Supply Chain Management: More Than a New Name for Logistics

Martha C. Cooper, Douglas M. Lambert and Janus D. Pagh
The Ohio State University

Practitioners and educators have variously addressed the concept of supply chain management (SCM) as an extension of logistics, the same as logistics, or as an all-encompassing approach to business integration. Based on a review of the literature and management practice, it is clear that there is a need for some level of coordination of activities and processes within and between organizations in the supply chain that extends beyond logistics. We believe that this is what should be called SCM. This article proposes a conceptual model that provides guidance for future supply chain decision-making and research.

What exactly is supply chain management (SCM) and how is it different from logistics management? In 1986, the Council of Logistics Management (CLM), the leading-edge professional organization with a current membership of over 13,000, 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 [1].

There is definitely a need for the integration of business operations in the supply chain that goes beyond logistics.

How is SCM different from this definition of logistics? Many of those writing, talking, and offering seminars about SCM are using the words as a synonym for logistics. And generally, academia is following rather than leading business practice regarding SCM. Consultants proposed the term and educators proposed structure and theory for executing SCM. The term "supply chain management" is relatively new in the literature, appearing first in 1982 [2]. About 1990, academics first described SCM from a theoretical standpoint to clarify the difference from more traditional approaches to managing the flow of materials and the associated flow of information [3].

The original use of the term emphasized a reduction in inventory both within and across firms but that initial perspective has been broadening. The term "logistics" has also had various interpretations. From some of the statements on SCM, it appears that SCM is logistics taken across inter-organizational boundaries. However, the CLM definition makes it clear that logistics, properly implemented, was always intended to be from dirt-to-dirt and most textbooks in the 1980's and 1990's have taken this perspective [4]. Other views of SCM include more functions than logistics being integrated across firm boundaries.

There is definitely a need for the integration of business operations in the supply chain that goes beyond logistics. New product development is perhaps the clearest example of this since all aspects of business ideally should be involved, including marketing for the concept, research and development for the actual formulation, manufacturing and logistics for their respective capabilities, and finance for funding.

In addition to these internal functions there is a need to include external organizations in the product development process in order to reduce the time-to-market on new product introductions. Early supplier involvement in the product development process is important and, in some cases, second tier suppliers. Further, consumer and customer involvement is necessary. It should be apparent that logistics is never going to own the product development process or the customer for that

matter. The integration of business processes across the supply chain is what we are calling supply chain management.

Taking logistics to the supply chain is not the same as SCM. Manufacturing and operation researchers have also adopted the term SCM and are using it in their writing [5]. Many supply chain seminars appear to be basically manufacturing or logistics seminars repackaged. There is no need to replace the word logistics with SCM. In fact, it creates more confusion in a still emerging field and detracts from the need to achieve the much broader level of integration of firms.

In this paper we use the definition of supply chain management developed by members of The International Center for Competitive Excellence in 1994 [6]:

> Supply chain management is the integration of business processes from end user through original suppliers that provides products, services and information that add value for customers.

We begin this article with a brief review of the literature that illustrates the confusion that exists. A conceptual framework is proposed, which considers SCM as a broader discipline than just integrated logistics management properly implemented. Finally, some suggestions for future research are outlined.

SCM: A Brief Literature Review

The concept of SCM first appeared in the literature in the mid-1980's [7]. However, the fundamental assumptions on which SCM rests are significantly older. They include: managing inter-organizational operations, which can be traced back to channels research in the 1960's [8]; systems integration research in the 1960's [9]; and the more recent ideas of sharing information and exchange of inventory for information [10].

The SCM literature can be categorized in a number of ways, but in this article, it will be examined in relation to: the scope of the supply chain; inter-organizational integration; objectives; and, the evolution toward an integrated supply chain. These characteristics were selected for the specific purpose of comparing SCM with integrated logistics management.

Scope of the Supply Chain

The scope of the supply chain can be defined in terms of the number of firms involved in the supply chain and the activities and functions involved. The original scope of the supply chain has been across firms, although some firms start by integrating within their organizations before expanding to other firms. Early writers stated that SCM covers the flow of goods from supplier through manufacturing and distribution chains to the end user [11]. Stevens [12] expanded this scope further upstream to the source of supply and down to the point of consumption (from dirt to dirt), which is the span of logistics defined by CLM. Stevens' understanding of the scope of the supply chain is the most commonly accepted in the literature.

There is no need to replace the word logistics with SCM. In fact, it creates more confusion in a still emerging field and detracts from the need to achieve the much broader level of integration of firms.

While some authors have addressed the entire supply chain, others have focused on parts of it, across or within firms. Specific functions tend to focus on their connection with other firms. For example, purchasing personnel may view SCM as managing suppliers [13]. Macbeth and Ferguson stated that the basic concept of supply chains extends the world-class manufacturing models across the former organizational boundaries [14]. Some practitioner-based articles have taken a narrow view of SCM by primarily focusing on redesigning the internal worldwide manufacturing and distribution network to achieve significant savings and increased customer service [15]. The editor of a new publication devoted to SCM stated that it is "alone among publications" and he defined SCM as "successful coordination and integration of all those activities associated with moving goods from the raw materials stage through to the end user, for sustainable competitive advantage. This includes activities like systems management, sourcing and procurement, production scheduling, order processing, inventory management, transportation, warehousing, and customer service" [16]. This definition is remarkably close to the CLM view of logistics.

Supply chain management is the integration of business processes from end user through original suppliers that provides products, services and information that add value for customers.

