyalty are likely to be distributed on an exclusive basis. This is particularly true if the consumer is willing to overcome the inconvenience of traveling some distance to obtain the product. Usually, exclusive distribution is undertaken when the manufacturer desires more aggressive selling on the part of the wholesaler or retailer or when channel control is important. Exclusive distribution may enhance the product's image and enable the firm to charge higher retail prices.

Sometimes manufacturers use multiple brands in order to offer exclusive distribution to more than one retailer or distributor. Exclusive distribution occurs more frequently at the wholesale level than at the retail level. Anheuser-Busch, for example, offers exclusive rights to distributors, who in turn use intensive distribution at the retail level (in states such as Florida where this is allowed). In general, exclusive distribution lends itself to direct channels (manufacturer to retailer). Intensive distribution is more likely to involve indirect channels with two or more intermediaries.

9.1.3. Channel Structure

With customer requirements and the type of distribution determined, management must select supply chain institutions for both inbound and outbound portions of the supply chain. Factors to consider when selecting supply chain members include financial strength, capabilities; ability to link up processes, ability to grow with the business, and competing supply chains.

9.1.4. Control

In many cases a firm may have to exercise some control over other members of the supply chain to ensure product quality and/or post-purchase services. The need for control stems from management's desire to protect the firm's long-term profitability.

9.2. Product Characteristics

Product characteristics are a major consideration in supply chain design. Nine product characteristics should be analyzed by the designer: the product's value, the technicality of the product, the degree of market acceptance, the degree of substitutability, the product's bulk, the product's perishability, the degree of market concentration, seasonality, and the width and depth of the product line.

9.2.1. Value

Products with a high per-unit cost require a large inventory investment. Consequently, high-value products typically will require shorter supply chains (fewer members) in order to minimize total inventory investment. But supply chains tend to be longer when the unit value is low, unless sales volume is high. In general, intensive distribution is used for low-value products.

The product's value also influences its inventory carrying cost and the desirability of premium transportation. Low-value, low-margin grocery products may be shipped by rail car and stored in field warehouses. High-value component parts and products such as high-fashion merchandise may be shipped by air freight to minimize in-transit inventories and reduce inventory carrying costs and markdowns.

9.2.2. Technicality

Highly technical products usually require demonstration by a salesperson as well as prepurchase and postpurchase service that often requires that repair parts be stocked. Technical products include such items as computers, high-priced stereo components, expensive cameras and video equipment, im-

ported sports cars, and a multitude of industrial products. Generally, direct channels and selective or exclusive distribution policies are used for these kinds of products.

9.2.3. Market Acceptance

The degree of market acceptance determines the amount of selling effort required. If a leading manufacturer offers a new product and plans significant introductory advertising, customer acceptance will be high and intermediaries will want to carry the product. But new products with little market acceptance and low brand identification require aggressive selling.

9.2.4. Substitutability

Product substitutability is closely related to brand loyalty. When brand loyalty is low, product substitution is likely and intensive distribution is required. Firms place a premium on point-of-purchase displays in high-traffic areas. To gain support from wholesalers and/or retailers, the producer may offer higher-than-normal margins. Selective or exclusive distribution makes product support easier.

9.2.5. Bulk

Generally, low-value, high-weight products are restricted to markets close to the point of production. These products often require special materials-handling skills. With low weight and small cubes, more units can be shipped in a truck, rail car, or container, thereby reducing the per-unit cost of transportation. Tank truck shipment of orange juice concentrate from Florida to northern markets for packaging is an example of moving a product closer to the point of consumption to overcome value and bulk restrictions.

9.2.6. Perishability

Perishability refers to physical deterioration or to product obsolescence caused by changing customer buying patterns or technological change. Perishable products are usually sold on a direct basis in order to move product through the supply chain more quickly and reduce the potential for inventory loss.

9.2.7. Market Concentration

When the market is concentrated in a geographic area, short supply chains may be the most effective and efficient method. When markets are widely dispersed, however, specialized intermediaries are necessary; they can capitalize on the efficiencies associated with moving larger quantities. Because of widely dispersed markets, many food-processing companies use brokers to market their products. This factor also explains the existence of pooling agencies, such as freight forwarders and local cartage firms, that aggregate small shipments into truckload or carload units for movement to distant points.

