
**HISTORY
AND
INTRODUCTION**

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Introduction

The APICS dictionary defines the term *supply chain* as either the “processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies,” or as the “functions within and outside a company that enable the value chain to make products and provide services to the customer.” The APICS dictionary defines *value chain* as those “functions within a company that add value to the products or services that the organization sells to customers and for which it receives payment.”

Supply chain—1) The processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies. 2) The functions within and outside a company that enable the value chain to make products and provide services to the customer.

APICS Dictionary, 8th edition, 1995

The differences between the definitions of the supply chain and the value chain are illustrated in [Figure 1.1](#). In [Figure 1.1](#) the supply chain is shown as a series of arrows moving from the raw materials stage to the final customer. Each of these arrows represents an individual firm, which has its own value chain. In [Figure 1.1](#) this value chain is enlarged for one firm in the supply chain so that some of the internal functions of the firm that add value can be shown. In this example note that purchasing, marketing, and operations management are shown as part of the firm’s internal value chain. These are internal functions of the firm and they occur in every firm that is a member of a supply chain.

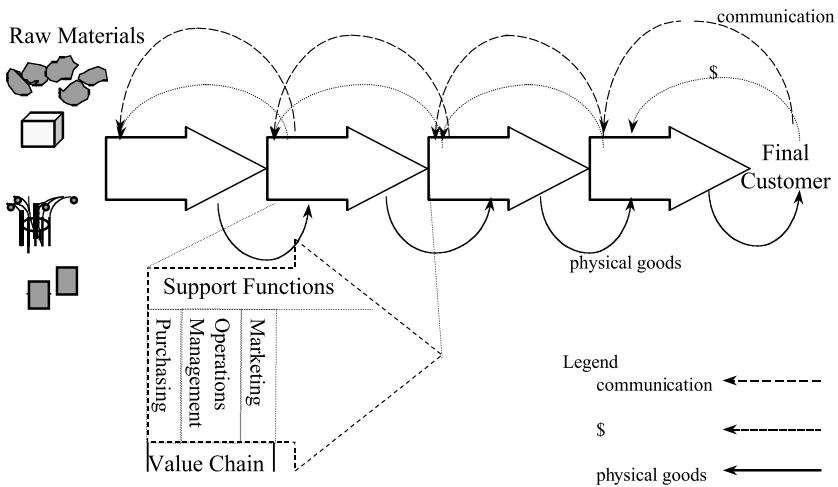


Figure 1.1 Supply Chain

Value chain—The functions within a company that add value to the products or services that the organization sells to customers and for which it receives payment.

APICS Dictionary, 8th edition, 1995

Another term used in some firms is *pipeline*. A pipeline is the supply chain for just one part used in a product. In these firms a supply chain for a complex product consists of many pipelines. An example of a pipeline would be a product that begins with rolled steel. A second step in the pipeline is the cutting process. This is followed by the stamping of the steel into a fender or other component. The component is then assembled into the final product. For example, it may be a fender which is assembled onto a car body.

Figure 1.1 also illustrates that the supply chain consists of more than the movement of physical goods between firms. It is also involves the flow of information between firms. This communication is necessary to manage and maintain the supply chain. Another supply chain flow is the flow of money. This is also shown in Figure 1.1 to illustrate that the primary purpose of every firm in the supply chain is to make money. This helps to remind all supply chain members that increasing their own income requires them to do everything in their power to improve the operations of the supply chain.

Supply Chain Management Evolution

Supply Chain Management (SCM) represents a significant change in how most organizations view themselves. Traditionally, firms view themselves as having customers and suppliers. Historically, a firm did not consider the potential for either its supplier or its customer to become a partner. In many industries each firm was very competitive with its suppliers and customers, fearing that they would be taken advantage of by them.

Beginning in the 1960s and 1970s firms began to view themselves as closely linked functions whose joint purpose was to serve their customers. This internal integration was often referred to as *materials logistics management* or *materials management*. In this structure those management functions involved in the material flow were grouped together. Firms that adopted the materials management structure integrated their purchasing, operations, and distribution functions to improve customer service while lowering their operating costs. Those firms that successfully integrated these functions did improve their performance. But, the firms were still constrained by other functions in the firm, which were not integrated, such as product development. Or, the firms were constrained by either their customer's or their supplier's unresponsiveness. These constraints prevented the firms from responding quickly to changes in the market which delayed their responses to meeting the changed needs of their customers.

Materials management—The grouping of management functions supporting the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control of work in process to the warehousing, shipping, and distribution of the finished product.

APICS Dictionary, 8th edition, 1995

In the 1980s and 1990s many firms continued to further integrate their materials management functions. As it became clear that leading companies in this integration were able to increase their profits, more firms began to adopt supply chain management practices.

