

# Supply Chain Management: Implementation Issues and Research Opportunities

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In 1998, the Council of Logistics Management modified its definition of logistics to indicate that logistics is a subset of supply chain management and that the two terms are not synonymous. Now that this difference has been recognized by the premier logistics professional organization, the challenge is to determine how to successfully implement supply chain management. This paper concentrates on operationalizing the supply chain management framework suggested in a 1997 article. Case studies conducted at several companies and involving multiple members of supply chains are used to illustrate the concepts described.

One of the most significant changes in the paradigm of modern business management is that individual businesses no longer compete as solely autonomous entities, but rather as supply chains. Business management has entered the era of inter-network competition and the ultimate success of a single business will depend on management's ability to integrate the company's intricate network of business relationships [1].

Increasingly the management of multiple relationships across the supply chain is being referred to as supply chain management (SCM). Strictly speaking, however, the supply chain is not just a chain of businesses with one-to-one, business-to-business relationships, but a network of multiple businesses and relationships. SCM offers the opportunity to capture the synergy of intra- and inter-company integration and management. In that sense, SCM deals with total business process excellence and represents a new way of managing the business and relationships with other members of the supply chain.

While top management recognizes that managing the supply chain cannot be left to chance, these executives are searching for ways to successfully deal with the complexity of the task. Thus far, there has been relatively little guidance from academia, which has in general been

following rather than leading business practice [2]. There is a need for building theory and developing normative tools and methods for successful SCM practice.

In 1997, Cooper, Lambert, and Pagh offered a framework for understanding SCM, and raised a number of research questions [3]. In this paper, we begin to address some of these questions by adding substance to and operationalizing the framework. The exploratory empirical findings reported here are part of a research effort to develop a normative model that executives can use to capture the full potential of successful SCM. We have focused on what we believe to be the most essential variables for understanding and managing the supply chain. The definition of SCM used in this article was developed in 1994 and modified in 1998 by members of The Global Supply Chain Forum [4]:

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

This broader understanding of the SCM concept is illustrated in Figure 1, which depicts a simplified supply chain network structure, the information and product flows, and the key supply chain business processes

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penetrating functional silos within the company and the various corporate silos across the supply chain. Thus, business processes become supply chain business processes linked across intra- and inter-company boundaries.

### SCM versus Logistics

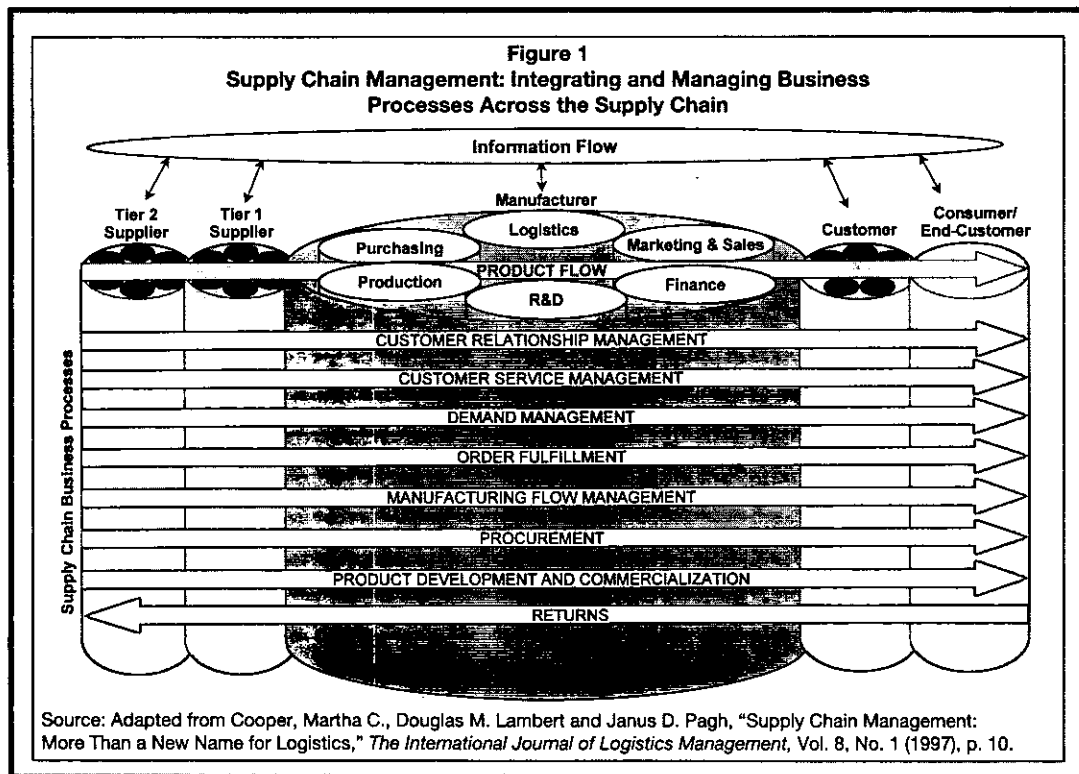
The term SCM was originally introduced by consultants in the early 1980's [5] and has subsequently gained tremendous attention [6]. Since the early 1990's, academics have attempted to give structure to SCM [7]. Bechtel and Jayaram [8] provided an extensive retrospective review of the literature and research on SCM. They identified generic schools of thought, and the major contributions and fundamental assumptions of SCM that must be challenged in the future.