9.2.8. Seasonality

Seasonality must be considered when applicable. For some products, sales volumes peak at certain times of the year (such as toy sales at Christmas); in other cases, raw materials, such as fresh fruits and vegetables, may only be available at specific times. Both cases require out-of-season storage. Manufacturers must invest in warehouses, use third parties, or provide incentives to intermediaries so they perform the storage function. For example, manufacturers might offer a seasonal discount or consignment inventories to wholesalers or retailers who agree to take early delivery.

9.2.9. Width and Depth

The width and depth of a supplier's product line influence supply chain design. A manufacturer of products with low per-unit values may use intensive distribution with direct sales if the product line is broad enough to result in a relatively large average sales volume. Grocery manufacturers such as Kellogg's and General Foods are examples. Usually, a manufacturer of a limited line of products will use wholesalers to achieve adequate market coverage at a reasonable cost.

9.3. Customer Service Objectives

Customer service represents the place component of the marketing mix. Customer service can be used to differentiate the product or influence the market price—if customers are willing to pay more for better service. In addition, the supply chain structure will determine the costs of providing a specified level of customer service.

Customer service is a complex subject. However, it is usually measured in terms of the level of product availability, speed and consistency of the customer's order cycle, and communication that takes place between seller and customer. Management should establish customer service levels only after carefully studying customer needs.

9.3.1. Availability

The most important measure of customer service is inventory availability within a specified order cycle time. A common measure of availability is the number of orders shipped complete within a specified time period as a percentage of total orders received. The measure(s) selected should reflect the customer's view of customer service. The best measure of customer service reflects the product's importance to the customer and the customer's importance to the company.

9.3.2. Order Cycle

The order cycle is the time that elapses between the customer's order placement and the time the product is received. The ability to achieve the targeted order cycle time consistently influences the amount of inventory held throughout the supply chain. Consequently, the speed and consistency of the order cycle are prime factors in supply chain design. Most customers prefer consistent service to fast service because the former allows them to plan inventory levels to a greater extent than is possible with a fast but highly variable order cycle.

9.3.3. Communication

Communication refers to the firm's ability to supply timely information to the customer regarding such factors as order status, order tracking, back-order status, order confirmation, product substitution, product shortages, and product information requests. The use of automated information systems usually results in fewer errors in shipping, picking, packing, labeling, and documentation. The ability of supply chain members to provide good communications systems is a major factor in supply chain design.

10. SUPPLY CHAIN PERFORMANCE MEASUREMENT

The literature rarely focuses on measuring supply chain performance, for a number of reasons:

1. Measuring supply chain performance is difficult.
2. Some aspects of supply chain performance are difficult to quantify, making it difficult to establish a common performance standard.
3. Differences in supply chains make it difficult to establish standards for comparison.

One measure of supply chain performance is the extent to which the company's target market(s) are being satisfied, given the firm's goals and objectives. This would include measures of product availability, adequacy of customer service, and strength of brand image.

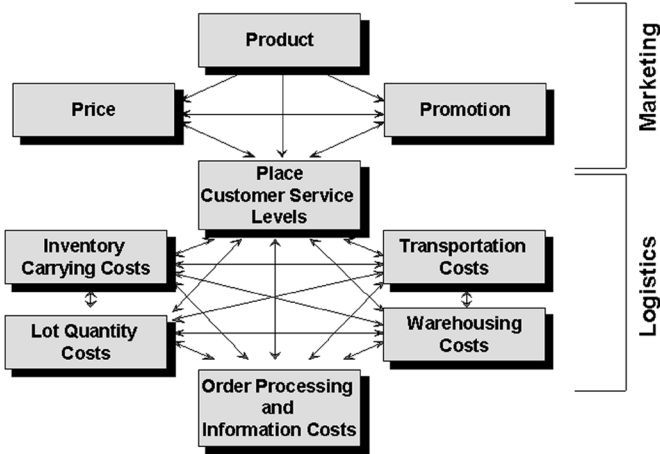
Next, management must analyze supply chain structure to determine whether the corporate strategy has been successfully implemented. Measures of structure efficiency include member turnover, competitive strength, and related issues. When management evaluates supply chain structure, it must compare the firm's ability to perform the functions/activities internally with another member's ability to perform these functions/activities.