The second scope issue is how many functions and activities should be included in SCM. The greatest agreement among authors is the need for information systems integration [17], as well as planning and control activities [18]. Bowersox [19], Cavinato [20], and Mentzer [21] indicate

SCM partnerships will likely involve more processes and functions than integrated logistics management partnerships.

that SCM also may include: cooperative efforts between chain members in such areas as marketing research, promotion, sales and information gathering, research and development, product design, and total system/value analysis. Product development, operations management, manufacturing operations, and customer service management are also included in the implementation of SCM in leading-edge companies, such as 3M [22], Hewlett-Packard [23], Digital Equipment Corporation [24], Xerox [25], and others [26].

Inter-organizational Integration

To implement SCM, some level of coordination across organizational boundaries is needed. This includes integration of processes and functions within organizations and across the supply chain. A driving force behind SCM is the recognition that suboptimatization occurs if each organization in the supply chain attempts to optimize its own results rather than to integrate its goals and activities with other organizations to optimize the results of the chain [27]. Organizational relationships tie firms to each other and may tie their success to the chain as a whole [28]. According to Christopher, "Leading-edge companies have realized that the real competition is not company against company, but rather supply chain against supply chain" [29].

One central question is how to integrate the supply chain. Cooper, Ellram, Gardner, and Hanks [30] identify four possible means of managing the integration of a supply chain: dyadic, channel integrator, analytic optimization, and keiretsu. A dyadic approach concentrates on one level up or one level down and is often a starting place for developing an integrated supply chain. The other three can go further up/or down the supply chain. The method of management differs depending on the relative strength of the supply chain members and use of computerized models such as in analytic optimization.

The importance of building and managing relationships among members of the supply chain has been addressed by many authors [31]. An integrated supply chain of partners without common ownership must be managed in a different manner from that of a single monolithic bureaucracy [32]. Different forms of relationships are appropriate and not all links in the supply chain need to be partnerships [33]. SCM partnerships will likely involve more processes and functions than integrated logistics management partnerships.

Objectives of SCM

Houlihan and Jones and Riley [34] stated that the objective of SCM is to "lower the total amount of resources required to provide the necessary level of customer service to a specific segment". Other writers have indicated objectives supportive of this overall goal [35], including synchronizing the requirements of the customer with the flow of materials from suppliers [36], reducing inventory investment in the chain, increasing customer service, building competitive advantage for the supply chain [37], and value [38].

Toward an Integrated Supply Chain

After examining the motives and reasons for forming or joining an integrated supply chain, the company must address how to establish and manage the supply chain. A four-stage model was presented by Stevens [39] of increasing integration from Stage A, complete functional independence, to Stage D, inter-organizational integration embracing tier 1 suppliers and customers. Stevens characterizes Stage D as being more than just extending the scope of the chain alone. It embodies a change from product-orientation to customer-orientation, ensuring that the company is attuned to the customer's requirements, and a change in the relationship between entities in the chain from the adversarial attitude of conflict to one of mutual support and cooperation.

Based on the principles of Business Process Management and Business Process Redesign, Hewitt expanded Stevens' model by suggesting an emerging new fifth stage (Stage E), which is integrated intra-company and inter-company supply chain process management. The objective of optimization initiatives, in this stage, is total business process efficiency and effectiveness maximization [40].

Cooper and Ellram [41] addressed the integration issue by suggesting a framework to examine how characteristics of SCM influence a firm's decision to form or enter an integrated supply chain; to plan for the

formation of the supply chain; and, to manage the on-going operation of the supply chain. The identified characteristics may have different levels of importance at different stages in the process of establishing and managing supply chains.

A three-stage model for achieving an integrated supply chain was suggested by Scott and Westbrook. The model included: 1) a mapping stage, to analyze lead times and inventory levels throughout the supply chain, and thus indicate the current competitive stage of the chain and potential improvements; 2) a positioning stage, to identify opportunities for collaborative activities between chain members; and 3) a selection of action stage, to increase the competitiveness of the chain. An extensive list of operational tools was provided in order to enhance supply chain effectiveness [42]. Towill, Naim and Wikner [43] presented a similar operations management approach that focused on ways of reducing demand amplification in the supply chain.

Commonalties in the Literature

A review of the SCM literature reveals that confusion exists in terms of what SCM actually is. Nevertheless, some commonalities do seem to exist:

- It evolves through several stages of increasing intra- and inter-organizational integration and coordination; and, in its broadest sense and implementation, it spans the entire chain from initial source (supplier's supplier, etc.) to ultimate consumer (customer's customer, etc.).
- It potentially involves many independent organizations. Thus, managing intra- and inter-organizational relationships is of essential importance.
- It includes the bidirectional flow of products (materials and services) and information, the associated managerial and operational activities.
- It seeks to fulfill the goals of providing high customer value with an appropriate use of resources, and to build competitive chain advantages.

Distinguishing SCM from Logistics

One purpose of this paper is to compare the concept of SCM to a contemporary understanding of integrated logistics management. The 1986 CLM definition of logistics has been augmented to include services along with goods and information movement. In addition to conforming to customer requirements, others view the output of the logistics process as creating value for the ultimate customer [44] and contributing to current and future profitability of the firm [45].

A framework for logistics management proposed by Novack, Rinehart and Wells is based on two important assumptions: the need for integration of logistics activities throughout the firm and supply chain, and the need for linkages across the disciplines of production/operations, transportation, and physical distribution, marketing and purchasing [46].

From a comparison of the understanding of integrated logistics management and the characteristics of SCM as described by most authors, it is unclear what specific characteristics differentiate the two disciplines. It is adding confusion to the discipline of logistics to conceptualize SCM as implementing logistics across independent organizations in the supply chain.

In conclusion, for many, the contemporary understanding of SCM is not appreciably different from the understanding of integrated logistics management, however broadly logistics is defined [47]. The relevant question that we need to gain consensus on is whether SCM simply is new words for properly implemented logistics across organizations, or if we need to reconceptualize and extend the concept beyond the logistics domain. Executives in the leading corporations implementing state-of-the-art SCM understand that SCM encompasses more than logistics.