Until recently most practitioners [9], consultants [10], and academics [11] viewed SCM as not appreciably different from the contemporary understanding of logistics management, as defined by the Council of Logistics Management in 1986 [12]. That is, SCM was viewed as logistics outside the firm to include customers and suppliers. Logistics as defined by the CLM always represented a supply chain orientation, "from point-of-

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

Executives in companies leading the drive to implement SCM visualize the necessity to integrate all key business operations across the supply chain [13]. This broader understanding of SCM is likewise the core message in the following statement by James E. Morehouse. "For companies to survive and prosper, they will need to operate their supply chains as extended enterprises with relationships which embrace business processes, from materials extraction to consumption [14]." Thus, the understanding of SCM has been re-conceptualized from integrating logistics across the supply chain to the current

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understanding of integrating and managing key business processes across the supply chain [15]. Based on this emerging distinction between SCM and logistics, in 1998, CLM announced a modified definition of logistics. The modified definition explicitly declares CLM's position that logistics management is only a part of SCM. The revised CLM definition is:

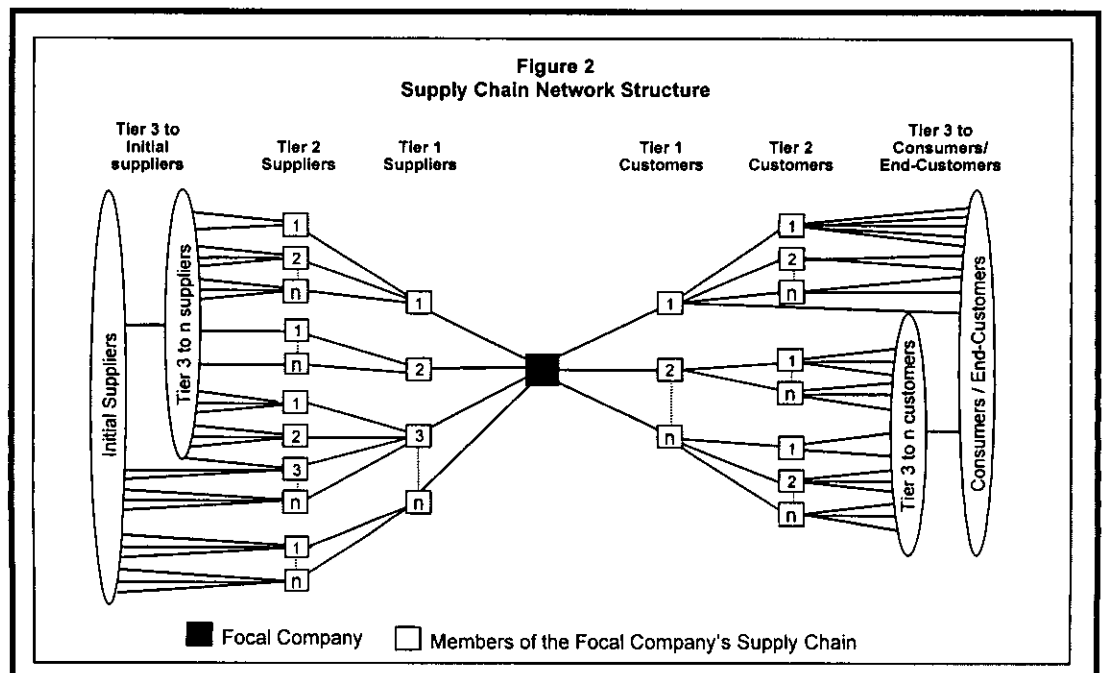
Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point-of-consumption in order to meet customers' requirements [16].

Managing the supply chain is a complicated task and even managing logistics in the supply chain, product/service flows and related information, from point-of-origin to point-of-consumption is very challenging. It is a lot easier to write a definition of logistics or of supply chain management than it is to implement that definition. Imagine the degree of complexity if you are actually going to manage all tiers of suppliers back to the point of origin and all tiers of customers out to the point-of-consumption of the products/services. It is probably easier to understand why executives would want to manage their supply chains to the point-of-consumption because whoever has the relationship with

the end-user has the power in the supply chain. Intel has created a relationship with the end-user by having computer manufacturers place an "Intel chip inside" label on their computers. This affects the computer manufacturer's ability to switch chip suppliers. But managing all Tier 1 suppliers' networks to the point of origin is an enormous undertaking. Managing the entire supply chain is a very difficult and challenging task, as illustrated in Figure 2.

The early marketing channels researchers such as Wroe Alderson and Louis P. Bucklin conceptualized the key factors for why and how channels are created and structured [17]. From a supply chain standpoint these researchers were basically on the right track, particularly in the areas of: 1) identifying who should be a member of the marketing channel, 2) describing the need for channel coordination, and 3) drawing actual marketing channels. However, for the last 30 years the channels researchers studied power and conflict with questionable results and ignored two critical issues. First, they did not build on the early contributions by including suppliers to the manufacturer, and thus neglected the importance of a total supply chain perspective. Second, they focused on marketing activities and flows across the channel, and overlooked the need to integrate and manage multiple key processes

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across companies.

Unlike the marketing channels literature, a major weakness of the SCM literature to date is that the authors appear to assume that everyone knows who is a member of the supply chain. There has been little effort to identify: specific supply chain members, key processes that require integration or what management must do to successfully manage the supply chain.

The SCM framework encompasses the combination of three closely inter-related elements: the structure of the supply chain, the supply chain business processes, and the supply chain management components (see Figure 3). We believe that the combination of these three elements captures the essence of SCM.

The supply chain structure is the network of members and the links between members of the supply chain. Business processes are the activities that produce a specific output of value to the customer. The management components are the managerial variables by which the business processes are integrated and managed across the

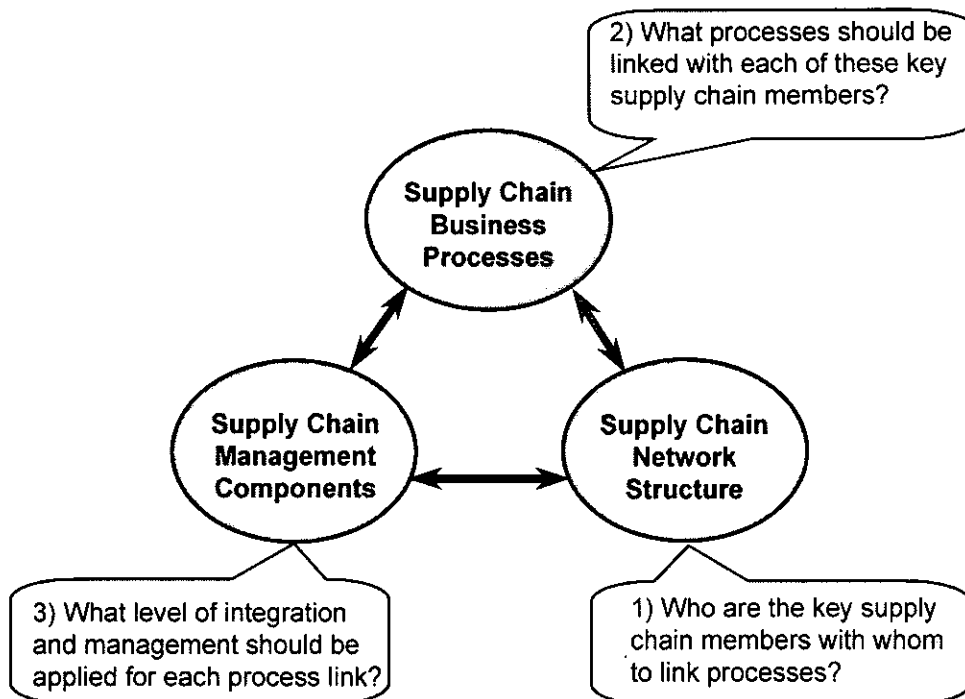
supply chain. In combination, the SCM definition and this new framework moves the SCM philosophy to its next evolutionary stage.

