A framework of supply chain management literature

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Abstract

Over the past decade, the traditional purchasing and logistics functions have evolved into a broader strategic approach to materials and distribution management known as supply chain management. This research reviews the literature base and development of supply chain management from two separate paths that eventually merged into the modern era of a holistic and strategic approach to operations, materials and logistics management. In addition, this article attempts to clearly describe supply chain management since the literature is replete with buzzwords that address elements or stages of this new management philosophy. This article also discusses various supply chain management strategies and the conditions conducive to supply chain management. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

During the 1990s, many manufacturers and service providers sought to collaborate with their suppliers and upgrade their purchasing and supply management functions from a clerical role to an integral part of a new phenomenon known as supply chain management. Since this aspect of supply chain management primarily focuses on the purchasing and supply management functions of industrial buyers, we have classified it elsewhere as the purchasing and supply perspective of supply chain management (Tan et al., 1999, 1998b). Correspondingly, many wholesalers and retailers have also integrated their physical distribution and logistics functions into the transportation and logistics perspective of supply chain management to enhance competitive advantage. Over the last 10 years, these two traditional supporting functions of corporate strategy evolved along separate paths and eventually merged into a holistic and strategic approach to operations, materials and logistics management, commonly referred to as supply chain management (SCM).

This article reviews the literature base and development of supply chain management along these two separate paths and integrates the two bodies of literature in the unification of supply chain management into a commonly accepted terminology that includes all the value creating activities along the value chain. In addition, this article attempts to describe supply chain management clearly, since the term has been used very liberally in the literature. This article also discusses various supply chain strategies and the conditions conducive to supply chain management.

2. Supply chain management defined

The literature is replete with buzzwords such as: integrated purchasing strategy, integrated logistics, supplier integration, buyer–supplier partnerships, supply base management, strategic supplier alliances, supply chain synchronization and supply chain management, to address elements or stages of this new management philosophy (Tan et al., 1998a; New, 1997; La Londe and Masters, 1994). While each terminology addresses elements of the phenomenon, typically focusing on immediate suppliers of an organization, supply chain management is the most widely used (but abused) term to describe this philosophy. Unfortunately, there is no explicit description of supply chain management or its activities in the literature (New, 1997). For example, Harland (1996) describes supply chain management as...
managing business activities and relationships (1) internally within an organization, (2) with immediate suppliers, (3) with first and second-tier suppliers and customers along the supply chain, and (4) with the entire supply chain.

Scott and Westbrook (1991) and New and Payne (1995) describe supply chain management as the chain linking each element of the manufacturing and supply process from raw materials through to the end user, encompassing several organizational boundaries. According to this broad definition, supply chain management encompasses the entire value chain and addresses materials and supply management from the extraction of raw materials to its end of useful life. Baatz (1995) further expands supply chain management to include recycling or re-use. Supply chain management focuses on how firms utilize their suppliers’ processes, technology, and capability to enhance competitive advantage (Farley, 1997), and the coordination of the manufacturing, logistics, and materials management functions within an organization (Lee and Billington, 1992). When all strategic organizations in the value chain ‘integrate’ and act as a single unified entity, performance is enhanced throughout the system of suppliers.

Fig. 1 shows the activities and firms involve in such a value chain as portrayed by New and Payne (1995). It begins with the extraction of raw materials or minerals from the earth, through the manufacturers, wholesalers, retailers, and the final users. Where appropriate, supply chain management also encompasses recycling or re-use of the products or materials. Supply chain management appears to treat all organizations within the value chain as a unified ‘virtual business’ entity. It includes activities such as planning, product design and development, sourcing, manufacturing, fabrication, assembly, transportation, warehousing, distribution, and post delivery customer support. In a truly ‘integrated’ supply chain, the final consumers pull the inventory through the value chain instead of the manufacturer pushing the items to the end users.

While in principle this definition of supply chain management addresses the supply process throughout the value chain, a practical approach to supply chain management is to consider only strategically important suppliers in the value chain (Tan et al., 1998a, b). Technically, the value chain is too complex to achieve a full integration of all business entities within it in order to reap the benefits offered by supply chain management. This leads to a second narrower definition of supply chain management: the integration of the various functional areas within an organization to enhance the flow of goods from immediate strategic suppliers through manufacturing and distribution chain to the end user (Houlihan, 1987, 1988). Research in this area generally focuses on improving the efficiency and competitive advantage of manufacturers by taking advantage of the immediate supplier’s capability and technology, particularly during the product design stage through early supplier involvement.