Executives in the leading corporations implementing state-of-the-art SCM understand that SCM encompasses more than logistics.

The Need for a New Understanding

A new and broad understanding of SCM seems to be emerging. Christopher defines the supply chain as "the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer" [48]. Giunipero and Brand state that "in its broadest context SCM is a strategic management tool used to enhance overall customer satisfaction that is intended to improve a firm's competitiveness and

profitability". Additionally, "CEOs of companies leading the drive to implement SCM visualize the necessity to go beyond the logistics function and focus on making business processes more effective and efficient" [49].

At the heart of this emerging new understanding are two significant changes. First, today's widely acknowledged and implemented process-orientation of business work activities de-emphasizes the functional structure within and between organizations. Second is the significant change in the perception of SCM as being more than just logistics. It can be the management of all business processes. Companies have realized that it is not only the logistics process that cuts across supply chains, but in principle, all business processes. Thus, business processes become supply chain business processes, penetrating intra- and inter-organizational boundaries, and should be managed as such.

The emerging concept of SCM follows a logical progression. In order to minimize inventory in the supply chain, information systems must be able to track and communicate production and customer requirements at different levels in the chain. Marketing and customer service must know product availability. Thus, all functions or business processes need some level of upstream and/or downstream coordination and visibility.

Supply chain business processes can cross intra- and inter-organizational boundaries, independently of formal structure.

From the above discussion, it seems clear that there is a need to expand and re-conceptualize the definition and understanding of SCM. The new vision of SCM ideally embraces all business processes cutting across all organizations within the supply chain, from initial point of supply to the ultimate point of consumption. A framework that is in agreement with this new understanding is introduced in the following section.

A New Conceptual Framework of SCM

The SCM framework consists of three major and closely related elements: business processes, management components, and the structure of the supply chain...

First the general structure is presented, followed by a detailed discussion of each element of the structure. The parts are drawn together at the conclusion of this section.

General Structure of the Framework

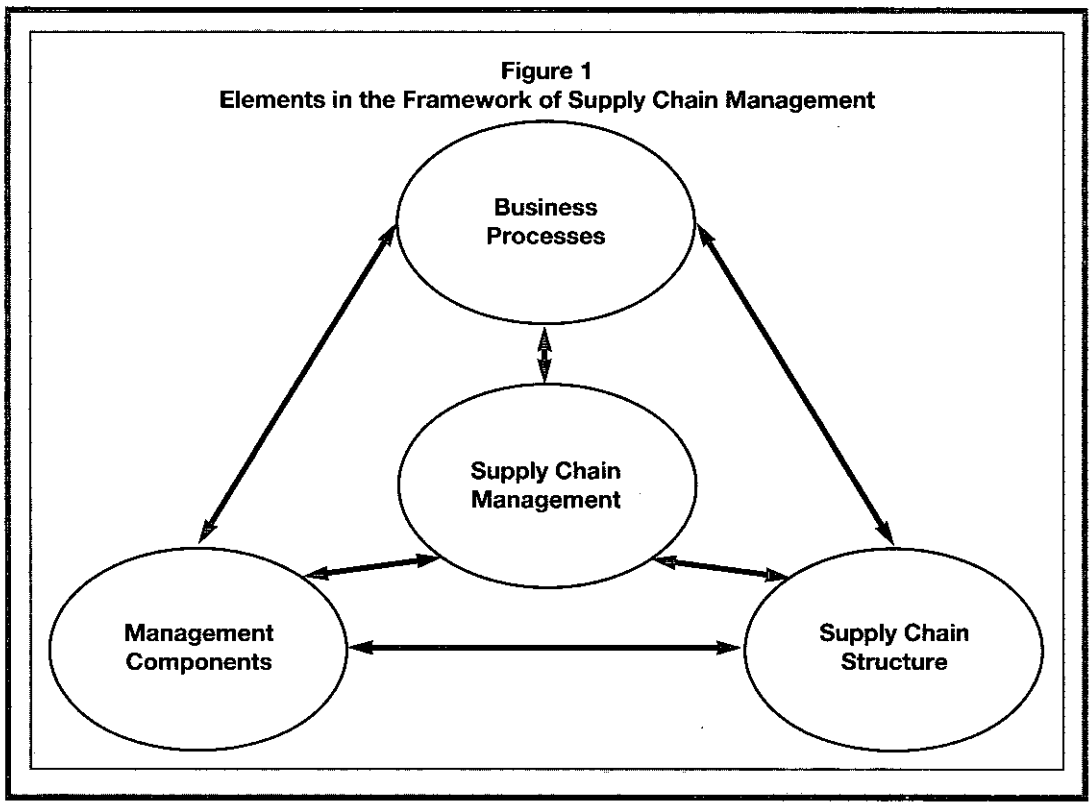
The SCM framework consists of three major and closely related elements: business processes, management components, and the structure of the supply chain (see Figure 1). Business processes are the activities that produce a specific output of value to the customer. The management components are the components by which the business processes are structured and managed. The supply chain structure is the configuration of companies within the supply chain.

This conceptualization moves the SCM philosophy toward closing the gap between leading-edge practitioners' implementation of SCM and that of academia. Each of the three interrelated elements that constitute the framework is now described.

Processes in the Supply Chain

The concept of a business process is defined and examples of possible supply chain processes are identified and described. Davenport [50] defines processes as "a structured and measured set of activities designed to produce a specific output for a particular customer or market". A process is a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs, a structure for action. Supply chain business processes can cross intra- and inter-organizational boundaries, independently of formal structure.