The implementation of SCM involves identifying the supply chain members, with whom it is critical to link, what processes need to be linked with each of these key members, and what type/level of integration applies to each process link. The objective of SCM is to maximize competitiveness and profitability for the company as well as the whole supply chain network including the end-customer. Consequently, supply chain process integration and redesign initiatives should be aimed at boosting total process efficiency and effectiveness across members of the supply chain.

In order to better understand SCM, a case study approach is being used involving the supply chains of members of The Global Supply Chain Forum. Thus far, over 80 in-depth interviews in 11 companies covering five different supply chains have been conducted with managers representing various levels, functions and processes. The processes

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**Figure 3**  
**Supply Chain Management Framework: Elements and Key Decisions**



Source: Adapted from Cooper, Martha C., Douglas M. Lambert and Janus D. Pagh, "Supply Chain Management: More Than a New Name for Logistics," *The International Journal of Logistics Management*, Vol. 8, No. 1 (1997), p. 6.

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covered in the interviews included customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization. The functions represented by those interviewed included, marketing/sales, logistics, manufacturing, information systems, finance, quality management, and strategic planning. The interviews were conducted using a 36 question interview guide, developed from our previous work, a review of the literature, and discussions with members of The Global Supply Chain Forum. The interviews ranged from one to three hours and were recorded and transcribed for analysis.

In this paper, we report some of the findings and key issues related to each of the three elements of the SCM framework. For simplicity, each element will be dealt with separately, although in practice they are closely interrelated. Issues regarding how to map business processes across the supply chain are briefly described. Finally, suggestions for future research and conclusions are outlined.

### **Supply Chain Network Structure**

One key element of managing the supply chain is to have an explicit knowledge and understanding of how the supply chain network structure is configured. We have found that the three primary structural aspects of a company's network structure are: 1) the members of the supply chain, 2) the structural dimensions of the network, and 3) the different types of process links across the supply chain. These three issues are all related to the first element, supply chain network structure, shown in Figure 3. Each issue will be addressed.

#### **Identifying Supply Chain Members**

When determining the network structure, it is necessary to identify who the members of the supply chain are. Including all types of members may cause the total network to become highly complex, since it may explode in the number of members added from tier level to tier level [18]. To integrate and manage all process links with all members across the supply chain would, in most cases, be counter-productive, if not impossible. The key is to identify the basis

for determining which members are critical to the success of the company and the supply chain, and thus should be allocated managerial attention and resources.

Marketing channels researchers identified members of the channel based on who takes part in the various marketing flows, including product, title, payment, information, and promotion flows [19]. Each flow included relevant members, such as banks for the payment flow and advertising agencies for the promotion flow. The channels researchers sought to include all members taking part in the marketing flows, regardless of how much impact each member had on the value provided to the end-customer or other stakeholders.

The members of a supply chain include all companies/organizations with whom the focal company interacts directly or indirectly through its suppliers or customers, from point-of-origin to point-of-consumption. However, to make a very complex network more manageable it seems appropriate to distinguish between primary and supporting members. The definitions of primary and supporting members are based on our interviews, discussions with members of The Global Supply Chain Forum, Porter's "Value Chain" framework [20], and Davenport's definition of a business process [21]. We define primary members of a supply chain to be:

all those autonomous companies or strategic business units who actually perform operational and/or managerial activities in the business processes designed to produce a specific output for a particular customer or market.

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

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

or perform activities in the value-adding processes of transforming inputs to outputs for the end customer.

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

It should be noted that the distinction between primary and supporting supply chain members is not obvious in all cases. Nevertheless, it is our belief that this distinction provides a reasonable managerial simplification and yet captures the essential aspects of who should be considered as key members of the supply chain. The approach for differentiating between types of members is to some extent similar to how Porter distinguished between primary and support activities in his "Value Chain" framework [22].

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

### The Structural Dimensions of the Network

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

within the end points of the supply chain.

The *horizontal structure* refers to the number of tiers across the supply chain. The supply chain may be long, with numerous tiers, or short, with few tiers. The *vertical structure* refers to the number of suppliers/customers represented within each tier. A company can have a narrow vertical structure, with few companies at each tier level, or a wide vertical structure with many suppliers and/or customers at each tier level. The third structural dimension is the company's *horizontal position* within the supply chain. A company can be positioned at or near the initial source of supply, be at or near to the ultimate customer, or somewhere between these end points of the supply chain.

In the companies studied, different combinations of these structural variables were found. In one example, a narrow and long network structure on the supplier side was combined with a wide and short structure on the customer side. Increasing or reducing the number of suppliers and/or customers will affect the structure of the supply chain. For example, as some companies move from multiple to single source suppliers, the supply chain becomes narrower. Outsourcing logistics, manufacturing, marketing or product development activities is another example of decision making that likely will change the supply chain structure. It may increase the length and width of the supply chain, and likewise influence the horizontal position of the focal company in the supply chain network.

