

SUPPLY CHAIN MANAGEMENT AND ITS IMPACT ON OPERATION DECISIONS

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ABSTRACT: *There has been a paradigm shift in traditional operation management ideology with the adoption of supply chain management (SCM) which is known for having a strategic, tactical, and operational impact on traditional business functions. The purpose of this paper is to study and analyze SCM from an operation manager's perspective and analyze its impact on such critical operations decisions as: Quality, Process Strategy and Inventory Management.*

Keywords: *Operation Decisions, Supply Chain Management, Inventory Management, Business Strategy*

1. INTRODUCTION

In the era of globalization and competition, companies have recognized that they have to increase their efficiency by using strategies and technologies like Just-in-Time (JIT), Kanban, lean manufacturing, and total quality management (TQM) etc. However, the implementation of these strategies requires a sizeable investment. To remain competitive and enhance a firm's profitability, respective Supply Chains (SC) or networks must be effectively managed (Simchi-Levi et al., 2000).

In the 21st century, the business environment has been changed because of the proliferation of multinational companies, joint ventures, strategic alliances, business partnerships, and technological changes, which have contributed in the development of SC. For firms to survive in this extremely competitive environment, it is imperative for them to synchronize their strategies to meet changing demands while looking for new and more efficient ways to keep their costs at optimum levels. Supply Chain Management (SCM) provides a platform to accomplish this goal (Chapman et al., 2000; Tang et al., 2001).

As firms coordinate across multiple channels and levels, the concept of SCM is gaining momentum (Cooper et al., 1997). This momentum continues to be influenced by ever-increasing global competition, reduced product life cycles, increased international governmental de-regulation, as well as ever-increasing customer expectations. Premkumar (2000) asserted that inquisitiveness in SCM has been triggered because of a series of transformations in the competitive environment, accompanied by reduced product life cycles, JIT manufacturing, mass customization, globalization, and recent advancement in B2B (business-to-business) commerce. Rapid advancements in communication and transportation technologies have also been the driving forces for the continuing growth in SCM and new techniques that are being developed to manage it in the most efficient manner (Bovet & Sheffi, 1998; Simchi-Levi et al., 2000).

A SC manager has to change the focus from the traditional cost side to the identification of operational processes which are making an impact on the financial results. The role of corporate finance is to connect the investor mandate with operations whereas a well run SC brings positive benefits and is a strategically important goal. The main purpose of this paper is to study and analyze supply chain management from an operation manager's perspective. The impact of supply chain management on critical operations decisions, and the changes presented for the manager are also explored.

The remainder of the paper is organized as follows. Section 2 discusses various concepts pertaining to SCM from diverse standpoints. Section 3 reviews the historical significance and the link between SCM with core business strategies. Section 4 presents the premise that SCM should be viewed from operation management's perspective. Section 5 provides an insight into the implications of SCM on key operation decisions such as quality, process strategy and inventory management and finally Section 6 concludes.

2. SCM CONCEPTS

In an abstract way, SCM is the combination of art and science which goes through the long process of converting a raw material into a finished product. According to the Council of Supply Chain Management Professionals (CSCMP), SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers.

A supply chain consists of unified components that carry out a wide range of tasks: from procurement of materials to delivery of finished products or services to consumers through its structure of various facilities and supply locations. Suppliers and customers play critical roles by providing value added activities in the chain of events that bring raw materials from the source to the end consumer. The interaction between an organization and suppliers as well as customers on materials flow management issues can have a significant impact on the time-related performances which are, in turn, mediated by internal practices (Salvador et al., 2001).

A SC primarily helps in the conversion process, as raw material is transformed into finished goods, and thereafter in transporting the inventory from a source of supply to the end user. It assists in matching products as per customer demand (Fisher, 1997). The number of partners in a specific SC, and related tasks, determine the extent to which the SC can be applied (Cooper et al., 1997). By reducing the number of partners and related tasks in a SC, an organization can increase efficiency and reduce the possibility for impediments in production due to delays in receiving necessary materials. Since logistics and supply chain management are closely related terms, the past definitions of SCM focused on improving the operation of customary procedures by optimizing production and supply while expediting the stream of information and inventory through the SC network (Ross, 1998). The following table briefly summarizes the diverse conceptual definitions for SCM that are being currently employed in the field.