Hewitt [51] found that executives identified up to fourteen business processes. The initial business processes identified by the International Center for Competitive Excellence are presented to provide an example. There are seven processes: Customer Relationship Management, Customer Service Management, Demand Management, Order Fulfillment, Manufacturing Flow Management, Procurement, Product Development and Commercialization. Customer Relationship Management involves identifying key customer target markets and then developing and implementing programs with key customers. Customer Service provides one face to the customer using on-line information systems with current information about the order, as well as production and distribution status. This process also provides product information to the customer. Demand Management recognizes that the flow of materials and products is intertwined



with customer demand. Forecasting and reducing variability are key concerns of this process. Order Fulfillment provides for timely and accurate delivery of customer orders with the objective of exceeding customer need dates. Manufacturing Flow Management is concerned with making the products that the customer wants. This is resulting in more flexible manufacturing processes and an effort to have the right mix of products.

The Procurement process focuses on managing relationships with strategic suppliers rather than the traditional bid and buy system. The objective is to support the manufacturing flow management process and new product development. Product Development and Commercialization is important as new products are a critical part of the firm's success. Key customers and suppliers are integrated into the development process to reduce time to market.

The key differences between the traditional functions, which have similar names in some cases, and the process approach are that the focus of every process is on meeting the customer's requirements and that the firm is organized around these processes. The customer focus has not always happened in companies where the silo mentality has prevailed [52].

Supply Chain Management Components

An essential underlying premise of the SCM framework is that there are certain management components that are common across all business processes [53] and members of the supply chain. It is the management of these common components that is important, since they determine how the business processes, and thus the supply chain, are managed and structured.

Both the supply chain and the business process literatures suggest possible components that must receive management attention. Table 1 presents components suggested in the supply chain literature [54]. These span a range from strategic to operational, physical flow to information flow, tangible structures to organizational structures and cultures. Similar components are found in the business process re-engineering literature as listed in Table 1[55]. The components have been stated in consistent language for comparison purposes.

Hewitt [56], based on panel consensus from a set of over 30 successful supply chain redesign practitioners, described the need to change information flow structure, decision and authority structure, and work structure. He stated that true process redesign is only likely to be successful if it is recognized as a

...true process redesign is only likely to be successful if it is recognized as a multidimensional activity, simultaneously and explicitly addressing all SCM components.

multidimensional activity, simultaneously and explicitly addressing all SCM components.

Table 2 provides a synthesis of the literatures [57]. Ten management components are suggested. The first six are more tangible and measurable in terms of direct affect on the organization and supply chain, and also easier to change. The last four also have great effects on the success of an organization or supply chain but are more difficult to assess and alter in the short run. Each proposed component is briefly described next. Each component can have several sub-components whose importance can vary depending on the process being managed.

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 [58]. The control aspects can be operationalized as the best performance metrics for measuring supply chain success.

The work structure 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. 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.

Product flow facility structure refers to the network structure for sourcing, manufacturing, and distribution across the supply chain. With reductions in inventory,

Table 1
Key Components of Supply Chain Management

A Supply Chain Management Perspective	A Business Process Reengineering Perspective
Houlihan (1985):	**Hammer & Champy (1993):**
• Planning and control structure	• Process (work) structure
• Product flow facility structure	• Organization (job) structure
• Information flow (IT-structure)	• Values and attitudes
• Values and attitudes	• Management and evaluation structure
• Organizational culture	
• Management methods	**Andrews & Stalick (1993):**
	• Process (work) structure
Stevens (1989):	• Organization structure
• Process (work) structure	• Technology structure
• Planning and control structure	• Reward structure
• Product flow facility structure	• Measurement system
• Information flow (IT-structure)	• Management methods
• Organization structure	• Organizational culture
• Management methods	• Political power
• Power and leadership structure	• Individual belief systems
Cooper & Ellram (1990 & 1993):	**Hewitt (1994):**
• Process (work) structure	• Process (work) structure
• Planning and control structure	• Information flow (IT-structure)
• Product flow facility structure	• Decision authority
• Information flow (IT-structure)	
• Risk and reward structure	**MIT-model by Towers (1994):**
• Leadership structure	• Process (work) structure
• Corporate philosophies	• Organization and skill structure
	• Technology structure
	• Values and behavior
	• Management philosophies and decision structure

fewer warehouses would be needed. Since inventory is necessary in the system, some supply chain members may keep a disproportionate amount of inventory. As it is less expensive to have unfinished or semi-finished goods in inventory than finished goods, upstream members may bear more of this burden. Rationalizing the supply chain network has implications for all members.

Virtually every author indicates that the information flow facility structure is key. The kind of information passed among channel 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.

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

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.

The power and leadership structure across the supply chain will affect its form. One strong channel leader will drive the direction of the chain. In most chains studied to date, there are one or two strong leaders among the firms. The exercise of power, or lack of, can affect the level of commitment of other channel members. Forced participation will encourage exit behavior, given the opportunity [59].

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

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

The components identified span the range of management decision-making within a firm. These components are extended to apply to the management of a supply chain. While similarities exist, differences are exacerbated by having to deal with multiple independent entities.