Some potential quantitative measures of supply chain performance include logistics cost per unit, errors in order filling, and percent of damaged merchandise. Qualitative measures that managers may use when reevaluating the supply chain and specific members include degree of coordination, degree of conflict, and availability of information as needed. Management should set objectives for the supply chain and individual members and measure actual performance against planned performance. Also, evaluation measures should be developed over time and used to isolate potential problem areas. Perhaps the best measures of performance are the value created for customers and the profitability of the supply chain and its members.

For the individual firm, the goal is to find the most efficient way to offer the desired level of customer service (see Figure 8). For the supply chain, the goal is to improve overall efficiency by reallocating functions, and therefore costs, among its members. The level of customer service offered by the individual member firms, for example, will have a significant impact on other members and total supply chain performance.

For example, a manufacturer whose product availability is poor and order cycle times inconsistent may force wholesalers to carry more inventory as safety stock in order to offer an acceptable level of service to the retailers. In this case, lower logistics costs for the manufacturer were achieved at the expense of other members of the supply chain, and the entire supply chain may be less efficient.

However, if management concentrates on systems changes that improve logistics efficiency or effectiveness, it may be possible to satisfy all of the firm's objectives. For example, by linking members of the supply chain, using advanced information technology and sharing key data, a firm may be able to achieve some or all of the following: increased customer service levels, lower inventories, speedier collections, decreased transportation costs, lower warehousing costs, improvement in



Marketing Objective: Allocate resources to the marketing mix in such a manner as to maximize the long-term profitability of the firm.

Logistics Objective: Minimize Total Costs given the customer service objective where total costs = Transportation Costs + Warehousing Costs + Order Processing and Information Costs + Lot Quantity Costs + Inventory Carrying Costs

Figure 8 Cost Trade-offs Required in Marketing and Logistics. (From D. M. Lambert, *The Development of an Inventory Costing Methodology: A Study of the Cost Associated with Holding Inventory*, National Council of Physical Distribution Management, Chicago, 1976. Reprinted with permission)

cash flow, and high return on assets. Thus, all supply chain decisions are best viewed from a systems perspective, as an integrated whole.

A manufacturer has minimal additional cash invested in inventory held by the customer rather than in the manufacturer’s warehouse. Furthermore, the non-cost-of money components of inventory carrying cost are shifted to the next level of the supply chain. However, this may not be most efficient for the supply chain as a whole, as the value of inventory increases as it gets closer to the consumer because of mark-ups by each subsequent member and/or value added at various stages in the supply chain. The supply chain would be better off as a whole to have inventory held in the least valuable forms. In addition, the less differentiated the inventory has become, the more likely, in general, that it can be used in a different application.

In addition to rethinking traditional strategies for improving supply chain cash flow and return on assets, supply chain leaders may wish to consider automating and integrating the information systems within the supply chain. This can reduce lead-time variability and create time for planning. If communications flows throughout the supply chain are improved, all members will be able to reduce inventories while improving customer service.

In addition, the extra planning time that results due to increased communication speed will allow freight consolidations, warehousing cost savings, and lower lot quantity costs. Customer service levels can be improved and total operating costs reduced—truly a unique opportunity.

11. REENGINEERING IMPROVEMENT INTO THE SUPPLY CHAIN

A critical part of streamlining supply chains involves reengineering the key processes to meet customer needs. Reengineering is a process aimed at producing dramatic changes quickly. Hammer and Champy (1993) define it as the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as cost, quality service, and speed. Improvement through reengineering cannot be accomplished in a haphazard manner. These changes must be supported at the top and driven through an overall management plan.

A typical reengineering process proceeds through three stages: fact finding, identifying areas for improvement to business process redesign, and creative improvements. The fact-finding stage is a very detailed examination of the current systems, procedures, and work flows. Key focus is placed on separating facts from opinions.