A third definition of supply chain management emerges from the transportation and logistics literature of the wholesaling and retailing industry, emphasizing the importance of physical distribution and integrated logistics. There is no doubt that logistics is an important function of business and is evolving into strategic supply chain management (New and Payne, 1995). Physical transformation of the products is not a critical component of this definition of supply chain management. This is probably where the term supply chain management was originally used (Lamming, 1996). Its primary focus is the efficient physical distribution of final products from the manufacturers to the end users in an attempt to replace inventories with information. This is also consistent with those marketing related literature in supply chain management (Christopher et al., 1998; Christopher, 1996).

3. Evolution of supply chain management

In the 1950s and 1960s, most manufacturers emphasized mass production to minimize unit production cost as the primary operations strategy, with little product or process flexibility. New product development was slow and relied exclusively on in-house technology and capacity. ‘Bottleneck’ operations were cushioned with
inventory to maintain a balanced line flow, resulting in huge investment in work in process (WIP) inventory. Sharing technology and expertise with customers or suppliers was considered too risky and unacceptable and little emphasis appears to have been placed on cooperative and strategic buyer-supplier partnership. The purchasing function was generally regarded as being a service to production, and managers paid limited attention to issues concerned with purchasing (Farmer, 1997). In the 1970s, Manufacturing Resource Planning was introduced and managers realized the impact of huge WIP on manufacturing cost, quality, new product development and delivery lead-time. Manufacturers resorted to new materials management concepts to improve performance within the ‘four walls’ of the company.

The intense global competition in the 1980s forced world-class organizations to offer low cost, high quality and reliable products with greater design flexibility. Manufacturers utilized just-in-time (JIT) and other management initiatives to improve manufacturing efficiency and cycle time. In the fast-paced JIT manufacturing environment with little inventory to cushion production or scheduling problems, manufacturers began to realize the potential benefit and importance of strategic and cooperative buyer-supplier relationship. The concept of supply chain management emerged as manufacturers experimented with strategic partnerships with their immediate suppliers. In addition to the procurement professionals, experts in transportation and logistics carried the concept of materials management a step further to incorporate the physical distribution and transportation functions, resulting in the integrated logistics concept, also known as supply chain management.

The evolution of supply chain management continued into the 1990s as organizations further extended best practice in managing corporate resources to include strategic suppliers and the logistics function in the value chain. Supplier efficiency was broadened to include more sophisticated reconciliation of cost and quality considerations. Instead of duplicating non-value-adding activities, such as receiving inspection, manufacturers trusted suppliers’ quality control by purchasing only from a handful of qualified or certified suppliers (Inman and Hubler, 1992). More recently, many manufacturers and retailers have embraced the concept of supply chain management to improve efficiency across the value chain. Manufacturers now commonly exploit supplier strengths and technology in support of new product development (Ragatz et al., 1997; Morgan and Monczka, 1995), and retailers seamlessly integrate their physical distribution function with transportation partners to achieve direct store delivery or cross docking without the need for receiving inspection (St. Onge, 1996). A key facilitating mechanism in the evolution of supply chain management is a customer-focus corporate vision, which drives change throughout a firm’s internal and external linkages (Fig. 2).

4. Two alternative perspectives on supply chain management

Fig. 3 presents a summary framework of the evolution of supply chain management along two separate paths that eventually merged into a common body of literature. While it is not an exclusive nor distinctive classification of literature, Fig. 3 illustrates the evolution of supply chain management from the purchasing and supply activities, as well as the transportation and logistics functions, with a focus on integration, visibility, cycle time reduction, and streamlined channels (Tan et al., 1998b). The purchasing and supply perspective literature relates to the previously disparate functions of purchasing and supply management functions of the industrial buyers, whereas the transportation and logistics perspective of supply chain management literature evolves from the transportation and physical distribution functions of the wholesalers and retailers. However, there are other means of classifying supply chain management literature. For example, Harland et al. (1999) and Harland (1996) classify research in this area according to the levels of integration (i.e., internal chain, dyadic relationship,
external chain and network of suppliers and customers) among supply chain members.