TABLE 1 – SUPPLY CHAIN MANAGEMENT DEFINITIONS

Year	Author(s)/Researcher(s)	Conceptual Definitions – SCM and related terms
2006	Heizer and Render	It is the integration of the activities that procure materials and services, transform them into intermediate goods and final products, and deliver to customers.
2002	Monczka, Trent, and Handfield	SCM focuses on applying system's approach to assimilate and control the procurement and flow of raw materials and goods across different functions and channel members.
2001	Korpela, Lehmusvaara, and Tuominen	SCM is a constructive way to reinforce the chain through an effective coordination between the trading partners of the chain.
2001	Keskinocak and Tayur	Aim is to ensure that the right products at a right price are distributed to the right place at right time.
2000	Chandra and Kumar	Supply chain integration has turned out to be extremely necessary to increase consumer satisfaction and realize constructive development.
1998	Lambert, Stock, and Ellram	SCM deals with integration of all the value-creating elements in the procurement, manufacturing, and distribution processes from raw material stage, through the transformation process, and finally utilization at the end consumer.
1997	Cooper, Lambert and Pagh	The focus in the supply chain is on integration across firms, although many companies gave importance to internal integration before starting the process of external integration.
1996	Kranz	SCM is the effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer.

SCM has the potential to deliver increased returns, decreased operating expenses, and improve services (Cross, 2000). The incredible achievement of companies like Wal-Mart, Proctor & Gamble, and Hewlett-Packard prove the extent of the benefits that can be derived by making effectual use of SCM. Along with large companies, small businesses can employ these vital concepts in their business approach, thereby reaping benefits from the nascent stages of their enterprise (Chapman et al., 2000). In short, it is possible to create a balance between supply and demand by making effective use of supply chain practices.

3. HISTORICAL SIGNIFICANCE

It has been argued, that supply chain management, while an emerging area for practice and research, is still an outgrowth of earlier research work conducted in production and operation management (New, 1997). According to Cooper et al. (1997), the major tenets of SCM that historically includes managing inter-organizational operations that originated in channels and systems integration research (Buklin, 1966; Forrester, 1968). The more recent premise pertaining to “sharing information and exchange of inventory” further supports the foundation of supply chain management (La Londe, 1983). Bruce(1997) asserted that in order to appreciate the emergence of supply chain management, it is essential to examine the sequence of changes in areas of production and operation management that gives direction to this new thought.

In the 1970's, business was characterized by a hierarchical arrangement where each function played a role in achieving the synchronization of tasks. The manufacturing system was based on the famous MRP (Material Requirement Planning) approach. The MRP approach assists in converting the master production schedule developed for the final product into actual requirements. These requirements consist of components, parts, sub-assemblies, and raw materials (Chandra & Kumar, 2000; Schroder, 2000). Between the late 1970's and 1980's, production focus shifted to MRP II which involved cash flows sales, production, inventory, schedules, and basic functions of planning and controlling the manufacturing process.

The roots of what is now termed SCM emerged in the early 1980's, when Chrysler decided to establish long-term relationships with a few key suppliers in order to gain competitive advantage through price reduction and subsequently benefiting its suppliers through decreased costs (Cavinato, 2002). The supply chain concept was coined in the early 1980's by consultants in logistics (Oliver & Webber, 1982). In their original formulation, they specified that the concept must be viewed as a single entity and that strategic decision-making at the top level is essential to manage the chain (Gripsrud et al., 2006). Managing quality was considered a decisive way to attain a differential advantage through techniques like TQM (Total Quality Management). Quality experts such as Deming (1982), and Juran and Gryna (1988) also emphasized the effective management of vendor quality (Chandra & Kumar, 2000).

In the last decade, manufacturing technology has observed an unprecedented change because of increased global competition. Advancements in information technology have given rise to new concepts such as ERP (Enterprise Resource Planning), DRP (Distribution Resource Planning), CPFR (Collaborative Planning Forecasting and Replenishment), E-commerce, and many others (Aberdeen, 1996). SC applications are becoming more standardized, packaged, and widely deployed (Aimi, Hillman, & Hochman, 2007). The goal is to minimize the total cost across the supply chain rather than looking for new ways to reduce costs pertaining to materials procured from suppliers (Turbide, 1997). This is achieved by evaluating all processes in the SC and eliminating non-value added activities. In order to decide which activities contribute value to the SC, companies must first focus on their production process. Similarly, if we look at the manufacturing environment, it has been undergoing an evident change from “make to stock” to “make to order”, resulting in shorter product life cycles. To incorporate these changes, companies must have increased flexibility in terms of production, process, and labor so that they can effectively and timely respond to customer requirements. As a result, the supply chain management concept was evolved to address changing market needs.