Power of Supply Chain Management

The power of supply chain management is its potential to include the customer as a partner in supplying the goods or services provided by a supply

chain. Integrating the customer into the management of the supply chain has several advantages. First, integration improves the flow of information throughout the supply chain. Customer information is more than data. Customer information is data that has been analyzed in some manner so that there is insight into the needs of the customer. In the typical supply chain the further the members of a chain are from the end customer, the less understanding these members have of the needs of the customer. This increases the supply chain member's uncertainty and complicates the planning. Firms respond to uncertainty differently. Some firms may increase inventory while others may increase lead times. Either action reduces their ability to respond to their customers. As uncertainty is reduced because they have more information, firms are able to develop plans with shorter lead times. By improving the information flow in the supply chain, firms throughout the chain have less uncertainty to resolve during the planning process. This allows all the firms in the supply chain to reduce inventory and consequently to shorten their lead times while reducing their costs. This, in turn, allows the chain to respond to their customer faster.

A second advantage of integrating the customer into the supply chain is that this integrates the product development function with the other functions in the firm. This integration allows the product development staff to communicate more with the customer both internally and externally to the firm, which decreases the firm's response time to the customer's needs and tends to reduce product development time.

Some firms use the concept of internal customer to remind their employees that each employee performs just one step in a supply chain whose purpose it is to provide a good or service to the end customer. The purpose of the internal customer logic is to keep each employee focused on the needs of the end customer. This helps employees recognize that not only is their firm just one link of a larger supply chain, but that the firm itself can be viewed as a chain of processes each of which is a customer of the preceding process.

Internal customer—The recipient (person or department) of another person's or department's output (product, service or information) within an organization.

APICS Dictionary, 8th edition, 1995

By focusing on customers, particularly the end customer, all members of the supply chain see the need and benefits of obtaining and using information

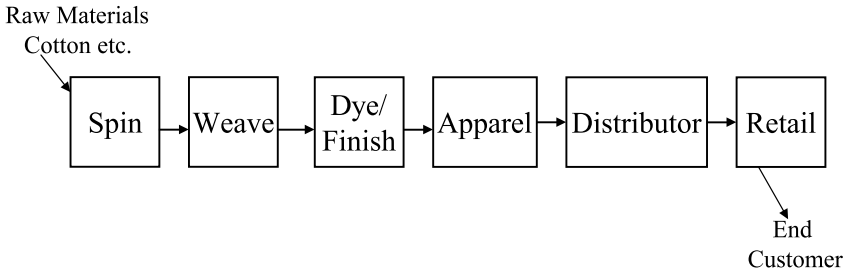


Figure 1.2 Example of Supply Chain

about the end customer. For example, Figure 1.2 is a simplified presentation of a supply chain for apparel sold at retail. If information from the end customer can be spread throughout the supply chain, there can be faster reaction from the supply chain to the end customer's requirements. If the retail firm shares its inventory status with the distributor, the distributor can prepare for reorders. If this information is shared with the apparel manufacturer, it can prepare for reorders also. As this information travels back through the chain and helps to eliminate surprises, the lead times for everyone can be reduced, which also reduces the amount of capital tied up in inventory. If enough information is being shared, the uncertainty in the demand faced by each step in the chain is reduced, which also leads to a reduction in inventory throughout the chain. Reducing uncertainty reduces the need for inventory in each level of the supply chain, because there is less need for just-in-case inventory. Since the supply chain members can use the information to produce inventory that is needed, the information sharing allows each firm to maintain or even improve its level of service. The following example illustrates the profit that can be made through proper supply chain management.

To illustrate, let's consider a supply chain with 3 members. In this hypothetical supply chain, if the finished goods inventory for Firm 3 (which sells to the retail store) can be reduced by 50 pieces, its raw materials can also be reduced by 50 pieces. Considering only the cost of its raw materials, which is \$25, then the firm has reduced its capital invested by \$1,250 ($50 \times \25) by using information to reduce inventory by 50 pieces. Assume that Firm 2 pays about \$13 for the raw materials in the finished goods that it sells to its customer, Firm 3, at \$25. If Firm 2 can reduce its finished goods and raw materials by the same 50 pieces Firm 3 was able to reduce, then the amount of its reduction in capital invested due to the elimination of the 50 pieces of inventory is \$650 ($50 \times \13). For Firm 1, if it experiences the same reduction in inventory as the other firms, and its raw material costs are \$6 for each

part sold at \$13, then its reduction in capital is \$300 ($50 \times \6). The total savings in the supply chain due to the reduction of this inventory is \$2,200 ($\$1,250 + \$650 + \300).

What Is New about Supply Chain Management?

Supply chain management, just-in-time production (JIT), quick response manufacturing, vendor management, and other terms such as *agile manufacturing* all share the goal of improving vendor response to customer demand. All of these philosophies or concepts share the same core values. They attempt to improve customer service by eliminating waste from the system in all of its forms including wasted time. Supply chain management embraces the other philosophies and extends their scope from one firm to all the firms in a supply chain.