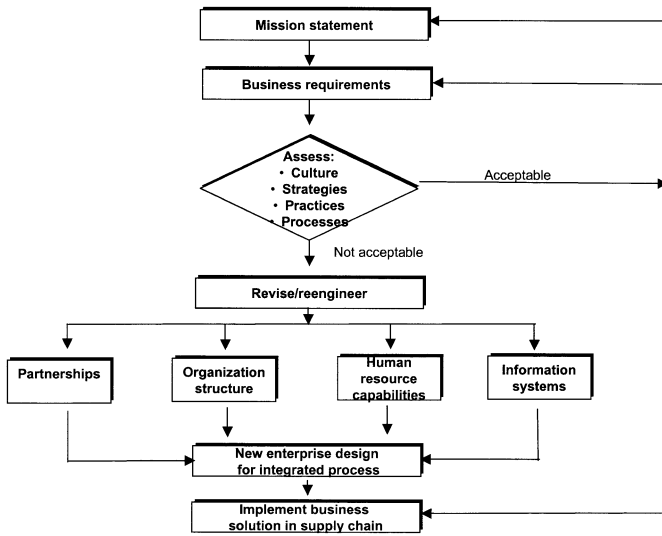


Figure 9 Reengineering SCM Process Flow Chart. (From D. M. Lambert, L. C. Guinipero, and G. J. Ridenhower, “Supply Chain Management: A Key to Achieving Business Excellence in the 21st Century,” manuscript. All rights reserved)

Armed with the facts collected in the first stage, reengineering teams identify areas for improvement. They analyze where value was added for the final customer, with particular emphasis on customer contact points and product information transfers that are currently ineffective or inefficient. After identification of improvement points the creative phase of redesigning business process and information flow begins. The outcomes of the creative phase will fundamentally change both the nature of the work and how it is performed.

Figure 9 illustrates a general plan when undertaking a process reengineering approach. Organizational energy needs to focus on the firm’s mission statement. The mission statement drives the business requirements in the organization. A complete assessment is made of the firm’s culture, strategies, business practices, and processes.

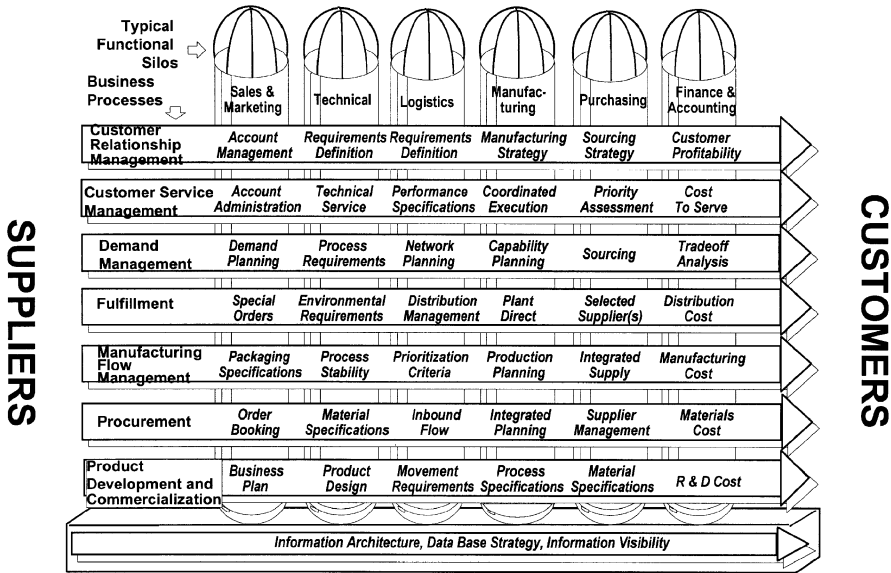
If this analysis proves acceptable, management implements its business solution across the supply chain. Typically, improvements are required in one of the areas to enhance supply chain performance. An example of this reengineering is the new Mercedes-Benz microcar, which is based on the principle of systems supply (Coleman et al. 1995). This reengineering of the process results in delegating more design activities to suppliers, reducing the amount of engineering and labor at the primary manufacturer. The result is passing the savings of these efficiencies along to the customer in the form of increased value.