3.1 SCM and Its Relation to Business Strategies

Nowadays the term “supply chain management” has become a buzz word. However, organizations can only reap higher benefits by broadening their focus from individual operations to an integrated value chain approach that critically analyzes their core business strategies. Jacobs and Chase (2006) purported that operations and supply chain strategies are comprehensive and involve long-term processes that foster inevitable positive change. This philosophy has considerable influence on tasks such as: SC design for strategic advantage, collaborative and SC partnerships, and information sharing among partners - all vital for a SC design and operation. Cross-functional collaboration plays a fundamental role in order to gain advantage from supply chains. Products can no longer contend on features alone and depend on the supply chains through which they are distributed (Ayers, 1999). Additionally, numerous other factors should not be ignored when considering a SC strategy.

A company must analyze and understand the applicable external SC before devising the business strategy. Reviewing the products and members of the supply chain can help a company acquire an extensive perception of their supply chain, and provide insight into areas to be explored for further growth (Chapman et al., 2000). Porter (1980) categorized business strategies into two main types: cost leadership and differentiation. The cost leadership strategy is characterized by standardized products, continuous process flow, with a greater emphasis on efficiency. Whereas companies using a differentiation strategy compete based on distinctive products with a focus on customization and innovation, the production environment is typical job shop. These differentiations have become the basis for other strategies used today.

The above framework is similar to one proposed by Fisher (1997) who recognized the need to first understand the demand patterns of the products before developing an effective supply chain. Standardized or functional products that are available in the majority of stores have a predictable demand, extended life span, and low return rates. Firms with their strategy based on these products concentrate primarily on reducing costs; especially those related to the manufacturing, storage, and movement of goods. On the other hand, non-standardized or innovative products have an unpredictable demand, shorter life span, and higher return rates. As a result, firms dealing with these types of products are focused on minimizing opportunity costs and costs resulting from an excess inventory. This is accomplished through customization and quick response times (similar to the differentiation strategy presented by Schroeder (2000)). The decisions related to the placement of inventory and utilization of available resource capacities plays a significant role. Firms adopting such product strategies design their supply chain in a way that allows them to have extensive gains by being more receptive than their competitors.

4. PERSPECTIVES OF SUPPLY CHAIN MANAGEMENT

Normally organizations observe SCM from three different perspectives, i.e. a) Operational, b) Technical, and c) Business Perspective.

Operational Perspective: This is focused on how to manage the flow of goods and balance the network of warehouses, distribution centers and transportation services. The main attention is keeping raw materials and finished goods in stocks. It is also focused on managing the flow of components across suppliers and production centers. The technical terms involved in this perspective are Kanban, order fulfillment, lean production, and economic order quantity.

Technical Perspective: This perspective depicts SC as network of hardware, middleware, and software components that collaborate for the support of SC operations while using the collection of data, automation and information. This is the technical perspective where IT people see the flow of goods as a flow of information. The technical terms are: ERP, EDI, CRM, and Database.

Business Perspective: This perspective is focused on the flow of money where corporate executives monitor the performance indicators which measure the value generated by SC execution.

These are the different perspectives which an organization normally observes. However, our paper is mainly focused on the Operational Perspective (Camerinelli, 2007).

4.1 SCM From An Operation Management's Perspective

The supply chain basically comprises of three components: sourcing, manufacturing and distribution (Clinton & Calantone, 1997; Korpela et al., 2001). These components are generally controlled with a corresponding amount of stock. Accordingly, a firm has to make the decisions in relation to location, production, inventory and transportation.

Location - It is important to identify where production facilities, stocking locations, and sourcing sites are located to establish routes along which materials will flow. The supply chain can often be improved by locating facilities in countries where unique resources are available (Heizer & Render, 2006).

