

Defining supply chain management: a historical perspective and practical guidelines

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Keywords

Competitiveness,
Operations, Strategy,
Supply-chain management

Abstract

Interest in supply chain management has steadily increased since the 1980s when firms saw the benefits of collaborative relationships within and beyond their own organization. Firms are finding that they can no longer compete effectively in isolation of their suppliers or other entities in the supply chain. A number of definitions of supply chain management have been proposed in the literature and in practice. This paper defines the concept of supply chain management and discusses its historical evolution. The term does not replace supplier partnerships, nor is it a description of the logistics function. The competitive importance of linking a firm's supply chain strategy to its overall business strategy and some practical guidelines are offered for successful supply chain management.

Introduction to supply chain concepts

Firms can no longer effectively compete in isolation of their suppliers and other entities in the supply chain. Interest in the concept of supply chain management has steadily increased since the 1980s when companies saw the benefits of collaborative relationships within and beyond their own organization. A number of definitions have been proposed concerning the concept of "the supply chain" and its management. This paper defines the concept of the supply chain and discusses the evolution of supply chain management. The term does not replace supplier partnerships, nor is it a description of the logistics function. Industry groups are now working together to improve the integrative processes of supply chain management and accelerate the benefits available through successful implementation. The competitive importance of linking a firm's supply chain strategy to its overall business strategy and some practical guidelines are offered for successful supply chain management.

Definition of supply chain

Various definitions of a supply chain have been offered in the past several years as the concept has gained popularity. The *APICS Dictionary* describes the supply chain as:

- 1 the processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies; and
- 2 the functions within and outside a company that enable the value chain to make products and provide services to the customer (Cox *et al.*, 1995).

Another source defines supply chain as, the network of entities through which material flows. Those entities may include suppliers, carriers, manufacturing sites, distribution centers, retailers, and customers (Lummus and Alber, 1997). The Supply Chain Council (1997) uses the definition: "The supply chain – a term increasingly used by logistics professionals – encompasses every effort involved in producing and delivering a final product,

from the supplier's supplier to the customer's customer. Four basic processes – plan, source, make, deliver – broadly define these efforts, which include managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer." Quinn (1997) defines the supply chain as "all of those activities associated with moving goods from the raw-materials stage through to the end user. This includes sourcing and procurement, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. Importantly, it also embodies the information systems so necessary to monitor all of those activities."

In addition to defining the supply chain, several authors have further defined the concept of supply chain management. As defined by Ellram and Cooper (1993), supply chain management is "an integrating philosophy to manage the total flow of a distribution channel from supplier to ultimate customer". Monczka and Morgan (1997) state that "integrated supply chain management is about going from the external customer and then managing all the processes that are needed to provide the customer with value in a horizontal way". They believe that supply chains, not firms, compete and that those who will be the strongest competitors are those that "can provide management and leadership to the fully integrated supply chain including external customer as well as prime suppliers, their suppliers, and their suppliers' suppliers".

From these definitions, a summary definition of the supply chain can be stated as: all the activities involved in delivering a product from raw material through to the customer including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer, and the information systems necessary to monitor all of these activities. Supply chain management coordinates and integrates all of these activities into a seamless process. It links all of the partners in the chain including departments

within an organization and the external partners including suppliers, carriers, third-party companies, and information systems providers. Managers in companies across the supply chain take an interest in the success of other companies. They work together to make the whole supply chain competitive. They have the facts about the market, they know a lot about competition, and they coordinate their activities with those of their trading partners. It encompasses the processes necessary to create, source, make to, and to deliver to demand. They use technology to gather information on market demands and exchange information between organizations. A key point in supply chain management is that the entire process must be viewed as one system. Any inefficiencies incurred across the supply chain (suppliers, manufacturing plants, warehouses, customers, etc.) must be assessed to determine the true capabilities of the process. Figure 1 describes the total integration required within the supply chain.

Interest in supply chains

Why has managing the supply chain become an issue for the 1990s? In part, the answer lies in the fact that few companies continue to be vertically integrated. Companies have become more specialized and search for suppliers who can provide low cost, quality materials rather than own their source of supply. It becomes critical for companies to manage the entire network of supply to optimize overall performance. These organizations have realized that whenever a company deals with another company that performs the next phase of the supply chain, both stand to benefit from the other's success.