Supply chains that burst to many Tier 1 customers/suppliers will strain corporate resources and limit the number of process links that management of the focal company can integrate and closely manage beyond Tier 1. In general, we found that companies with immediately wide vertical structures, actively managed only a few Tier 2 customers or suppliers. Some of the companies studied have transferred servicing small customers to distributors, thus, moving the small customers further down in the supply chain from the focal company. This principle, known as functional spin-off, is described in the channels literature [23], and can be applied to the focal company's network of suppliers as well as to its customers.

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different from each company's perspective, since management of each company sees its firm as the focal company, and views the membership and network structure differently. Thus, the perceived supply chain network structure is arbitrary. However, because each firm is a member of the other's supply chain, it is important for management of each firm to understand their interrelated roles and perspectives. The reason for this is that the integration and management of business processes across company boundaries will be successful only if it makes sense from each company's perspective [24].

### Types of Business Process Links

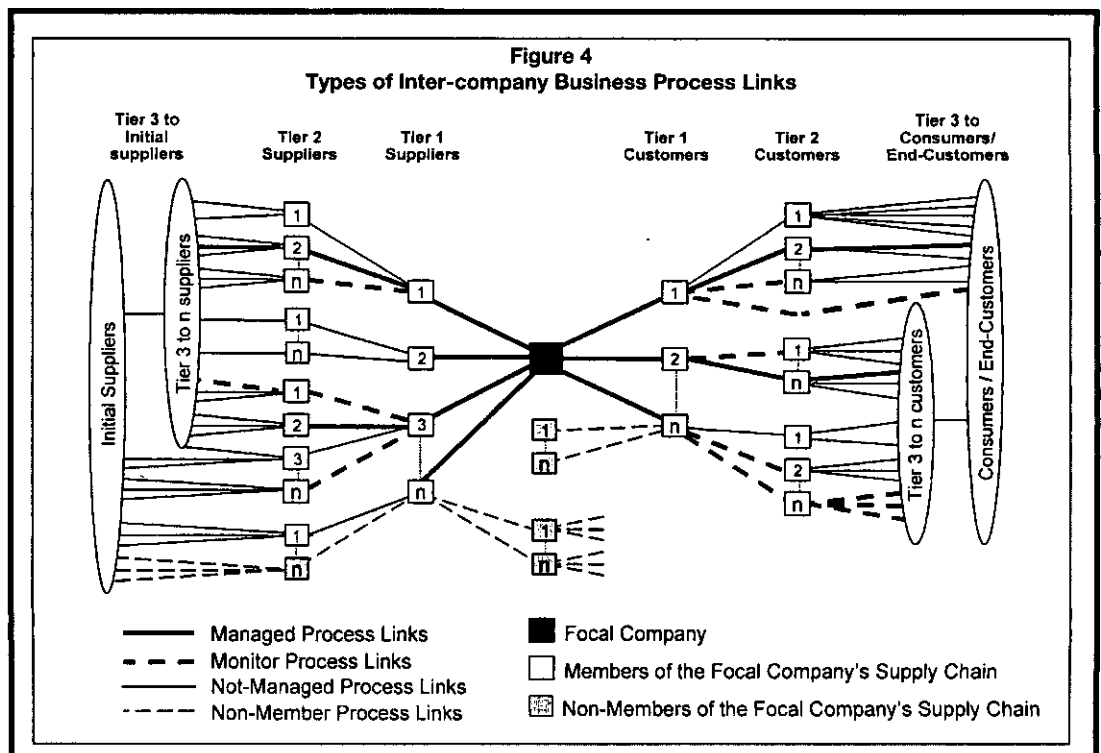
As noted earlier, integrating and managing all business process links throughout the entire supply chain is likely not appropriate. Since the drivers for process integration are situational and different from process link to process link, the levels of integration vary from link to link, and over time. Thus, some links are more critical than others [25]. As a consequence, the task of allocating scarce resources among the different business process links across the supply chain is crucial. Our research indicates that four fundamentally different types of business process links can be identified between members of a supply

chain. These are managed business process links, monitored business process links, not managed business process links, and non-member business process links.

**Managed Process Links.** Managed process links are links where the focal company integrates a process with one or more customers/suppliers. This might be in collaboration with other member companies of the supply chain. In the supply chain drawn in Figure 4, the managed process links are indicated by the thickest solid lines. The focal company will integrate and manage process links with Tier 1 customers and suppliers. As indicated by the remaining thick solid lines in Figure 4, the focal company is actively involved in the management of a number of other process links beyond Tier 1.

**Monitored Process Links.** Studying how the case companies managed their supply chains leads us to the identification of a second type of process link, which we call monitored process links. Monitored process links are not as critical to the focal company, however, it is important to the focal company that the process links are integrated and managed appropriately between other member companies. Thus, the focal

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company, as frequently as necessary, simply monitors or audits how the process link is integrated and managed. The thick dashed lines in Figure 4 indicate the monitored process links.

**Not-managed Process Links.** Not-managed process links are links that the focal company is not actively involved in, nor are they critical enough to use resources for monitoring. In other words, the focal company fully trusts the other members to manage the process links appropriately, or because of limited resources leaves it up to them. The thin solid lines in Figure 4 indicate the not-managed process links. For example, a manufacturer has a number of suppliers for cardboard shipping cartons. Usually the manufacturer will not choose to integrate and manage the links beyond the carton supplier all the way back to the growing of the trees. The manufacturer wants certainty of supply, but it may not be necessary to integrate and manage the links beyond the cardboard shipping carton supplier.