Table 2
Identified Supply Chain Management Components Based on the Literature

	Planning and Control	Work structure	Organi-zation structure	Product flow facility structure	Infor-mation flow facility structure	Product structure	Manage-ment methods	Power and leader-ship structure	Risk and reward structure	Culture and attitude
Houlihan (1985)	✘	✘	✘	✘	✘	✘	✘			✘
Jones and Riley (1985)	✘	✘	✘	✘	✘		✘			✘
Stevens (1989)	✘	✘	✘	✘	✘					✘
Ellram and Cooper (1990)	✘	✘		✘	✘				✘	
Lee and Billington (1992)		✘		✘	✘					
Cooper and Ellram (1993)	✘	✘	✘	✘	✘		✘	✘	✘	✘
Hewitt (1994)	✘	✘	✘	✘	✘				✘	
Scott and Westbrook (1991)		✘		✘	✘	✘				
Towill, Naim and Wikner (1992)	✘	✘		✘	✘	✘				
Hammer (1990)	✘	✘	✘	✘	✘		✘		✘	✘
Andrews and Stalick (1994)	✘	✘	✘		✘		✘	✘	✘	✘
Cooper and Gardner (1993)	✘	✘		✘	✘				✘	✘
Lambert, Emmelhainz and Gardner (1996)	✘				✘		✘		✘	✘

Structure of the Supply Chain

All firms participate in a supply chain from the raw materials to the ultimate consumer. How much of this supply chain needs to be managed depends on several factors, such as the complexity of the product, the number of available suppliers, and the availability of raw materials. Dimensions to consider include the length of the supply chain and the number of suppliers and customers at each level. Here, the value tree analogy may be helpful [60]. It would be rare for a firm to participate in only one supply chain. For most manufacturers, the supply chain looks less like a pipeline or chain than an uprooted tree. The question is how many of these branches and roots need to be managed.

The closeness of the relationship at different points in the supply chain will differ. More partnership characteristics will probably be exhibited with key suppliers or customers. Critical components may need closer management further up the channel to avoid shutting down production lines. A second supplier may be recommended to maintain a source of supply for production. Sharing information with competitors then becomes an issue.

If there are many components for a product, it will take considerable management time for all of these relationships to be partnerships. More than likely, the firms will need to choose the level of partnership appropriate for particular supply chain links [61]. Not all links throughout the supply chain should be closely coordinated and integrated. The most appropriate relationship is the one that best fits the specific set of circumstances [62].

...the firms will need to choose the level of partnership appropriate for particular supply chain links.

Determining which parts of the supply chain deserve management attention depends on a number of factors, which must be weighed against firm capabilities and the importance to the firm.

Putting It All Together

A new conceptualization of supply chain management is proposed that includes three elements: the business processes, the management components, and the structure of the chain. An example of how this might apply to a firm is suggested in Figure 2, which depicts the supply chain across the top. The processes cut across the functions within the firm and also across other firms within the supply chain. Although not shown in Figure 2, each firm in the supply chain will have its own set of functional silos that must be related to each key supply chain process. The management components are listed at the bottom.

Suggestions for Future Research

There are several research questions to be raised to advance the understanding of supply chain management and to improve its practice. Some of these are listed below.

- What are the relevant supply chain processes and are they the same for all companies? The proposed framework suggests that all business processes are part of supply chain management. Research is needed to determine whether these are the relevant business processes and whether the processes are consistent across firms. Also, will the processes be consistent over time or will they change as a result of a change in strategy?
- What is the intra- and inter-organizational scope of processes? How far up/down stream should they extend? Should all processes cut across the whole supply chain from dirt-to-dirt, or do different processes follow different links, have different scope and sometimes jump links? What determinants and supply chain characteristics will influence these decisions?
- On what level should processes and management components be integrated between firms and throughout the supply chain? One approach would be to strive for the highest level of integration at all links in the chain. The partnership literature suggests this is not appropriate nor attainable. Determining the level of integration of the management components may differ by conditions, such as complexity of the product and compatibility of corporate cultures.
- What are the relevant supply chain management components? Have all of the relevant management sub-components been identified? Should there be more or fewer components? Is it necessary to identify a specific set of management components related to each key business process, or is there a universal set of management components?
- What is the most appropriate form for the supply chain? Is the supply chain, the

tree, or some other metaphor a better representation of the system of companies bringing value to the customer? Under what conditions should the channel be integrated and how far up or down the channel should it be integrated? Will the level of integration be the same for all processes or will it differ depending on the importance of the process in achieving strategic goals?

- What metrics should be used to evaluate the performance of an entire supply chain? What are the potential implementation barriers, and how should they be overcome?
- Is SCM the best term for this integrated management form? SCM was first proposed in 1982. More recently, the term demand chain has been suggested to provide additional focus on the customer. Since the end consumer is the focus of the entire supply chain, all members of the chain are suppliers to the end user. Hence supply chain may still be the appropriate terminology. The value tree is another possible term. In an attempt to capture and conceptualize the broader perspective, Lambert and Stock introduced the concept of Integrated Channel Management (ICM), and described it as "the coordination of all activities, beyond just the traditional logistics activities, between channel members that result in a high level of customer satisfaction for end-users" [63].