A second reason partially stems from increased national and international competition. Customers have multiple sources from which to choose to satisfy demand; locating product throughout the distribution channel for maximum customer accessibility at a minimum cost becomes crucial. Previously, companies looked at solving the distribution

problem through maintaining inventory at various locations throughout the chain. However, the dynamic nature of the marketplace makes holding inventory a risky and potentially unprofitable business. Customers' buying habits are constantly changing, and competitors are continually adding and deleting products. Demand changes make it almost a sure bet that the company will have the wrong inventory. The cost of holding any inventory also means most companies cannot provide a low cost product when funds are tied up in inventory.

A third reason for the shift in emphasis to the supply chain is due to a realization by most companies that maximizing performance of one department or function may lead to less than optimal performance for the whole company. Purchasing may negotiate a lower the price on a component and receive a favorable purchase price variance, but the cost to produce the finished product may go up due to inefficiencies in the plant. Companies must look across the entire supply chain to gauge the impact of decisions in any one area.

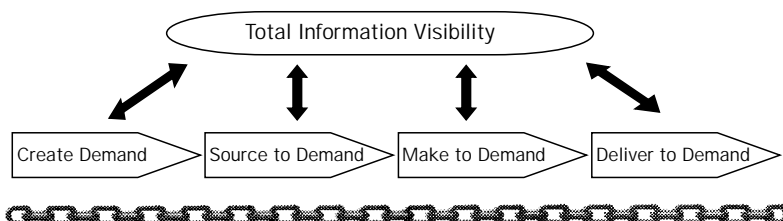
Advanced Manufacturing Research, a Boston-based consulting firm, developed a supply chain model which emphasizes material and information flow between manufacturers and their trading partners (Davis, 1995). They believe the changes required by management are due to the following changes in how manufacturers are doing business:

- Greater sharing of information between vendors and customers.
- Horizontal business processes replacing vertical departmental functions.
- Shift from mass production to customized products.
- Increased reliance on purchased materials and outside processing with a simultaneous reduction in the number of suppliers.
- Greater emphasis on organizational and process flexibility.
- Necessity to coordinate processes across many sites.
- Employee empowerment and the need for rules-based real time decision support systems.
- Competitive pressure to introduce new products more quickly.

Companies are streamlining all operations and minimizing the time-to-customer for their products.

For these reasons, expertly managing the supply chain has become critical for most companies. As Ralph Drayer, vice president of product supply/customer service at Procter and Gamble put it, "Winning in the marketplace of the 1990s is going to require a far

Figure 1
Supply chain integration



different kind of relationship – one that recognizes that the ultimate winners will be those who understand the interdependence of retailer/manufacturer business systems and who work together to exploit opportunities to deliver superior consumer value” (Drayer, 1994). Managers in companies across the supply chain take an interest in the success of the other companies. They work together to make the whole supply chain competitive. They have the facts about the market, they know a lot about competition, and they coordinate their activities with those of their trading partners. They use technology to gather information on market demands and exchange information between organizations. Critical to managing the supply chain is managing the link between each node within the chain to synchronize the entire supply chain.

History of the supply chain initiative

The history of the supply chain initiative can be traced to early beginnings in the textile industry with the quick response program and later to efficient consumer response in the grocery industry. More recently a variety of companies across many industries have begun looking at the entire supply chain process. This section will discuss those early beginnings of the supply chain and some more recent success stories.

Quick response, for general merchandise retailers and their suppliers

Owing to intense competition in the textile and apparel industry world-wide, leaders in the US apparel industry formed the Crafted With Pride in the USA Council in 1984 (Kurt Salmon Associates, Inc., 1993). In 1985, Kurt Salmon Associates were commissioned to conduct a supply chain analysis. The results of the study showed the delivery time for the apparel supply chain, from raw material to consumer, was 66 weeks long, 40 weeks of which were spent in warehouses or in transit. The long supply chain resulted in major losses to the industry due to financing the inventory and lack of the right product in the right place at the right time.