There are two forces driving supply chain management. First, is that there is the new communications technology available now that allows managers to actively manage a supply chain. Second, customers are demanding lower prices and better products and services. To meet their customers' demands, firms are optimizing the entire supply chain. Supply chain management allows all the firms in a supply chain to look beyond their own objectives to the objective of maximizing the final customer's satisfaction. The payoff for supply chain members that can do this is increased profits for their shareholders.

The largest barrier to successfully managing a supply chain is perhaps the human element. Failure to correctly manage the issues of trust and communication will abort any attempt to manage the supply chain. When there is a lack of trust and communication, the supply chain's members will soon succumb to greed or suspicion that other members of the supply chain are profiting at their expense. When the communication is not adequate, the supply chain will not improve its response enough to increase profits for its members. Without an increase in profits, the efforts to manage the supply chain will be reduced, because there will be no reward for actively managing it.

Supply chain management requires an unprecedented level of cooperation between the members of the supply chain. It requires an open sharing of information so that all members know they are receiving their full share of the profits. Since many of the firms in a supply chain do not have a history of cooperation, achieving the trust necessary for supply chain management is a time-intensive task.

Another way that the firms in the supply chain can save money is by ensuring that their marketing strategies correspond to the supply chain's capabilities—i.e., from their position in the supply chain they can actually

provide what the customer wants. They are also able to gain money by improving the supply chain's capabilities to match the market demand with a decreased level of inventory. Firms are able to do this because they have additional information to forecast needs and as the lead time is reduced, their need to forecast is reduced. This reduced need to forecast reduces the need to carry inventory stocks for the just-in-case scenario.

Collaborative Planning

Many major retailers and large manufacturers have reduced their operating costs through their use of supply chain management techniques. But, there has been little effect on the price of the item to the consumer. Some argue that this occurred because the total amount of inventory in the supply chain was not reduced. Instead, the inventory may have been transferred to the second and third tier suppliers, but not eliminated from the supply chain.

Collaborative planning requires the firm to work with customers and suppliers to ensure that every day all of them have production and delivery schedules that agree with the needs of the customer. This has to be done routinely and not when the supply chain or a member is in a crisis.

Some firms are using Advanced Planning and Scheduling (APS) software to aid their collaborative communication. This is a trend that is just starting, but it may develop into a set of methods by which supply chain partners could have joint sales forecasts and/or production plans in which a revision by one partner would be immediately transmitted to the next partner.

For the APS to be effective for collaborative forecasting and planning throughout the supply chain, it is necessary that a reliable method for passing information between the different APS systems be in use. When a supplier has only one or two major customers, it is possible for them to have the same type of software as their customer. When a supplier has many customers, they cannot have software that matches each of their customer's needs.

How to Implement Supply Chain Management

A firm in the supply chain must initiate the attempt to form partnerships and actively manage the supply chain. Often a firm that has a large amount of market power in the chain will become the leader of the supply chain. This firm needs to justify the effort to manage the supply chain by explaining the benefits that will accrue to each member in the supply chain and to itself. To do this, the supply chain leader must show the partners where the improvements in the supply chain will arise and how these will lead to a gain for everyone. To establish trust among the members of the supply chain, the lead firm

must also suggest how communication can be opened up and how every member will be ensured that it is receiving its fair share of profits. One recent example of this has been Wal-Mart. For years it has gathered extensive data on customer buying patterns. Wal-Mart has used this data internally to manage its own layouts and inventory. Now it is beginning to share all of this data with its most trusted suppliers. This will allow the supplier who knows how to take advantage of this data an opportunity to improve service to Wal-Mart while decreasing its own costs.

Managing a supply chain is more complex and difficult than managing an individual firm. But, the principles of management used to integrate a firm's own internal functions also apply to managing the entire supply chain. For example, a well-understood phenomenon in the management of a firm is that there is always a bottleneck that constrains sales. This bottleneck may be internal to the firm (a process that cannot produce enough to meet demand) or it may be external to the firm (market demand that is less than the capacity of the firm). This principle applies to the entire supply chain. While the supply chain is driven by customer demand, it is constrained by its own internal resources. One difference is that these resources may not be owned by the same firm. It is possible for the output of an entire supply chain to be limited because one firm does not have capacity to meet surging demand. It is also possible for every firm in the supply chain to be operating at a low utilization because there is not enough demand in the market for the products from the supply chain. There are bottlenecks inside the supply chain just as there are bottlenecks inside firms. To properly manage the supply chain, its members must be aware of the location of their bottlenecks internally and also of the bottlenecks in the supply chain.

Examining the Basics of Supply Chain Management

Since the principles of managing the supply chain are the same as those required to integrate the internal functions of the firm, this book will first explore the basic principles of supply chain management at an individual firm and then examine how these principles apply to the entire supply chain. There is no cookbook for managing the supply chain. However, there are some basic principles that can be used for it. And, a set of best management practices is evolving as managers gain experience managing their supply chains.