12. IMPLEMENTING INTEGRATED SUPPLY CHAIN MANAGEMENT

Implementing SCM requires making the transition from a functional organization to a focus on process. Figure 10 illustrates how each function in the organization maps with the seven key processes.

In the customer relationship management process, sales and marketing provides the account management expertise, engineering provides the specifications that define the requirements, logistics provides knowledge of customer service requirements, manufacturing provides the manufacturing strategy, purchasing provides the sourcing strategy, and finance and accounting provides customer profitability reports. The customer service requirements must be used as input to manufacturing, sourcing, and logistics strategies.

If the proper coordination mechanisms are not in place across the various functions, the process will be neither effective or efficient. Taking a process focus means that all functions that touch the product or provide information must work together. For example, purchasing depends on sales/marketing data fed through a production schedule that are used to assess specific order levels and timing of requirements. These orders drive production requirements, which in turn are transmitted upstream to suppliers.



Note: Process sponsorship and ownership must be established to drive the attainment of the supply chain vision and eliminate the functional barriers that artificially separate the process flows.

Figure 10 Implementation of Supply Chain Management. (From D. M. Lambert, L. C. Guinipero, and G. J. Ridenhower, "Supply Chain Management: A Key to Achieving Business Excellence in the 21st Century," manuscript. All rights reserved)

The increasing use of outsourcing has accelerated the need to coordinate supply chain processes because the organization becomes more dependent on outside contractors' suppliers. Consequently, coordination mechanisms must be in place within the organization. Where to place these coordination mechanisms and which team and functions are responsible become critical decisions.

Several process redesign and reengineering techniques can be applied to the seven key processes. Chrysler Corporation's development of Neon was accomplished through the efforts of 150 internal employees. This core group leveraged its efforts to 600 engineers, 289 suppliers, and line employees. Concurrent engineering techniques required the involvement of personnel from all key functional areas working with suppliers to develop the vehicle in 42 months. The use of concurrent engineering resulted in the avoidance of later disagreements, misunderstandings, and delays.

All firms within the supply chain will have their own functional silos that must be overcome and a process approach that must be accepted in order to successfully implement SCM. The requirements for successful implementation of SCM include:

- Executive support, leadership, and commitment to change
- An understanding of the degree of change that is necessary
- Agreement on the SCM vision and the key processes
- The necessary commitment of resources and empowerment to achieve the stated goals

13. MANAGING SUPPLIER RELATIONSHIPS

Supplier partnerships have become one of the hottest topics in interfirm relationships. Business pressures such as shortened product life cycles and global competition are making business too complex and expensive for one firm to go it alone. Despite all the interest in partnerships, a great deal of confusion still exists about what constitutes a partnership and when it makes the most sense to have one. This section will present a model (Lambert et al. 1996a, b) that can be used to identify when a partnership is appropriate as well as the type of partnership that should be implemented.

While there are countless definitions for partnerships in use today, we prefer the following definition: "A partnership is a tailored business relationship based on mutual trust, openness, shared risk and shared rewards that yields a competitive advantage, resulting in business performance greater than would be achieved by the firms individually" (Lambert et al. 1996a, b).

13.1. Types of Partnerships

Relationships between organizations can range from arm’s-length relationships (consisting of either one-time exchanges or multiple transactions) to vertical integration of the two organizations, as shown in Figure 11. Most relationships between organizations have been at arm’s length where the two organizations conduct business with each other, often over a long period of time and involving multiple exchanges. However, there is no sense of joint commitment or joint operations between the two companies. In arm’s-length relationships, a seller typically offers standard products/services to a wide range of customers, who receive standard terms and conditions. When the exchanges end, the relationship ends. While arm’s length represents an appropriate option in many situations, there are times when a closer, more integrated relationship, called a partnership, would provide significant benefits to both firms.

A partnership is not the same as a joint venture, which normally entails some degree of shared ownership across the two parties. Nor is it the same as vertical integration. Yet a well-managed partnership can provide benefits similar to those found in joint ventures or vertical integration. For instance, Pepsi, by acquiring restaurants such as Taco Bell, Pizza Hut, and KFC, ensured that Coca-Cola would never be served in these outlets. Coca-Cola has achieved a similar result without the cost of vertical integration through its partnership with McDonald’s.