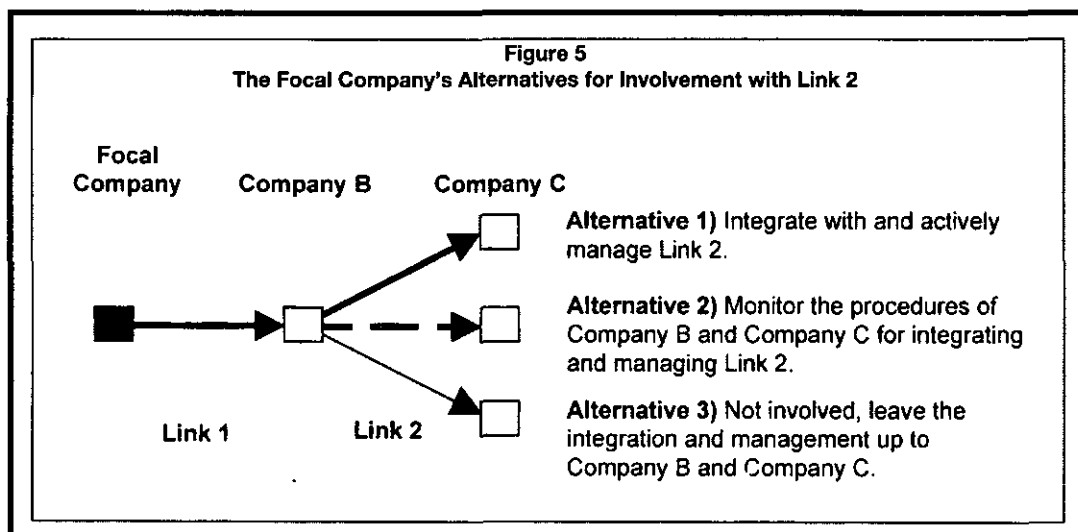
The three alternatives for integrating and managing links are illustrated in Figure 5. Company A, the focal company, may choose to integrate with and actively manage Link 2 (alternative 1). Or, Company A could choose not to integrate, but only to monitor the procedures of companies B and C for integrating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

and C (alternative 3).

**Non-member Process Links.** The case studies indicated that managers are aware that their supply chains are influenced by decisions made in other connected supply chains. For example, a supplier to the focal company is also a supplier to the chief competitor. Such a supply chain structure may have implications for the supplier's allocation of manpower to the focal company's product development process, or availability of products in times of shortage, and/or protection of confidentiality of information. This leads us to identifying a fourth type of business link, which we specify as non-member process links. Non-member process links are process links between members of the focal company's supply chain and non-members of the supply chain. Non-member links are not considered as links of the focal company's supply chain structure, but they can and often will affect the performance of the focal company and its supply chain. The thin dashed lines in Figure 4 illustrate examples of non-member process links.

Based on the process links just described, our research reveals variation in how closely executives integrate and manage links further away from the first tier. In some cases, companies work through or around other members/links in order to achieve specific supply chain objectives, such as product availability, improved quality, or reduced overall supply chain costs. For example, a tomato ketchup manufacturer in New Zealand conducts research on tomatoes in order to develop plants that yield higher

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quality tomatoes and the young plants are provided to their contracted growers. Since the growers tend to be small, the manufacturer negotiates contracts with suppliers of equipment and supplies such as fertilizer and chemicals. The farmers are encouraged to purchase their raw materials and machinery using the contract rates. This results in higher quality raw materials and lower prices without sacrificing the margins and financial strength of the growers.

There are several examples of companies who, in times of shortage, discovered that it was important to manage beyond Tier 1 suppliers for critical times. One example involves a material used in the manufacture of semi-conductors. It turned out that six Tier 1 suppliers all purchased from the same Tier 2 supplier. When shortages occurred, it became apparent that the critical relationship was with the Tier 2 supplier.

The monitored and non-member types of process links have not been identified or described previously in the literature. We believe that SCM practice needs to incorporate these two types of process links when considering the variety of possible forms of supply chain integration.

## **Business Process Chains**

Thousands of activities are performed and coordinated within a company, and every company is by nature in some way involved in supply chain relationships with other companies [26]. When a relationship is built between two companies certain of their internal activities will be linked and managed between the two companies [27]. Since both companies have linked some internal activities with other members of their supply chain, a link between two companies is thus a link in what might be conceived as a supply chain network. For example, the internal activities of a manufacturer are linked with and can affect the internal activities of a distributor, which in turn are linked with and can have an effect on the internal activities of a retailer. Ultimately, the internal activities of the retailer are linked with and can affect the activities of the end-customer.

The results of empirical research by Håkansson and Snehota stress that "the structure of activities within and between

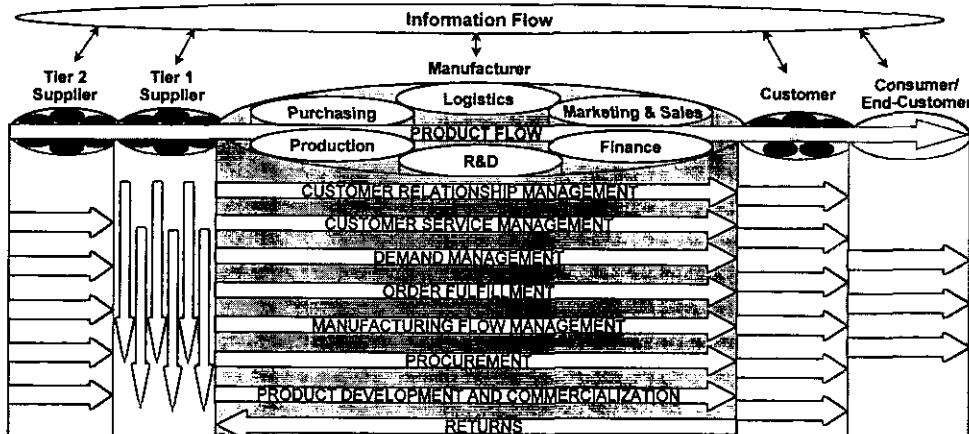
companies is a critical cornerstone of creating unique and superior supply chain performance [28]." In our study the executives believed that competitiveness and profitability could increase if internal key activities and business processes are linked and managed across multiple companies. As stated by Lambert, Giunipero and Ridenhower, "Successful supply chain management requires a change from managing individual functions to integrating activities into key supply chain business processes [29]."

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

In this study, we have adopted Davenport's definition of a process as "a structured and measured set of activities designed to produce a specific output for a particular customer or market [30]." A process can be viewed as a structure of activities designed for action with a focus on end-customers and on the dynamic management of flows involving products, information, cash, knowledge and/or ideas.