4.1. Purchasing and supply perspective of the industrial buyers

In general, most of the recent literature on supply chain management addresses the purchasing and supply perspective (e.g., Farmer, 1997; Morgan and Monczka, 1996; Lamming and Hampson, 1996; Kraljic, 1983). This perspective of supply chain management is synonymous with supplier base integration that evolves from the traditional purchasing and supply management functions. It emphasizes that purchasing and materials management represents a basic strategic business process, rather than a narrow specialized supporting function to overall business strategy (Reck et al., 1992). It is a management philosophy that extends traditional internal activities by embracing an inter-enterprise scope, bringing trading partners together with the common goal of optimization and efficiency (Harwick, 1997). Supply chain management creates a virtual organization composed of several independent entities with the common goal of efficiently and effectively managing all its entities and operations, including the integration of purchasing, demand management, new product design and development, and manufacturing planning and control.

This perspective on supply chain management focuses on the manufacturing industry and has little to do with the wholesaling or retailing industry. Its short-term objective is primarily to increase productivity and reduce inventory and cycle time, while the long-term strategic goal is to increase customer satisfaction, market share and profits for all members of the virtual organization. To realize these objectives, all strategic partners must recognize that the purchasing function is the crucial link between the sources of supply and the organization itself, with support coming from overlapping activities to enhance manufacturability for both the customer and supplier. The involvement of purchasing in concurrent engineering is essential for selecting components that assure the requisite quality is designed into the product and to aid in collapsing design-to-production cycle time.

Suppliers participate at the earliest stage of product design to render cost-effective design choices, often leading to innovation in process and material technology to compete in the global market (Monczka et al., 1994). By
involving suppliers early in the design stage, manufacturers may be able to develop alternative conceptual solutions, select the best components and technologies, and solicit help in design assessment (Ragatz et al., 1997; Burt and Soukup, 1985). An emphasis on internal competencies requires greater reliance on external suppliers to support directly non-core requirements, particularly in design and engineering support (Prahalad and Hamel, 1990).

Elsewhere (Tan et al., 1998b), we have empirically examined the impact of the purchasing and supply perspective of supply chain management on contemporary business practices, and concluded that the factors cited in the literature as being elements of effective supply chain management (for example, customer relations and purchasing practices) positively affect corporate performance. In general, supply chain management seeks improved performance through elimination of waste and better use of internal and external supplier capabilities and technology to create a seamlessly coordinated supply chain. Thus, elevating inter-company competition to inter-supply chain competition (Anderson and Katz, 1998; Birou et al., 1998; Lummus et al., 1998; Morgan and Monczka, 1996; Christopher, 1996).

4.2. Transportation and logistics perspective of the merchants

The transportation and logistics functions of the wholesaling and retailing industry focus on a different aspect of supply chain management, that is, one of location and logistics issues more often than transformation. Its origin can be traced to an effort for better management of the transportation and logistics functions (Christopher et al., 1998; Christopher, 1992, 1996; Fisher, 1997; Lamb, 1995; Turner, 1993; Bowersox et al., 1992; MacDonald, 1991). While Lamming (1996) primarily addresses the purchasing and supply perspective of supply chain management, he concludes that supply chain management is a theory grounded in the field of logistics. Interestingly, Eloranta and Hameri (1991) note that research in logistics tend to be separated into inbound and outbound logistics, with a primary focus on inbound logistics.

According to this perspective, supply chain management incorporates logistics focus into the strategic decisions of the business (Hale, 1999; Houlihan, 1988). The once narrow focus of logistics becomes a comprehensive topic that spans the entire value chain from suppliers to customers (Shapiro et al., 1993; Langley and Holcomb, 1992). It enables channel members to compete as a unified logistics entity instead of simply pushing inventory back along the value chain. In such a setup, La Londe and Masters (1994) suggest that most of the benefits of forward and backward vertical integration can be obtained by coordinating the logistics operations of independent firms in the value chain. In this respect, supply chain management is synonymous with integrated logistics systems, and the literature base is extensive (Johnson et al., 1999; Lambert et al., 1998; Bowersox and Closs, 1996; Coyle et al., 1996).