While most partnerships share some common elements and characteristics, there is no one ideal or benchmark relationship that is appropriate in all situations. Because each relationship has its own set of motivating factors as well as its own unique operating environment, the duration, breadth, strength, and closeness of the partnership will vary from case to case and over time. Research (Lambert et al. 1996) has indicated that three types of partnerships exist.

- *Type I:* The organizations involved recognize each other as partners and, on a limited basis, coordinate activities and planning. The partnership usually has a short-term focus and involves only one division or functional area within each organization.
- *Type II:* The organizations involved progress beyond coordination of activities to integration of activities. Although not expected to last forever, the partnership has a long-term horizon. Multiple divisions and functions within the firm are involved in the partnership.
- *Type III:* The organizations share a significant level of integration. Each party views the other as an extension of their own firm. Typically no end date for the partnership exists.

Normally, a firm will have a wide range of relationships spanning the entire spectrum, the majority of which will not be partnerships but arm’s-length associations. Of the relationships that are partnerships, the largest percentage will be type I, and only a limited number will be type III partnerships. Type III partnerships should be reserved for those suppliers or customers who are critical to an organization’s long-term success. The previously described relationship between Coke and McDonald’s has been evaluated as a type III partnership.

13.1.1. The Partnership Model

The partnership model shown in Figure 12 has three major elements that lead to outcomes: drivers, facilitators, and components. Drivers are compelling reasons to partner. Facilitators are supportive corporate environmental factors that enhance partnership growth and development. Components are joint activities and processes used to build and sustain the partnership. Outcomes reflect the performance of the partnership.

13.1.1.1. Drivers Both parties must believe that they will receive significant benefits in one or more areas and that these benefits would not be possible without a partnership. The primary potential benefits that drive the desire to partner include asset/cost efficiencies, customer service improvements, marketing advantage, and profit stability/growth (see Table 1 for examples). While the presence of strong drivers is necessary for successful partnerships, the drivers by themselves do not ensure success. The benefits derived from the drivers must be sustainable over the long term. If, for instance,

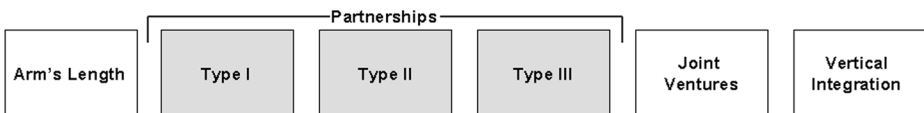


Figure 11 Types of Relationships. (From D. M. Lambert, M. A. Emmelhainz, and J. T. Gardner, “Developing and Implementing Supply Chain Partnerships,” *International Journal of Logistics Management*, Vol. 7, No. 2, 1996, pp. 1–7. Reprinted by permission)