In an exploratory study involving 30 successful supply chain redesign practitioners, Hewitt found that companies have identified between nine and 24 internal business processes. The two most commonly identifiable processes were order fulfillment and product development [31]. In our research, managers in the companies studied identified between one and seven internal

**Figure 6**  
**Supply Chain Management: The Disconnects**



business processes. Representative lists of business processes of selected companies are presented in Figure 7. The case study companies had different strategic objectives, which may explain the difference in identified business processes and the numbers of business processes. However, more research needs to be conducted on these key issues.

The primary focus thus far has been on determining processes internal to the company. A prerequisite for successful SCM is to coordinate activities within the firm. One way to do this is to identify the key business processes and manage them using cross-functional teams. We have not yet addressed which processes are critical and/or

beneficial to integrate and manage across the supply chain. As we attempted to draw the supply chains of the case study companies, it became clear that in some cases the internal business processes have been extended to suppliers and managed to some extent between the two firms involved. This may imply that when a leadership role is taken, a firm's internal business processes can become the supply chain business processes. The obvious advantage when this is possible is that each member of the band is playing the same tune.

The members of The Global Supply Chain Forum have, as a starting point, identified the following seven key business processes that could be linked across the

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**Figure 7**  
**Representative Business Processes Identified in Selected Case Companies**

**Company A**

- Product Development
- Supply Chain
- Customer Management

**Company B**

- Strategy Development
- Business Management
- Market Development
- Product Development
- Manufacturing Capability Development
- Order Fulfillment

**Company C**

- Selling Process
- Customer Order Fulfillment
- Manufacturing & Supply
- New Product Creation
- Procurement

**Company D**

- Business Process
  - Marketing Planning
  - Prospecting
  - Exploring Needs
  - Developing Solutions
  - Decision
  - Presenting & Closing
  - Delivering
  - Demonstration Results

**Company E**

- Customer Relationship Management
- Customer Order Fulfillment
- Business Planning
- Manufacturing & Supply
- Product Development
- Procurement

**Company F**

- Supply Chain
- Account Planning

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supply chain: customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, and product development and commercialization. The returns process has subsequently been added. These processes have been described previously [32].

The number of business processes, critical and/or beneficial to integrate and manage between companies, will likely vary. In some cases it may be appropriate to link just one key process, and in other cases appropriate to link multiple or all key business processes. However, in each specific case, it is important that executives thoroughly analyze and discuss which key business processes to integrate and manage. The major components for integrating and managing process links in a supply chain network are addressed next.

### **The Management Components of SCM**

The SCM management components are the third element of the SCM framework (see Figure 3). An essential underlying premise of the SCM framework is that there are certain management components that are common across all business processes and members of the supply chain [33]. We believe these common management components to be critical and fundamental for successful SCM, since they essentially represent and determine how each process link is integrated and managed. The level of integration and management of a business process link is a function of the number and level, ranging from low to high, of components added to the link [34]. Consequently, adding more management components or increasing the level of each component can increase the level of integration of the business process link.

The literature on SCM, business process reengineering, and buyer-supplier relationships suggests numerous possible components that must receive managerial attention when managing supply chain relationships [35]. Based on the management components identified in our previous article [36], additional review of the literature, and interviews with 80 managers, we have identified nine management components for

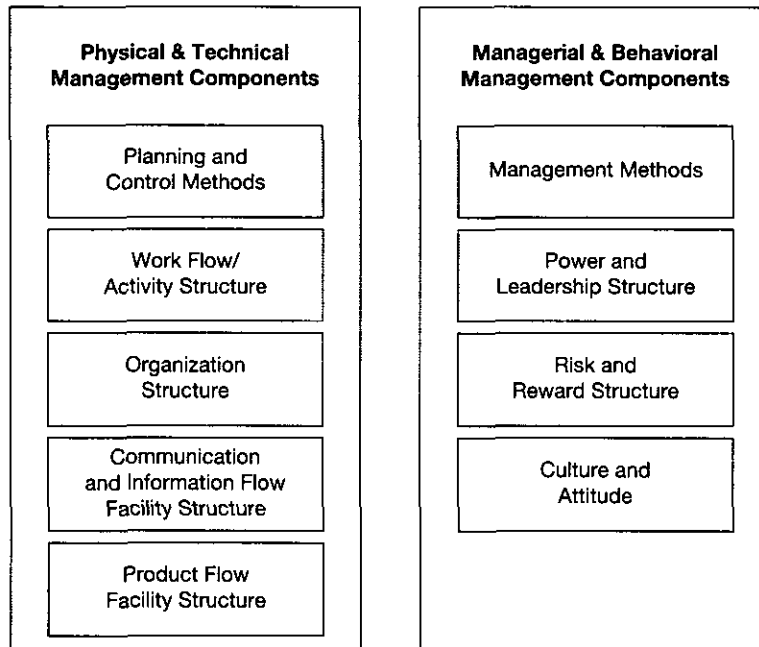
successful SCM.

Figure 8 illustrates how the management components can be divided into two groups, to point out some basic differences. The first group is the physical and technical group, which includes the most visible, tangible, measurable, and easy-to-change components. Our research, and much literature on change management [37] shows that if this group of management components is the only focus of managerial attention, managing the supply chain will most likely be doomed to fail.

The second group is comprised of the managerial and behavioral components. These components are less tangible and visible and are, therefore, often difficult to assess and alter. The managerial and behavioral components define the organizational behavior and influence how the physical and technical management components can be implemented. If the managerial and behavioral components are not aligned to drive and reinforce an organizational behavior supportive to the supply chain objectives and operations, the supply chain will likely be less competitive and profitable. If one or more components in the physical and technical group are changed, management components in the managerial and behavioral group likewise may have to be readjusted. Consequently, the groundwork for successful SCM is established by understanding each of these SCM components and their interdependence. Hewitt stated that true intra- and inter-company business process management, or redesign, is only likely to be successful if it is recognized as a multi-component change process, simultaneously and explicitly addressing all SCM components [38]. For greater details of the content of each management component we refer to Cooper, Lambert and Pagh [39].