Production - An organization needs to make decisions regarding products to be manufactured at specific plant location/s, suppliers where service those plants, production facilities that will furnish distinct allocation centers, and finally the delivery of goods to the end consumer. These judgments have an immense effect on returns, costs, and desired service levels that a company intends to accomplish.

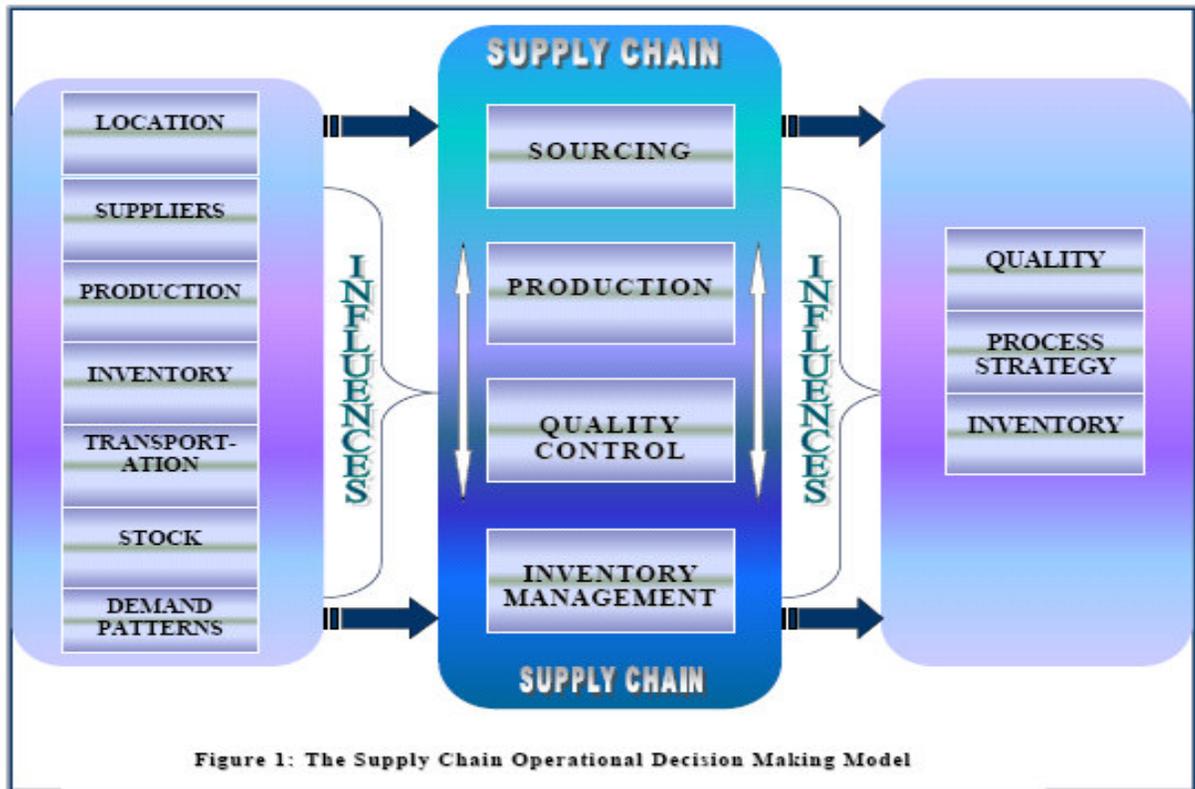
Inventory - Inventory related decisions are critical as each member in the supply chain has to maintain a definite inventory of raw materials, parts, subassemblies, and finished goods that provides cushion against uncertainties that could happen anytime.

Transportation - Strategic decisions related to transportation involve information pertaining to the distribution of materials, parts, and products from one part of the supply chain to the next. Selecting the preeminent means to transport goods frequently involves a trade off between the distribution cost and the implicit cost of inventory (Ganeshan & Harrison, 1995).

5. ROLE IN OPERATION MANAGEMENT DECISIONS

Operation management is considered a vital function in manufacturing company. Nevertheless, from the SC perspective, it is only one of the key elements having a strategic impact on business as a whole. Operation strategies ascertain how operations can sustain a firm's business strategy and other functional strategies within a structure of corporate strategy (Krause et al., 2000). According to Chandra and Kumar (2000), operations as comprised of all the manufacturing related activities and the SC in provides a distinctive and innovative tactic to manage these cohesive tasks, which working to enhance an organization's overall efficiency.