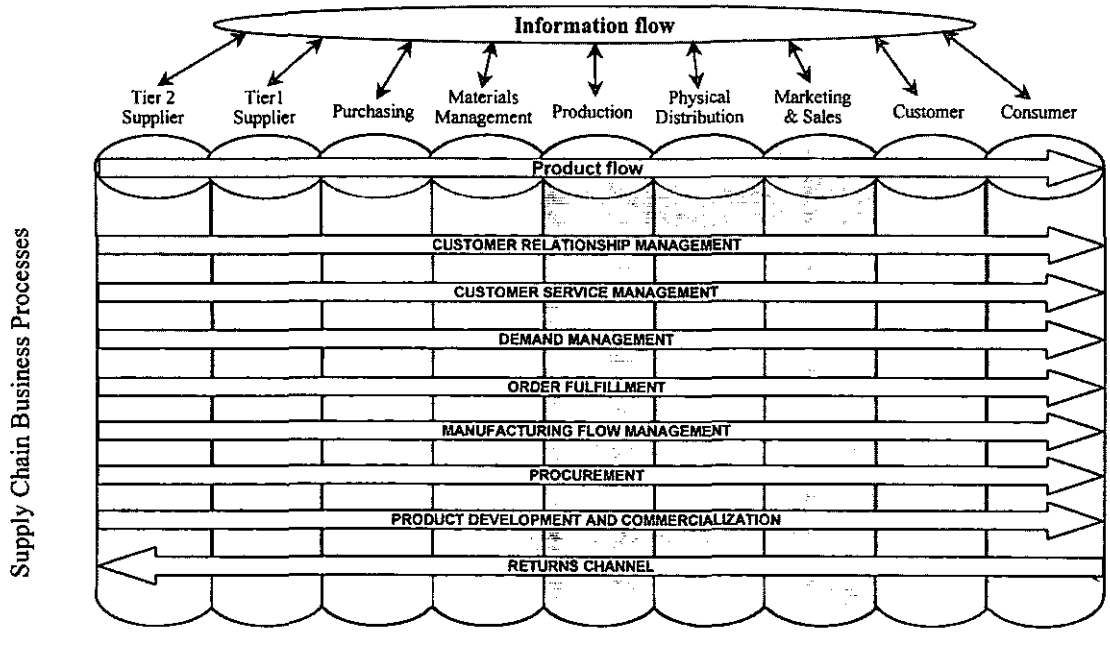
Conclusion

The literature and practice indicate that there is not a consistent view of what SCM really is or should be. More recent writers indicate that it transcends firms, functions, and business processes. This makes it more than just logistics. To achieve the objective of integrated SCM, most, if not all functions and business processes are involved.

To achieve the objective of integrated SCM, most, if not all functions and business processes are involved.

Hewitt [64] calls for development of theory and principles to guide management to close the gap between the practice and the theory of SCM. A three-part framework

Figure 2
A Framework of Supply Chain Management



Supply Chain Management Components

- Planning and Control
- Work structure
- Organization structure
- Product flow facility structure
- Information flow facility (IT) structure
- Product structure
- Management methods
- Power and leadership structure
- Risk and reward structure
- Culture and attitude

has been proposed which integrates the potential structures of supply chains, the business processes, and the key components for management attention.

Many of those writing, talking and offering seminars about supply chain management are using the words as a synonym for logistics. And, generally academia is following rather than leading business practice. There is definitely a need for the integration of business operations in the supply chain that goes beyond logistics. New product development is perhaps the clearest example of this. Logistics is never going to own the product development process or the customer for that matter. The integration of all key business processes across the supply chain is what we are calling supply chain management. Research is needed to define and expand the boundaries of supply chain management.

References

[1] Council of Logistics Management, *What is it All About?,* Oak Brook, IL, 1986.

[2] Oliver, R. Keith and Michael D. Webber, "Supply-Chain Management: Logistics Catches Up with Strategy," *Outlook,* 1982, cit. Martin Christopher, *Logistics, The Strategic Issues,* London: Chapman and Hall, 1992.

[3] Ellram, Lisa M. and Martha C. Cooper, "Supply Chain Management, Partnership, and the Shipper -Third Party Relationship," *The International Journal of Logistics Management,* Vol. 1, No. 2 (1990), pp. 1-10.

[4] Lambert, Douglas M. and James R. Stock, *Strategic Logistics Management,* 3. ed., Richard D. Irwin, Inc., 1993; John J. Coyle, Edward J. Bardi, and Joseph L. Cavinato, *Transportation,* 3. Ed., St. Paul: West Publishing Company, 1990; and, Donald J. Bowersox, David J. Closs, and Omar K. Helferich, *Logistical Management,* 3. ed., p. 16., New York: Macmillian Publishing Company, 1986.

[5] Fisher, Marshall L., "What is the Right Supply Chain for Your Product?" *Harvard Business Review,* Vol. 75, No. 2 March-April (1997), pp. 105-116; Hau L. Lee and Corey Billington, "Managing Supply Chain Inventory: Pitfalls and Opportunities," *Sloan Management Review,* Spring, 1992, pp. 65-73; Denis R. Towill, Mohamed M. Naim, and J. Wikner, "Industrial Dynamics Simulation Models in the Design of Supply Chains," *International Journal of Physical Distribution and Logistics Management,* Vol. 22, No. 5 (1992), pp. 3-13.

[6] The International Center for Competitive Excellence, University of North Florida, Douglas M. Lambert, co-coordinator, 1994. In 1996, this group moved with Lambert to The Ohio State University and changed its name to The Global Supply Chain Forum.

[7] Same as reference 2; John B. Houlihan, "International Supply Chain Management," *International Journal of Physical Distribution and Materials Management,* Vol. 15, No. 1 (1985), pp. 22-38; and, Thomas C. Jones, and Daniel W. Riley, "Using Inventory for Competitive Advantage through Supply Chain Management," *International Journal of Physical Distribution and Materials Management,* Vol. 15, No. 5 (1985), pp. 16-26.

[8] Bucklin, Louis P., *A Theory of Distribution Channel Structure,* Berkeley, CA: IBER Special Publications, 1966.

[9] Forrester, Jay W., *Principles of Systems,* Cambridge, MA: Wright-Allen Press, 1969; and, S. L. Optner, *Systems Analysis,* Englewood Cliffs, NJ: Prentice-Hall, Inc., 1960.

[10] La Londe, Bernard J., "A Reconfiguration of Logistics Systems in the 80's: Strategies and Challenges," *Journal of Business Logistics,* Vol. 4, No. 1 (1984), pp. 1-11.

[11] Same as reference 7.

[12] Stevens, Graham C., "Integration of the Supply Chain," *International Journal of Physical Distribution and Logistics Management,* Vol. 19, No. 8 (1989), pp. 3-8.