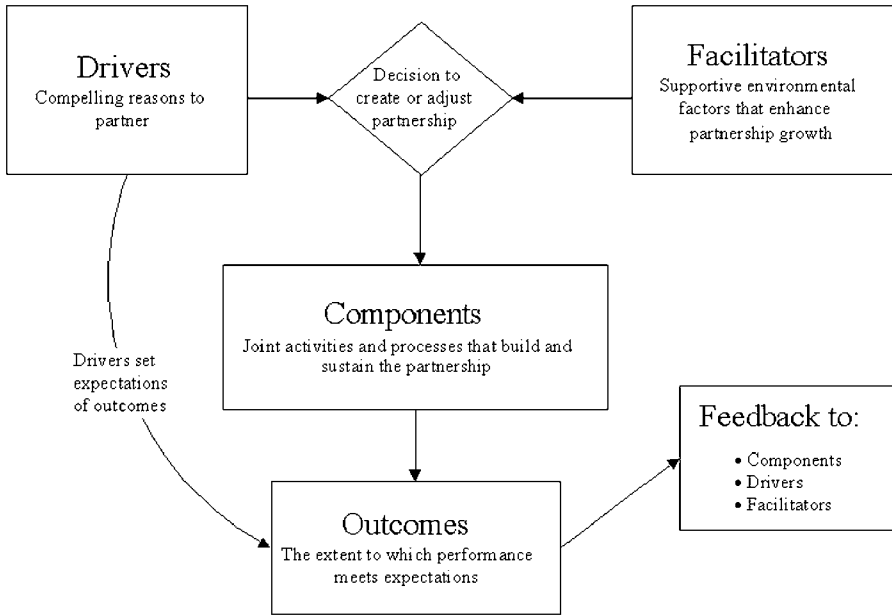


Figure 12 The Partnering Process. (From D. M. Lambert, M. A. Emmelhainz, and J. T. Gardner, "Developing and Implementing Supply Chain Partnerships," *International Journal of Logistics Management*, Vol. 7, No. 2, 1996, pp. 1–7. Reprinted by permission)

the marketing advantage or cost efficiencies resulting from the relationship can be easily matched by a competitor, the probability of long-term partnership success is reduced.

In evaluating a relationship, how does a manager know if there are enough drivers to pursue a partnership? First, drivers must exist for each party. It is unlikely that the drivers will be the same for both parties, but they need to be strong for both. Second, the drivers must be strong enough to provide each party with a realistic expectation of significant benefits through a strengthening of the relationship. Each party should independently assess the strength of its specific drivers and present its drivers to the other party. One of the reasons that partnerships fail is that one or both of the parties have unrealistic expectations. The process of evaluation of the drivers helps the parties set realistic expectations.

13.1.1.2. Facilitators Drivers provide the motivation to partner. But even with a strong desire for building a partnership, the probability of success is reduced if the corporate environments are not supportive of a close relationship. Just as the relationship of a young couple with a strong desire to marry can be derailed by unsupportive in-laws, different communication styles, and dissimilar values, so can a corporate relationship be sidetracked by a hostile environment. On the other hand, a supportive environment that enhances integration of the two parties will improve the success of the partnership. Facilitators are elements of a corporate environment that allow a partnership to grow and strengthen. They serve as a foundation for a good relationship. In the short run, facilitators cannot be developed; they either exist or they don't. And the degree to which they exist often determines whether a partnership succeeds or fails. Facilitators include corporate compatibility, similar managerial philosophy and techniques, mutuality, and symmetry (see Table 1 for details).

Facilitators apply to the combined environment of the two potential partners. Therefore, unlike drivers, which are assessed by managers in each firm independently, facilitators should be assessed jointly. The discussion of corporate values, philosophies, and objectives often leads to an improved relationship even if no further steps toward building a partnership are taken. The more positive the facilitators, the better the chance of partnership success.

If both parties realistically expect benefits from a partnership and if the corporate environments appear supportive, then a partnership is warranted. The appropriateness of any one type of partnership is a function of the combined strength of the drivers and facilitators. A combination of strong drivers and strong facilitators would suggest a type III partnership, while low drivers and low facilitators

TABLE 1 Partnership Drivers, Facilitators, and Components**Partnership Drivers**

- Asset/cost efficiency: What is the probability that this relationship will substantially reduce channel costs or improve asset utilization, for example, product costs, distribution costs savings, handling costs savings, packing costs savings, information handling costs savings, managerial efficiencies, and assets devoted to the relationship?
- Customer service: What is the probability that this relationship will substantially improve the customer service level as measured by the customer, for example, improved on-time delivery, better taking of movement, paperless order processing, accurate order deliveries, improved cycle times, improved fill rates, customer survey results, and process improvements?
- Marketing advantage: What is the probability that this relationship will lead to substantial marketing advantages, for example, new market entry, promotion joint advertising, sales promotion, price (reduced price advantage), product jointly developed product innovation, branding opportunities, place (expanded geographic coverage, market saturation), access to technology, and innovation potential?
- Profit stability/growth: What is the probability that this relationship will result in profit growth or reduced variability in profit, for example, growth, cyclical leveling, seasonal leveling, market share stability, sales volume, and assurance of supply?