We found all nine management components in the business process links studied, including examples of applications for successful SCM. However, the number, levels of components and combinations of representations varied. A further indication, which emerged from studying the companies, is that the physical and technical components were well understood and applied/managed the farthest up and down the supply chain. For example, in one case,

**Figure 8**  
**Supply Chain Management: Fundamental Management Components**



the focal company had integrated its demand management process across four links by applying the following components: planning and control methods, work flow/activity structure, communication and information flow facility structure and product flow facility structure. The managerial and behavioral management components were, in general, less well understood and more difficulties were encountered in their implementation. We only found one example of managerial and behavioral management components applied to more than one link across the supply chain.

### Mapping the Supply Chain

In the companies studied, the business processes were not linked across the same firms. In other words, different business processes had different looking supply chain network structures. An example is a focal company that involves Supplier A, but not Supplier B in its product development process, whereas the demand management process is linked with both suppliers. Thus, we found that managers choose to integrate and manage different supply chain links for

different business processes.

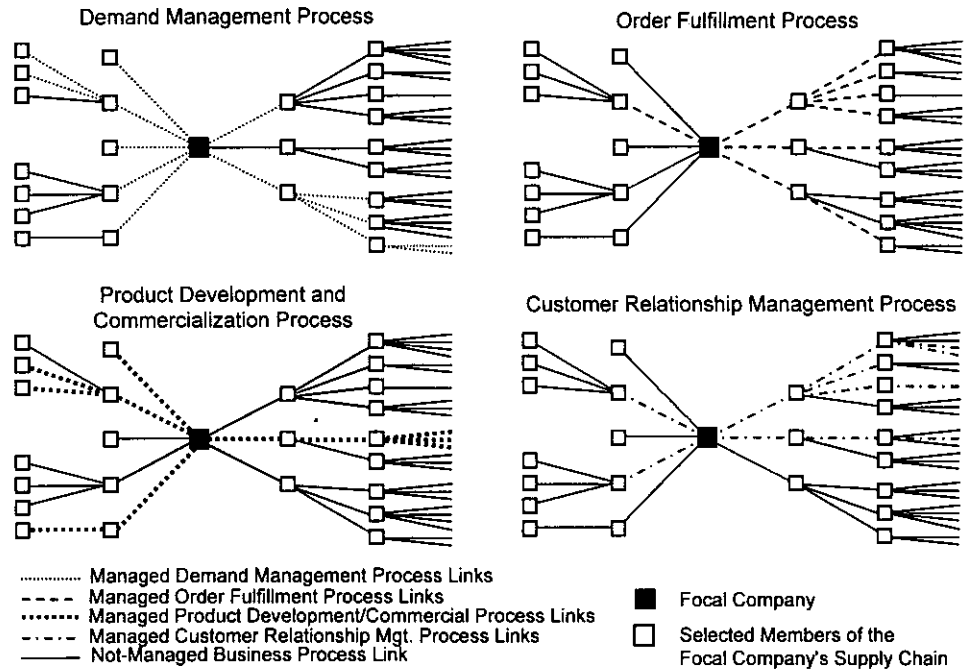
Figure 9 is an illustration of how the integrated and managed business process links of a focal company may differ from process to process. For simplicity we have only illustrated the managed and not-managed business process links, and thus omitted the monitored and non-member process links. Also, we have only included very few supply chain members.

Figure 10 illustrates the superimposed supply chains of the four individual business process chains in Figure 9 onto one diagram. We believe that it is necessary first to map individual processes and then superimpose them on one supply chain map. We suggest managers use this approach to map their supply chains for analysis and possible redesign.

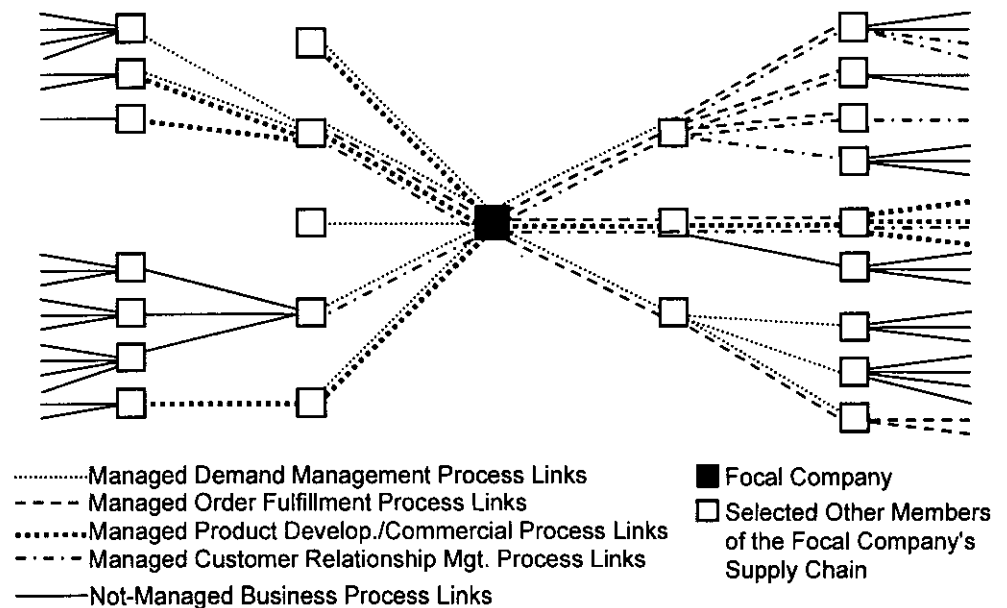
Previous literature has suggested that some or all business processes should be linked across the supply chain, from the initial source of supply to the ultimate end-customer. In our research, there were no examples of this, nor were there any in the cases described in the literature. In fact the companies studied had only integrated some selected key process links, and were likewise only monitoring some other selected links.