Broadly defined, an integrated logistics system encompasses the integration of processes, systems and organizations that control the movement of goods from the suppliers to a satisfied customer without waste (Ellram, 1991). Where logistics once meant saturating warehouses with inventory, an integrated logistics system includes inventory management, vendor relationships, transportation, distribution, warehousing and delivery services. The role of effective physical distribution is a critical component of the logistics process. Merchandise must be replenished quickly and arrived where and when it is needed in smaller lot sizes, especially in a JIT system (Handfield, 1994). The goal is to replace inventory with perfect information. Effective coordination of logistics activities, by means of excellent information technology processes, is essential to organizational performance (Lewis and Talalayevsky, 1997). The advancement of electronic interchange, bar coding and radio frequency scanning technologies has greatly aided the evolution of the integrated logistics concept. Evidence of work in this area includes Whiteoak (1994), who traces the evolution of the retail grocery distribution practice in the 1970s into the current supply chain management concept.

The current research extends the supply chain management concept beyond the confines of one company to include other organizations in the value chain, including the carrier, which plays a crucial role in an efficient supply chain (Carter and Ferrin, 1995). However the literature suggests that internal organization cultures prevent a truly integrated logistics concept (Gattorna et al., 1991) although there is empirical evidence that transaction-specific investment has a strong positive effect on the commitments of such a relationship (Andersen and Weitz, 1992).

Organizations in the retail industry resort to supply chain management to counter the increasing uncertainty and complexity of the marketplace and competitive situation to reduce inventory in the entire value chain (Houlihan, 1987, 1988). It is a strategic tool and differs from classical transportation and logistics management in that the value chain is a single unified entity. Jones and Riley (1987) also echo this single entity concept, where inventories are used only as a last resort to buffer uncertainty in business pattern. Davis (1993) and Scott and Westbrook (1991) suggest that a supply chain can reduce its overall inventory simply by efficiently redistributing stock within the supply chain. In the integrated logistics concept, short and reliable order cycle and the ability to fill entire orders are critical customer service elements (Ellram et al., 1989). However, it is important to recognize that the geographical spreads of channel members
and cost structures determine the structure of logistical support (Fernie, 1995; Taylor and Probert, 1993).

4.3. The unified/integrated supply chain management strategy

When supply chain management was integrated from the two perspectives into a common body of knowledge that encompasses all the value-adding activities on the value chain, researchers realized the importance of incorporating supply chain management in overall business planning process (Harland et al., 1999). However, Carter and Narasimhan (1994) note that it is not widely practised. Business process reengineering literature (Burgess, 1998; Fiedlner and Vokurka, 1997) supports the notion of closely integrating the operations across functional areas between manufacturers, suppliers and customer. In an empirical survey, Ellram and Pearson (1994) also discover that despite the increased emphasis of integrating purchasing into overall corporate strategy, the primary function of purchasing remained a clerical role of negotiating price/items. While many strategic models have been proposed (for example, Reck and Long, 1988) to link the crucial role of supply chain management in overall strategic corporate planning, they failed to suggest any action model that is useful to practitioners. More recently, Frohlich et al. (1997) have utilized rigorous statistical analyses of survey data and suggested that there are three different types of supply chain strategies, and the process of fulfilling customer’s orders is of paramount importance to all three types. The three supply chain strategies are ‘innovator’, ‘marketeer’ and ‘caretaker’ strategies. While ‘innovators’ emphasize rapid new product introduction and design changes, ‘marketeers’ offer broad product lines and ‘caretakers’ focus on offering the lowest price.

The goal of the integrated supply chain strategy is to create manufacturing processes and logistics functions seamlessly across the supply chain as an effective competitive weapon that cannot be easily duplicated by competitors (Anderson and Kat, 1998; Birou et al., 1998; Lummus et al., 1998; Lee and Billington, 1995). A well-integrated supply chain involves coordinating the flows of materials and information between suppliers, manufacturers and customers (White et al., 1999; Narasimhan and Carter, 1998; Trent and Monczka, 1998), and implementing product postponement and mass customization in the supply chain (Lee and Tang, 1998; Pagh and Cooper, 1998; Van Hoek et al., 1998). Higher level of integration with suppliers and customers in the supply chain is expected to result in more effective competitive advantage (Johnson, 1999; Hines et al., 1998; Lummus et al., 1998; Narasimhan and Jayaram, 1998).