The result of this study was the development of the quick response (QR) strategy. QR is a partnership where retailers and suppliers work together to respond more quickly to consumer needs by sharing information. Significant changes as a result of the study were the industry adoption of the UPC code used by the grocery industry and a set of standards for electronic data interchange

(EDI) between companies. Retailers began installing point of sale (POS) scanning systems to transfer sales information rapidly to distributors and manufacturers. “QR maximizes the profitability of inventory by placing the company’s dollars where and when they are needed based on point of sale data plus sales history” (Mullin, 1994). QR incorporates marketing information on promotion, discounts, and forecasts into the manufacturing and distribution plan.

Efficient consumer response, the grocery business initiative

In 1992, a group of grocery industry leaders created a joint industry task force called the efficient consumer response (ECR) working group. The group was charged with examining the grocery supply chain to identify opportunities to make the supply chain more competitive (Kurt Salmon Associates Inc., 1993). Kurt Salmon Associates were engaged by the group to examine the grocery supplier/distributor/consumer value-chain and determine what improvements in cost and service could be accomplished through changes in technology and business practices.

The results of the study indicated little change in technology was required to improve performance, other than further development of EDI and POS systems. However, the study identified a set of best practices which, if implemented, could substantially improve overall performance of the supply chain. As Kurt Salmon and Associates (1993) found: “By expediting the quick and accurate flow of information up the supply chain, ECR enables distributors and suppliers to anticipate future demand far more accurately than the current system allows”. Through implementation of best practices they projected an overall reduction in supply chain inventory of 37 percent, and overall cost reductions in the industry in the range of \$24 to \$30 billion.

The successful adoption of ECR for a manufacturer depends on their ability to maintain manufacturing flexibility which enables them to match supply with demand. Key to this flexibility is a process that tightly integrates demand management, production scheduling, and inventory deployment to allow the company to better utilize information, production resources, and inventory (Weeks and Crawford, 1994).

A further development from ECR was the concept of continuous replenishment (CRP). CRP is a move away from pushing product from inventory holding areas to pulling products onto grocery shelves based on consumer demand (ECR Performance Measures Operating Committee, 1994). Point of purchase

transactions are forwarded by computer to the manufacturer allowing them to keep the retailer replenished and balanced just-in-time.

CRP has been introduced by a number of manufacturers (Garry, 1994). Procter & Gamble and Campbell soup are delivering as much as 30 to 40 percent of their volume by CRP. Ralston, General Mills and Pillsbury distribute about 10 percent by CRP. Estimates of improvements in performance with CRP include increasing inventory turns from 10 up to 50, reducing days of supply from 30 to 5 and increasing net margin from 5 percent to 7 percent.

Other early supply chain initiatives

Besides the apparel and grocery industry initiatives, other early manufacturing efforts to improve supply chain performance have been documented. Some of these include: Hewlett-Packard, Whirlpool, Wal-Mart, West Co., Becton Dickinson, Baxter, and Georgia-Pacific Corp. A brief outline of their supply chain initiatives are described as follows.

Hewlett-Packard

The computer components manufacturer, systematically linked its distribution activities with its manufacturing activities in the computer terminal business in the early 1990s (Hammell and Kopczak, 1993). The implementation included changes in both the physical distribution of the product, and a new distribution requirements planning (DRP) system. The DRP system nets customer orders with forecasts and serves as the beginning pull in the supply chain.

Whirlpool

The appliance manufacturer, began its supply chain implementation with a team of executives in 1992 chartering this vision - "Winning companies will be those who come the closest to achieving an inter-enterprise pull system. They will be linked in a short cycle response mode to the customer" (Davis, 1995). Whirlpool has created a new vice-president of logistics position, established cross-functional teams for key product areas, entered into single source agreements with suppliers based on reliability and the ability to assist in product design, and is using EDI to communicate daily with suppliers all as part of its supply chain management program. As a result, product availability is up in the 90-95 percent range, inventories have been reduced by 15 to 20 percent and lead times reduced to as low as five days.