Partnership Facilitators

- Corporate compatibility: What is the probability that the two organizations will mesh smoothly in terms of (1) culture, for example, both firms place a value on keeping commitments, constancy of purpose, employees valued as long-term assets, and external stakeholders considered important, and (2) business, for example, strategic plans and objectives consistent, commitment to partnership ideas, and willingness to change?
- Management philosophy and techniques: What is the probability that the management philosophy and techniques of the two companies will match smoothly, for example, organizational structure, use of TQM, degree of top management support, types of motivation used, importance of teamwork, attitudes toward "personnel churning," and degree of employee empowerment?
- Mutuality: What is the probability both parties have the skills and predisposition needed for mutual relationship building? Is management skilled at two-sided thinking and action, taking the perspective of the other company, expressing goals and sharing expectations, and taking a longer-term view, for example, or is management willing to share financial information and integrate systems?
- Symmetry: What is the probability that the parties are similar on the following important factors that will affect the success of the relationship: relative size in terms of sales, relative market share in their respective industries, financial strength, productivity, brand image/reputation, and technological sophistication?

Partnership Components

- Planning (style, level, and content)
- Joint operating controls (measurement and ability to make changes)
- Communications (non-routine and day-to-day: organization, balanced flow, and electronic)
- Risk/reward sharing (loss tolerance, gain commitment, and commitment to fairness)
- Trust and commitment to each other's success)
- Contract style (time frame and coverage)
- Scope (share of partner's business, value added, and critical activities) Investment (financial, technology, and people)

Partnership Outcomes

- Global performance outcomes (enhancement of profits, leveling of profits over time)
- Process outcomes (improved service, reduced costs)
- Competitive advantage (market positioning, market share, access to knowledge)

Source: D. M. Lambert, M. A. Emmelhainz, and T. Gardner, "Developing and Implementing Supply Chain Partnerships," *International Journal of Logistics Management*, Vol. 7, No. 2, 1996, pp. 4–13.

suggest an arm's-length relationship. While it might seem, from all of the press on the importance of integrated relationships and alliances, that managers should attempt to turn all of their corporate relationships into type III partnerships, this is not the case. In partnering, more is not always better. The objective in establishing a partnership should not be to have a type III partnership; rather, it should be to have the most appropriate type of partnership given the specific drivers and facilitators.

In fact, in situations with low drivers and/or facilitators, trying to achieve a type III partnership is likely to be counterproductive. The necessary foundation is just not there. Once it has been determined that a partnership of a specific type is warranted and should be pursued, the next step is actually to put the partnership into place. This is done through the components.

An assessment of drivers and facilitators is used to determine the potential for a partnership, but the components describe the type of relationship that has actually been implemented.

13.1.1.3. Components Components are the activities and processes that management establishes and controls throughout the life of the partnership. Components make the relationship operational and help managers create the benefits of partnering. Every partnership has the same basic components, but the way in which the components are implemented and managed varies. Components include planning, joint operating controls, communications, risk/reward sharing, trust and commitment, contract style, scope, and financial investment. Table 1 summarizes the drives, facilitators, and components of partnership.

13.1.1.4. Outcomes and Feedback Whatever type of supplier partnership is implemented, the effectiveness of the relationship must be evaluated and possibly adjusted. The key to effective measurement and feedback is how well the drivers of partnership were developed at the outset. At this beginning point, the measurement and metrics of relating to each driver should have been made explicit. These explicit measures then become the standard in evaluation of the partnership outcomes. Feedback can loop back to any step in the model. Feedback can take the form of periodic updating of the status of the drivers, facilitators, and components.

Additional information on the partnership model can be found in Gardner et al. (1999). Information on this book and other current developments in the partnership research can be found at the website of the International Journal of Logistics Management at www.logisticssupplychain.org.

14. SUMMARY

In this chapter we saw that:

1. Supply chain management is different from managing logistics in the supply chain.
2. Various supply chain structures are used.
3. Supply chain management is a process-oriented approach to manage relationships in the supply chain, and leading-edge firms such as 3M are implementing SCM.
4. Communications can improve the efficiency and effectiveness of the supply chain.
5. A number of factors influence supply chain design, evolution, and performance.
6. The implementation of integrated supply chain management requires a process management team structure.
7. Partnerships with key suppliers and customers are an important part of supply chain management.

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