Most recent research that addresses supply chain management strategy emphasizes the critical role of purchasing in formulating corporate level strategies. For example, Freeman and Cavinato (1990) propose a four-stage supply chain management model and describe the purchasing characteristics necessary in each stage. This conceptual work is useful in matching purchasing with the strategic process of the firm, but it does not provide a framework for strategically linking purchasing to the other functional areas. Subsequently, Watts et al. (1992) develop a conceptual framework for linking purchasing to corporate competitive strategy and to functional level strategies. This framework is a crucial step in stimulating more active purchasing involvement in developing and implementing corporate competitive strategy that will improve an organization’s performance.

5. Conditions conducive to supply chain management

Supply chain management may allow organizations to realize the advantages of backward vertical integration while overcoming its disadvantages. However, certain conditions must be present for a successful supply chain management adoption. Farley (1997) concludes that the single most important prerequisite is a change in the corporate cultures of all members in the value chain to make it conducive to supply chain management. A traditional culture that emphasizes seeking good, short-term, company-focused performance appears to be in conflict with the objectives of supply chain management. Supply chain management focuses on positioning the virtual organization in such a way that all contributors in the value chain benefit. Effective supply chain management rests on the twin pillars of trust and communication (Grieco, 1989), and procurement and logistics professionals must be equipped with the necessary expertise in the critical functions of their own enterprise and fully understand how it affects the entire value chain.

A buyers’ market is an ideal situation in which to develop long-term strategies with key suppliers because buyers have leverage in negotiating cost, quality, certification of processes, acquisition and sharing of new technology and production competence, especially for recurrent transactions that require specialized processes (Ellram, 1994). In response to the intense global competition, mergers and acquisition that create redundant logistics capability, and new information technology, firms may adopt supply chain management to move beyond mere cost reduction into the domain of real manufacturing efficiency (La Londe and Masters, 1994; Porter, 1994).

In recent years, the rapid development of client/server supply chain management software that includes a completely integrated supply chain management and electronic commerce component also aids in the evolution of supply chain management (King, 1996; Semich, 1994). Sharing information with supply chain partners through Electronic Data Interchange (EDI) is also a critical
component of supply chain management (Ellram et al., 1989). EDI is not just an electronic ordering system; it can integrate stocking, logistics, materials acquisition, shipping and other functions to create a more proactive and effective style of business management and customer responsiveness (Mische, 1992). The direct transfer of information between retailers and vendors aids in improving logistics efficiency and supporting increased customer service levels. Besides the ability to increase accuracy and timeliness of information transferred, EDI may improve cycle reliability and help to decrease cycle time.

Superior logistics management aids in successful supply chain management adoption. When coupled with an information system such as EDI, the transportation system becomes the warehouse. Orders can be consolidated in the computer and carriers can be coordinated for JIT delivery. Successful application of JIT principles in supply chain management requires agreements that strengthen buyer–supplier cooperation so that supply strategy is directly links to the firm’s overall strategy (Polakoff, 1992; Romero, 1991). As discussed above, JIT purchasing emphasizes reduction in inventory levels throughout the value chain (Adair-Heeley, 1988), instead of simply pushing back inventories on suppliers.

The traditional buyer–supplier relationship that emphasizes multiple sourcing, competitive bidding and use of short-term contracts has been characterized as adversarial (Hahn et al., 1986). It tends to focus on the short-term view of the purchase price and quality of a product instead of the long-term capabilities of the suppliers. However, there is a shift to developing long-term supplier capabilities in response to escalating competition, shorter product life cycles, and rapidly changing customer demands (Watts and Hahn, 1993, Shepherd, 1994). Although much has been written on buyer-supplier relationships (Heide and John, 1990; Ellram, 1991), there is a lack of empirical models for establishing a successful buyer-supplier partnership.