[13] Giunipero, Lawrence C. and Richard R. Brand, "Purchasing's Role in Supply Chain Management," *The International Journal of Logistics Management,* Vol. 7, No. 1 (1996), pp. 29-37.

[14] Macbeth, Douglas K. and Neil Ferguson, *Partnership Sourcing - An Integrated Supply Chain Management Approach,* London: Pitman Publishing, 1993.

[15] Davis, Tom, "Effective Supply

Chain Management," *Sloan Management Review,* Summer, 1993; and, Bruce C. Arntzen, Gerald G. Brown, Thomas P. Harrison, and Linda L. Trafton, "Global Supply Chain Management Digital Equipment Corporation," *Interface,* Vol. 25, No. 1 (1995), pp. 69-93.

[16] James A. Cooke, "In This Issue," *Supply Chain Management Review,* Vol. 1, No. 1 (Spring 1997), p. 3.

[17] Same as reference 3; same as reference 7; same as reference 12; and Lisa M. Ellram, "Supply Chain Management: The Industrial Organization Perspective," *International Journal of Physical Distribution and Logistics Management,* Vol. 21, No. 1 (1991), pp. 13-22.

[18] Jones and Riley (1985), op. cit; Lisa M. Ellram and Martha C. Cooper, "The Relationship Between Supply Chain Management and Keiretsu," *The International Journal of Logistics Management,* Vol. 4, No. 1 (1993), pp. 1-12; and Martha C. Cooper and Lisa M. Ellram, "Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy," *The International Journal of Logistics Management* (1993), Vol 4, No. 2, pp. 13-22.

[19] Bowersox, Donald J., "Lessons Learned from the World Class Leaders," *Supply Chain Management Review,* Vol. 1, No. 1 (1997), pp. 61-67.

[20] Cavinato, Joseph L., "A Total Cost/Value Model for Supply Chain Competitiveness," *Journal of Business Logistics,* Vol. 13, No. 2 (1992), pp. 285-301.

[21] Mentzer, J. Thomas, "Managing Channel Relations in the 21st Century," *Journal of Business Logistics,* Vol. 14, No. 1 (1993), pp. 27-42.

[22] Ridenhower, Gary, Presentation at the Global Supply Chain Forum, The Ohio State University, 1997.

[23] Davis (1993), op. cit; Hau L. Lee, Corey Billington, and Brent Carter, "Hewlett-Packard Gains Control of Inventory and Service through Design for Localization," *Interface,* Vol. 23, No. 4 (1993), pp. 1-11; and Hau L Lee, and Corey Billington, "The Evolution of Supply Chain Management Models and Practice at Hewlett-Packard," *Interface,* Vol. 25, No. 5 (1995), pp. 42-63.

[24] Arntzen, Brown, Harrison, and Trafton (1995), op. cit.

[25] Camp, Robert C. and Dan N. Colbert, "The Xerox Quest for Supply Chain Excellence," *Supply Chain Management Review,* Spring (1997), pp. 82-91.

[26] Levy, Michael L., "Lean Production in an International Supply Chain," *Sloan Management Review,* Winter (1997), pp. 94-102; Fisher (1997), op. cit.

[27] Same as reference 3.

[28] Schary, Philip B. and Tage Skjøtt-Larsen, *Managing the Global Supply Chain,* Copenhagen: Handelshøjskolens Forlag, Munksgaard International Publishers Ltd., 1995.

[29] Christopher, Martin, *Logistics and Supply Chain Management,* London: Pitman Publishing, 1992.

[30] Cooper, Martha C., Lisa M. Ellram, John T. Gardner and Albert M. Hanks, "Meshing Multiple Alliances," *Journal of Business Logistics,* Vol. 18, No. 1 (1997), pp. 67-89.

[31] Same as reference 3; Houlihan (1985), op. cit; Jones and Riley (1985), op. cit; Same as reference 12; Ellram (1991), op. cit; Douglas M. Lambert, Margaret A. Emmelhainz, and John T. Gardner, "Developing and Implementing Supply Chain Partnerships," *The International Journal of Logistics Management,* Vol. 7, No. 2 (1996), pp. 1-17; and, same as reference 30.

[32] Same as reference 14.

[33] Lambert, Emmelhainz, and Garder (1996), op. cit; same as reference 30; and, Cooper, Martha C. and John T. Gardner, "Good Business Relationships: More than just Partnerships or Strategic Alliances?" *The International Journal of Physical Distribution and Logistics Management,* Vol. 23, No. 6 (1993), pp. 14-26.

[34] Houlihan (1985), op. cit; and Jones and Riley (1985), op. cit.

[35] Same as reference 3; Joseph L. Cavinato, "Identifying Interfirm Total Cost Advantages for Supply Chain Competitiveness," *International Journal of Purchasing and Materials Management,* Fall (1991), pp. 10-15; Lee and Billington (1992), op. cit; Cooper and Ellram (1993), op. cit; and, Donald J. Bowersox and David C.

Closs, *Logistical Management: The Integrated Supply Chain Process, McGraw-Hill Series in Marketing,* New York: The McGraw-Hill Companies, INC. 1996.

[36] Same as reference 12.

[37] Cooper, Martha C., "International Supply Chain Management: Implications for the Bottom Line," *Proceedings of the Society of Logistics Engineers,* Hyattsville, MD: Society of Logistics Engineers (1993), pp. 57-60; Cooper and Ellram (1993), op. cit.

[38] Bernard J. La Londe, "Supply Chain Management: Myth or Reality?" *Supply Chain Management Review,* Spring, Vol. 1, Issue 1 (1997); and C. John Langley and Mary C. Holcomb, "Creating Logistics Customer Value," *Journal of Business Logistics,* Vol. 13, No. 2 (1992), pp. 1-27.