The impact of supply chain management on key decisions that operation managers make on a routine basis can be analyzed by understanding the relationship between various supply chain components and operation decisions as shown in Supply Chain Operational Decision Making Model (Figure 1).



The proposed framework is based on Schroder's operational model which comprises of four factors: (1) mission; (2) objectives; (3) policies and (4) distinctive competence. (1) A firm's mission statement defines the purpose of operation function with the support of main objectives: cost, quality, delivery, and flexibility. (2) Objectives are developed for each of the major decision areas including quality, process strategy, and inventory management. (3) Policies specify how the defined objectives would be accomplished. Since quality and cost are no longer a basis to compete, business firms consider innovation to be a crucial objective in remaining aggressive. The firm's distinctive competencies must support its mission and objectives in order to derive benefit from its operation (Krause et al., 2000). (4) Distinctive competences are established on unique resources that a company possesses to remain competitive (Schroder, 2000).

5.1 Quality

Quality embodies a key objectives that and is a crucial decision making area in operations. There is a definite relationship linking supply chains and the enhancement in quality: the latter requires effective synchronization among the members of the supply chain in terms of the sharing of information and identification of relations between various systems. Firms can equate this enhancement in quality with other tasks that are carried across the supply chain network (Schroeder, 2000).

Quality experts, Deming (1982) and Garvin (1987), emphasized the importance of reducing the number of suppliers to decrease variation in quality. They insisted that quality should be delegated as the most relevant criteria for evaluating vendors, carrying a greater weight than cost. Juran (1988) asserted that the relationship between buyer and supplier should be managed with the support of statistical tools and techniques. The preliminary involvement of suppliers in new product development processes results in a diminished number of defects during the production stage (Cusumano and Takeishi, 1991). Bowersox, Mentzer, and Speh (1995) purported that customer contentment in terms of superior quality products, excellent customer service, and speedy delivery can be achieved by implementing programs like JIT in the purchasing function.

One of the key factors influencing the management of SC is the product quality that must meet or exceed a customer's expectation. An effective supply chain design has a significant influence on overall quality owing to reduced lead times, improved information sharing among the technical and other expertise of partnering firms (Persson & Olhager, 2002). Garvin (1987) defined product quality in terms of its "performance, reliability, durability, conformance, features, aesthetics, serviceability, and perceived quality". The quality of products is deeply affected by the quality of inflowing parts and components that are used for manufacturing, which in turn, adds pressure to the procurement process. A company has to look beyond the supplier's quality level and their specification requirements. The rationale behind this premise is that a particular component may be purchased from several vendors. However, even though a vendor may be maintaining the desired quality requirements, the different supplier's products in the assembly process may result in a defective final product. To illustrate with a case example (Bowersox et al., 2002), a floor cleaning manufacturer firm "Tenant" was experiencing oil leak problems in their products due to "hydraulic hoses and fittings" procured from 16 different suppliers. After studying their supply chain, the company realized that procurement policies and vendor relationships had a huge impact on the quality of the finished products. Illustrating the quality enhancement through an effective procurement process can have an extensive influence on the total manufacturing cost.

Study conducted by Manoochchri (1984) revealed that the quality of the materials from suppliers had a great bearing on the quality and cost of final products. As a result, information pertaining to quality measures employed by vendors and quality performance is critical in determining the proper price of the components. A strong relationship between buyers and suppliers is necessary in order to share information. This area of SCM impacts on Total Quality Management (TQM) so much as in the end customer's perceived quality has important role to play in the success of companies involved in supply chain (Langley et al., 1996).

5.2 Process Strategy

Process decisions are the strategic decisions that provide information on the type of processes necessary to make a given product or service. These include- types of machinery and expertise needed, process charts, work plans, facility designs, and human resource related issues. The nature of the product (uniform vs. made to order) and the total production volume are the two key factors that assist in making the decisions regarding the process type (Schroeder, 2000).

SC design has a significant impact on process selection. Although companies can achieve efficiencies and considerable quality improvements by implementing product designs that facilitate speedy and accurate operations, SC implications throughout the product's life cycle the SC must not be ignored in order to evade losses that may occur on account of excess inventory and/or increased delivery costs (Lee & Billington, 1992). SC design has also a critical role to play in case of new products as it helps to define performance in terms of accessibility to customers, delivery time, and responsiveness that may consecutively be a deciding factor in product's achievement or failure.