6. Supplier certification

Another issue that has often been discussed in the supply chain management literature is supplier certification, primarily focused on purchased raw materials, components and final goods, and in a few cases, on service suppliers (Schneider et al., 1995, Jancsurak, 1992). Operating a supplier certification programme appears is inevitable for a JIT manufacturer that operates with no excess inventory and needs to deliver to the point of use (Maass, 1988; Burgess, 1987). The ultimate goal of supplier certification is quality at the source and to reduce inventory, non-conformance, communication errors, duplicate testing, receiving inspection, deliver to point of use, cycle time, and the ability to shift focus from process input to output. An early work in supplier certification is by Grieco (1989) who proposes a five-phase supplier certification process. Eventually, supplier certification extends to include the logistics function, Gibson et al. (1995) describe the utilization of supplier certification to certify carriers and its benefits. Inman and Hubler (1992) carry the concept of supplier certification further by suggesting that manufacturers should consider certification of supplier’s product as well as its processes to avoid the situation where the supplier’s product falls well within customer specifications but fails to perform as required.

The literature base reveals three basic approaches to certify suppliers. Most US firms develop their own certification systems. A growing number are adopting standardized systems, primarily based on ISO 9000 or Baldrige Award criteria in an effort to streamline the certification process. However, a small group of organizations encourage suppliers to pursue self-certification (Maass et al., 1990). Proprietary systems allow the organization to customize the certification criteria and process, but require extensive development time and investment. Utilizing ISO 9000 removes the redundant elements of proprietary programs and reduces the need for preliminary qualification and site visits. Unfortunately, it is costly for suppliers to go through the ISO 9000 process with no guarantee of continuous product improvement, only the assurance that a documented quality system process is in place. As a result, some organizations develop in-house certification programs that combine certain ISO 9000 criteria with their own.

A related issue in supply chain management literature is supplier development, which can be defined as any effort of a buying firm with its supplier to increase the capabilities of the supplier (Krause and Ellram, 1997). It involves a long-term cooperative effort between a buying firm and its suppliers to upgrade the suppliers’ technical, quality, delivery and cost capabilities and to foster ongoing improvements. Hahn et al. (1990) propose a conceptual model to describe the organizational decision process associated with a supplier development program to serve as a guideline for designing such a program that can link purchasing strategy with a firm’s overall corporate competitive strategy. Subsequently, Watts and Hahn (1993) have concluded that formal supplier evaluation is crucial to the supplier development process.

7. Conclusion

The development and evolution of supply chain management owes much to the purchasing and supply management, and transportation and logistics literature. As such, the term ‘supply chain management’ is used in many ways, but three distinct descriptions dominate prior literature. Firstly, supply chain management may be used as a handy synonym to describe the purchasing
and supply activities of manufacturers. Secondly, it may be used to describe the transportation and logistics functions of the merchants and retailers. Finally, it may be used to describe all the value-adding activities from the raw materials extractor to the end users, and including recycling. However, it should be no surprise that the various descriptions overlap in some cases.

Genuinely integrated supply chain management requires a massive commitment by all members of the value chain. For example, the buyer may have to overhaul its purchasing process and integrate a supplier’s engineering teams and product designers directly into its own decision-making process. Since the cost of changing a partner can be huge, the purchasing firm can become a captive of its suppliers. Poor supplier performance is not the only risk; the purchaser needs to worry about the possibility of a supplier passing trade secrets to competitors or with its new-found abilities, venturing out on its own. Trusting suppliers may be good business sense, but for many firms hostility may still be more profitable, even in the long run. There are many other pitfalls of supply chain management, such as conflicting objectives and mission, inadequate definition of customer service, and separation of supply chain design from operational decisions (Lee and Billington, 1992).

Integrating the purchasing and logistics functions with other key corporate functions can create a closely linked set of manufacturing and distribution processes. It allows organizations to deliver products and services to both internal and external customers in a more timely and effective manner. To further exploit the competitive advantage associated with integrated processes, some leading organizations adopt a strategic approach to managing the value chain, such as forming strategic alliances with suppliers and distributors instead of vertical integrating; inter-company competition is elevated to inter-supply chain competition. Although supply chain management developed along two separate paths, it has eventually merged into a unified body of literature with a common goal of waste elimination and increased efficiency.

References