Wal-Mart

The company began its own supply chain initiative by working directly with key manufacturers (Johnson and Davis, 1995). The manufacturers are responsible for managing Wal-Mart's warehouse inventory of their products, termed vendor managed inventory (VMI). In return, Wal-Mart expects near 100 percent order fulfillment rates on those products. KMart and other large retailers have implemented similar VMI programs.

West Co., Becton Dickinson, and Baxter

Within the medical products industry, three firms engaged in supply chain relationships in the early 1990s (Battaglia, 1994). West supplies rubber stoppers to Becton Dickinson who supplies medical products to Baxter. Becton Dickinson implemented the program by assigning a senior-level executive officer with the responsibility to monitor supply chain execution. Working together at all management levels the three companies have made improvements in quality and service while at the same time reducing cycle times and costs.

Georgia-Pacific Corp.

A leader in the manufacturing and distribution of building products in North America, Georgia-Pacific began implementing supply chain management practices within the decentralized operations of their company (Blackwell, 1994). Previously, traffic managers in each division controlled inbound and outbound shipments for their unit. Shipping priorities were fragmented and internal and external customers were not satisfied. A new centralized Transportation and Logistics Division was created to coordinate and streamline the distribution process. The new division looks at needs and priorities across the business units and has recognized savings to the company in reduced freight costs and other logistics improvements of \$20 million per year.

Many other examples of companies implementing supply chain management concepts are available (Blaser and Westbrook, 1995; Cook and Rogowski, 1996; Semich, 1994). The vast interest in the topic indicates the concept has become a key issue for a diverse group of companies who are taking steps to improve customer delivery and at the same time reduce overall costs. Better managing the supply chain also involves managing the marketing link to the supply chain and linking supply chain strategies to the overall company strategy.

Collaborative supply chain initiatives

Recently, several industry collaborative groups have developed to research aspects of supply chain management. The findings of these groups should provide practitioners with guidelines for “best practices” in supply chain design and accelerate the implementations of these practices.

In one year, the Supply Chain Council grew from 73 members to more than 300 of some of the world’s largest manufacturers. The Council has incorporated as a non-profit organization to provide services and support for further increasing its membership. The Council was formed to establish a framework to enable manufacturers and their suppliers to build a stronger supply chain and reap the benefits of improved supply chain management. The Council is developing a supply chain operations reference model (SCOR) to assist companies in evaluating their supply chain performance, identifying weak areas, and developing improvement solutions (The Supply Chain Council, 1997).

In another collaborative initiative, several leading manufacturers joined with the National Institute of Standards and Technology (NIST) to create a new organization that will improve and standardize communication and business processes throughout manufacturing supply chains and to share the results with other interested firms. This group, the National Initiative for Supply Chain Integration (NISCI) was formed after a NIST study showed that an overwhelming majority of companies compromising manufacturing supply chains are either small- or medium-sized businesses that lack the resources of larger firms. With a consortium of businesses, non-profit groups, and academic institutions, the plan is to identify specific supply chain initiatives, then select teams of members to research and implement best practices (Anonymous, 1997).

What the supply chain is not

The definitions described and developed earlier and recent industry collaborative activities indicate that supply chain management is not a standalone process. Many supply chain efforts have fallen short of the potential advantages because the term is often viewed as only relating to the supply side of the business or to the purchasing function. As indicated above, supply chain management is much more than just procurement. Among the misunderstanding evidenced, supply chain management is not:

- inventory management;
- logistics management;
- supplier partnerships;
- driven from the supply side;
- a shipping strategy;
- distribution management;
- the logistics pipeline;
- procurement management;
- a computer system.

Despite the acceptance of the concept of managing the supply chain and partly due to the limiting misunderstandings, growth of integrated supply chain management has been slow. Reasons for the slow growth of integrated supply chain management include the following:

- Lack of guidelines for creating alliances with supply chain partners.
- Failure to develop measures for monitoring alliances.
- Inability to broaden the supply chain vision beyond procurement or product distribution to encompass larger business processes.
- Inability to integrate the company’s internal procedures.
- Lack of trust inside and outside a company.
- Organizational resistance to the concept.
- Lack of buy-in by top managers.
- Lack of integrated information systems and electronic commerce linking firms.