[39] Same as reference 12.

[40] Hewitt, Fred, "Supply Chain Redesign," *The International Journal of Logistics Management,* Vol. 5, No. 2 (1994), pp. 1-9.

[41] Cooper and Ellram (1993), op. cit.

[42] Scott, Charles and Roy Westbrook, "New Strategic Tools for Supply Chain Management," *International Journal of Physical Distribution and Logistics Management,* Vol. 21, No. 1 (1991), pp. 23-33.

[43] Towill, Naim, and Wikner (1992), op. cit.

[44] Langley and Holcomb (1992), op. cit.

[45] Cooper, James, *Logistics and Distribution Planning: Strategies for Management,* KOGAN PAGE, 2nd edition, 1994.

[46] Novack, Robert A., Lloyd M. Rinehart, and Michael V. Wells, "Rethinking Concept Foundations in Logistics Management," *Journal of Business Logistics,* Vol. 13, No. 2 (1992), pp. 233-267.

[47] Copacino, William C., *Supply Chain Management: The Basics and Beyond,* The St. Lucie Press/APICS Series on Resource Management, 1997.

[48] Same as reference 29.

[49] Same as reference 13.

[50] Davenport, Thomas H., *Process Innovation, Reengineering Work through Information Technology,* Boston, Massachusetts: Harvard Business School Press, 1st edition, 1993.

[51] Same as reference 40.

[52] Michael Hammer, I, "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review,* Vol. 68, No. 4 (1990), pp. 104-112; Michael Hammer and James Champy, *Reengineering the Corporation: a Manifesto for Business Revolution,* New York, NY, 1993; HarperBusiness, same as reference 40; and, Stephen Towers, *Business Process Re-engineering, A Practical Handbook for Executives,* Stanley Thorns, 1994.

[53] Andrews, Dorine C. and Susan K. Stalick, *Business Reengineering: The Survival Guide,* 1. ed., Englewood Cliffs, NJ : Yourdon Press, 1994;

[54] Same as reference 3; same as reference 12; Cooper and Ellram (1993), op. cit; and Houlihan (1985), op. cit.

[55] Hammer and Champy (1993), op. cit; Same as reference 53; Towers (1994) op. cit; and, same as reference 40.

[56] Same as reference 40.

[57] Houlihan (1985), op. cit; Jones, and Riley (1985), op. cit; same as reference 12; same as reference 3; Lee and Billington (1992), op. cit; Cooper and Ellram (1993), op. cit; same as reference 40; same as reference 42; Towill, Naim, and Wikner (1992), op. cit; Hammer (1990), op. cit; same as reference 53; Cooper and Gardner (1993), op. cit; Lambert, Emmelhainz, and Gardner (1997), op. cit.

[58] Cooper and Ellram (1993), op. cit.

[59] Macneil Ian R., *The New Social Contract, an Inquiry into Modern Contractual Relations,* New Haven, CT: Yale University Press, 1980; and Oliver E. Williamson, *Markets and Hierarchies: Analysis and Antitrust Implications,* New York, Free Press, 1975.

[60] Same as reference 30.

[61] Lambert, Emmelhainz, and Gardner (1997), op. cit.

[62] Cooper and Gardner (1993), op. cit; Lambert, Emmelhainz, and Gardner (1997), op. cit.

[63] Lambert and Stock (1993), op. cit.

[64] Same as reference 40.

Martha C. Cooper is Professor of Marketing and Logistics at The Ohio State University. She has worked in brand management and in sales. She has made numerous presentations at meetings of academic and professional organizations and continuing education programs in the U.S., Canada, Eastern and Western Europe, and Africa. Her research interests include supply chain management, partnership and other inter-firm relationships, the role of customer service in corporate strategy, international logistics, strategic planning for logistics, and cluster analysis. She holds a BS in Math/Computer Science and a MS in Industrial Administration from Purdue University. Her Ph.D. is from The Ohio State University. She can be reached at The Ohio State University, 421 Hagerty Hall, 1775 College Rd., Columbus, OH 43210-1399. Phone: (614) 292-5761. Fax: (614) 292-0440. E-mail: cooper.7@osu.edu

Douglas M. Lambert is the Raymond E. Mason Professor of Transportation and Logistics, Fisher College of Business, The Ohio State University. Prior to joining OSU, he was the Prime F. Osborn III Eminent Scholar Chair in Transportation, Professor of Marketing and Logistics, and Director of The International Center for Competitive Excellence at the University of North Florida. Dr. Lambert has served as a faculty member for over 400 executive development programs in North and South America, Europe, Asia and Australia. His publications include more than 100 articles and six books. In 1986, Dr. Lambert received the CLM Distinguished Service Award for his contributions to logistics management. He holds an honors BA and MBA from the University of Western Ontario and a Ph.D. from The Ohio State University. Dr. Lambert is co-editor of *The International Journal of Logistics Management*. He can be reached at The Ohio State University, 421 Hagerty Hall, 1775 College Rd., Columbus, OH 43210-1399. Phone (614) 292-0331. Fax: (614) 292-0440.

Janus D. Pagh is a Doctoral Candidate in the Department of Industrial Management and Engineering at The Technical University of Denmark. He holds a BS in Industrial Management and Engineering and a MS in Logistics from The Technical University of Denmark. Since the beginning of 1997, he has been a visiting scholar at The Ohio State University, Department of Logistics. His current area of research is supply chain management and integration of manufacturing and logistics strategies and structures. He can be reached at The Technical University of Denmark, Department of Industrial Management and Engineering, 2800 Lyngby, Denmark. Phone (+45)4525-4466. Fax: (+45) 4593-4467. E-mail: janusp@ipv.dtw.dk