*...we found that managers choose to integrate and manage different supply chain links for different business processes.*

**Figure 9**  
**An Illustration of a Supply Chain Showing Each Integrated and Managed Business Process Link**



**Figure 10**  
**An Illustration of a Supply Chain Combining All the Integrated and Managed Business Process Links**



## Suggestions for Future Research

This article builds upon our previous article on SCM, which suggested a framework with a body of structural content to be used to implement SCM. However, there is still much work to be done. A top priority should be research to develop a normative model that can guide managers in the effort to develop and manage their supply chains. It is much easier to write a definition for SCM than it is to implement the definition. The research opportunities include:

- What are the operational definitions of the key business processes and what are the relationships among the processes? What are the relationships among the processes and the functional silos? What is the tolerance for sub-optimization? How do you obtain buy-in from the functional areas in order to implement a process approach within the firm? How can the various participants in a company be encouraged to work toward a common goal? Marketing and manufacturing reward structures often tend to be counter to one another yet the firm has overall profitability goals. Does the answer lie in similar reward structures, rewards tied to overall performance, or will process teams accomplish much of this? Beyond internal integration, how should inter-organizational change management be implemented?
- How should the existing supply chain be mapped? Should the map include all connected firms or only the primary firms? Are there other means of determining who should and should not be part of the supply chain map? For example, should only the most critical members be mapped? What are the implications for good SCM practice based upon the shape of the supply chain, that is horizontal structure, vertical structure and focal company position in the supply chain?
- What is the value proposition at the consumer level or end point of the supply chain? What are the methods that should be used to determine value? How should the various firms in the supply chain share the costs and the benefits?
- What metrics should be used to evaluate the performance of the entire supply chain, individual members or subsets of members? What are the potential barriers to implementation and how should they be overcome? What characteristics of managing the supply chain are related to higher performance of the supply chain, subsets of firms in the supply chain, and the individual firms? Since the processes may vary by link, these measures may need to be both process specific and global.
- What is the process to take the map of the existing supply chain and modify it to obtain the best supply chain given the desired outputs? How frequently should the supply chain structure be reviewed? What approaches could be used to perform the evaluation? Which approaches are appropriate for different supply chain forms and situations? How should the firm analyze the network to determine if there is a better configuration? How does building a stronger relationship with one member affect the management time allocable to other members? Should a third party manage some relationships to free resources for this closer relationship, which thus, changes the membership of the network? Is it an iterative process?
- What determines with whom to link business processes? What are the steps to take to determine with whom to link? What are the critical factors to the firm's success and that enable the firm to link with specific companies? What are the barriers to forming these relationships? Should the decision process vary based on whether Tier 1 or Tier n companies are the focus? For Tier n companies, what critical factors imply a closer relationship of managed or monitored links to key members to assure supply, quality, and service? What are the compelling reasons to have closer ties with companies beyond the first tier?
- What determines the processes to link with these key members? How should the firm decide which internal process to link with which suppliers and customers? What decision criteria determine whose internal business processes prevail across all or part of the supply chain?
- What determines the type/level of integration that should be applied to each

***A top priority should be research to develop a normative model that can guide managers in the effort to develop and manage their supply chains.***

process link? It is important to provide firms with some guidelines regarding what level of management components to apply to achieve the desired relationship and management of a link. More components and/or a higher level of effort on a component may be required to achieve a desired level of integration of a process link. What constitutes a low level versus a high level of a specific management component? What is the relationship among the management components for successful SCM? Do changes in the physical and technical components automatically require changes in the managerial and behavioral components?

## Conclusions

**...the successful integration and management of key business processes across members of the supply chain will determine the ultimate success of the single enterprise.**

Executives are becoming aware of the emerging paradigm of inter-network competition, and that the successful integration and management of key business processes across members of the supply chain will determine the ultimate success of the single enterprise. Managing the supply chain cannot be left to chance. For this reason, executives are striving to interpret and determine how to manage the company's supply chain network, and achieve the potential of SCM.

Our exploratory findings indicate that managing the supply chain involves three closely inter-related elements: 1) the supply chain network structure; 2) the supply chain business processes; and, 3) the management components. Successful SCM is based on determining: who are the key supply chain members with whom to integrate processes, what are the supply chain processes to link with these key members, and what type/level of integration should be applied to each of these process links? It is important to distinguish between primary and supporting supply chain members, and to identify the horizontal structure, the vertical structure, and the horizontal position of the focal company in the supply chain network. We have identified four fundamentally different types of business process links: managed business process links, monitored business process links, not-managed business process links, and non-member business process links.

Our findings suggest that the structure of activities/processes within and between companies is vital for creating superior

competitiveness and profitability, and that successful SCM requires integrating business processes with key members of the supply chain. Much friction, and thus waste of valuable resources results when supply chains are not integrated, appropriately streamlined and managed. Hopefully, this paper provides clarification on key aspects of SCM that will aid practitioners and researchers in their desire to understand and implement SCM.

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## Acknowledgement

The authors would like to acknowledge the contribution of the members of The Global Supply Chain Forum whose practice, insight, ideas, and comments have contributed significantly to this paper. The member companies in The Global Supply Chain Forum are: 3M; CEMEX; The Coca-Cola Company; CSX Corporation; Fletcher-Challenge; Goodyear Tire and Rubber Company; Hewlett-Packard Company; Limited Distribution Services, Inc.; Lucent Technologies; McDonald's; Texas Instruments, Inc.; Unilever HPC, USA; and, Whirlpool Corporation.

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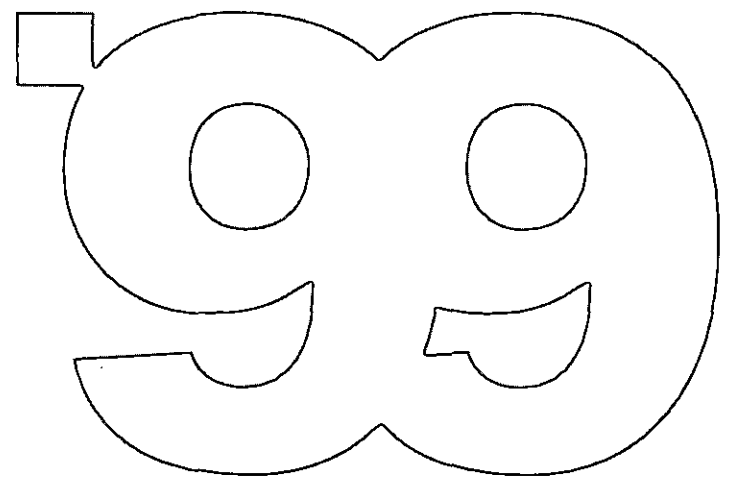
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