The generic process strategies are broken down into two broad categories: process oriented and product oriented. The process oriented strategy is characterized by a job shop/project type production environment intended to produce low volume and high variety products. On the other hand, a product oriented strategy is based on high volume, low variety products (continuous-flow). Companies have been repeatedly using either of these strategies based on their business needs. However, a novel production philosophy known as mass customization is emerging which combines the best of both strategies: mass production (which has primary focus on efficiency) and craft manufacturing (that utilizes expertise of skilled and motivated workers to make innovative products). However, successful implementation of this approach is not an easy task. Various approaches and concepts of SCM, i.e. strategic alliances, supplier-buyer relationships, and postponement (delayed customization- Dell) are essential in order to achieve mass customization (Lee & Billington, 1992; Simchi-Levi et al., 2000).

5.3 Inventory Management

Inventory management process is used to ascertain optimal inventory levels at each stage in the SC. Since holding inventory is considered an expensive issue, firms endeavor to look for ways to drive inventory in their respective SC. Determining where to place the inventory is an exigent task - although pressure seems to be on the manufacturer to distribute products in smaller batch sizes. Firms have acknowledged that customary inventory management techniques need to be changed in order to respond successfully to an unpredictable business environment. Thus, the inventories in the whole supply chain should be reserved at an optimum level to guarantee reduce costs and increased ROI (Benton, 1999).

Collaboration initiatives such as vendor management inventory (VMI) are emerging as a SC strategy for tracing of inventory in a proficient manner. With VMI, a supplier is responsible for all the replenishment decisions, which consecutively reduces the vulnerability for the partners of the SC. The objective is to purge retailer's oversight on particular orders. Such a strategy plays an exceedingly important part. Numerous firms including Campbell Soup and P&G have revealed successful VMI relationships with their trading partners.

Quick response (QR) is another significant retailer segment strategy to convalesce inventory management and efficiency. The fundamental idea is to make effective use of barcode technology along with EDI (Electronic Data Interchange) to pursue customer sales. Accordingly, with the help of POS (point of sales) information, the supplier can devise its production and inventory based on actual sales at the retail stratum. The ultimate outcome is lower inventory, better response time and reduced probability of out of stock position (Lambert, Stock, & Ellram, 1998).

The increasing importance of inventory replenishment has resulted in the requirement for systems that can improve customer service while keeping the inventory cost down. Cachon and Fischer (1997) established this by implementing a Continuous Replenishment Program (CRP) at Campbell Soup, the result was inventories reduced by 66% without compromising service level. In addition, there was a 12% reduction in the total cost of goods. Similarly, retailers in particular are looking for time-phased replenishment instead of holding inventory in advance. Automatic Replenishment Systems (ARS) offer a valuable way to handle replenishments based on the exact product utilization (Myers et al., 2000). For example, P&G have prolifically implemented ARP systems linking companies like Wal-Mart & Kmart. The results by Cooke (1998) revealed that over 40% of P&G's sales are through these systems.

6. CONCLUSION

In this paper, we have studied SCM from an operation manager's perspective and analyzed its impact on critical operations decisions such as Quality, Process Strategy and Inventory Management. The paper has also discussed various concepts pertaining to SCM from diverse standpoints and reviewed its historical significance. In addition the link between SCM with the core business strategies was established.

Ultimately SCM is about influencing behavior in particular directions and ways (Storey et al., 2006). When the SC and operations of an organization are understood and analyzed as separate entities, a company can develop a strategy that incorporates these two operations in order to achieve the highest levels of efficiency and success. Efficient operations will not lead to superior profits if a company's products are being manufactured in plants with outdated technologies that are poorly located relative to companies' vendors and their markets. The impact of operations on SCM is evident through the planning and coordination of various divisions within an organization as well as through the interactions with outside vendors. While historically SCM has been viewed as a function of operations management, the emerging research seems to insinuate that SCM has a larger impact on operations than previously realized. The operations manager's duties will become increasingly more complicated as the focus on SC increases. Once the impact of the SC on operations management is realized, companies can implement more effective strategies.

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