Linking the supply chain to the business strategy

The supply chain improvements described indicate that supply chain management has the potential to improve a firm’s competitiveness. Supply chain capability is as important to a company’s overall strategy as overall product strategy. Supply chain management encourages management of processes across departments. By linking supply chain objectives to company strategy, decisions can be made between competing demands on the supply chain. Improvements in performance are driven by externally-based targets rather than by internal department objectives.

Managing the supply chain means managing across traditional functional areas in the company and managing interactions external to the company with both suppliers and customers. This cross-boundary nature of management supports incorporating supply chain goals and capabilities in the strategic plan of the company. This focus on integration can then lead to using the supply chain to obtain a sustainable competitive advantage over competitors. The impact of managing overall product demand and the supply of product will impact the profitability of the

company. The supply chain strategy can be viewed as the pattern of decisions related to sourcing product, capacity planning, conversion of finished product, deployment of finished product, demand management and communication, and delivery. Linking supply chain strategy to the business strategy involves defining the key business processes involved in producing a company's product or service.

A company must develop objectives for the management of the supply chain based on corporate objectives. From these higher level objectives, a set of detailed objectives can be developed for each process within the supply chain. This cascading method serves to integrate the supply chain processes with the overall enterprise direction and provides measures for monitoring and execution. Supply chain management can be utilized to be a point of differentiation for a company. Excellence on a certain dimension in product position can provide a competitive marketing opportunity, but shortfalls in providing this dimension by the supply chain can eliminate this advantage. For a company to be competitive, it is not enough just to vary marketing programs. They must define a working relationship with customers and put themselves in a position to deliver customer value. All components of the supply chain must have the capability to meet strategic objectives.

Companies must evaluate the effectiveness of the supply chain strategy using a new set of measures. Typical rewards aimed at improving performance of functions or departments must be revised to strive to improve supply chain performance overall. By tying the supply chain strategy to the overall company strategy, the objectives become process objectives rather than functional objectives.

For example, traditionally, one of purchasing's measurements is material cost or material variance. Buying product at a lower cost is one way to improve that measure. Purchasing a carton at a lower cost from a new vendor might lower the cost of the carton. However, the new carton may not run as efficiently through the production process as the one from the original supplier. Purchasing's measure of material variance is favorable, but the manufacturing facility is recognizing added costs in downtime, maintenance, etc.

Measurements must be designed to look across the supply chain and become process objectives. Included in that process is the internal structure of the supply chain which often is causing as much confusion/cost as external portions of the chain.

Conclusions

This paper defined the concepts of supply chain and supply chain management and discussed why managers are increasingly interested in the concept. The historical evolution of the supply chain movement from its early days of quick response and efficient consumer response was discussed. Several early supply chain initiatives at companies were described which indicate the competitive advantages and importance of linking supply chain to overall business strategy.

This discussion provides insight for those companies investigating the concept of supply chain management. Companies who have achieved supply chain integration success report lower investments in inventory, a reduction in the cash flow cycle time, reduced cycle times, lower material acquisition costs, higher employee productivity, increased ability to meet customer requested dates (including short-term increases in demand), and lower logistics costs.

To begin managing across the entire supply chain, companies should consider the following guidelines in their plans and implementation:

- 1 Link supply chain strategy to overall business strategy to align supply chain initiatives to business objectives.
- 2 Identify supply chain goals and develop plans to assure every process is individually capable of meeting supply chain goals.
- 3 Develop systems to listen to signals of market demand and plan accordingly, including changes in ordering patterns and changes in demand due to customer promotions.
- 4 Manage the sources of supply by developing partnerships with suppliers to reduce the costs of materials and receive materials as needed.
- 5 Develop customized logistics networks tailored to each customer segment.
- 6 Develop a supply chain information systems strategy that can support decision making at all levels of the supply chain and offers a clear view of the flow of products.
- 7 Adopt cross-functional and cross-business performance measures that link every aspect of the supply chain and include both service and financial measures.

Companies who are successful will be those that are managing across all nodes of the supply chain from their supplier's supplier to their customer's customer. A clear understanding of supply chain concepts and a willingness to openly share information between supply chain partners is a necessary first step to making the supply chain a competitive force for a business.

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