

An Overview on Applications of Supply Chain Management in Industries

Parth Patel

Student of B. Tech (Mechanical), Final Year from Birla Vishvakarma Mahavidyalaya (BVM) Engineering College, VV Nagar, Anand (Gujarat-India)

Abstract

Management of the supply chain is essential for running any kind of business. We give a summary of supply chain management's developments in this article. Alternative definitions and important topics pertaining to supply chain management are presented in the first section, which is followed by a discussion of the difficulties in managing supply chains. Then, we talk about substantial supply chain management inefficiencies. Lastly, a quick synopsis of the research supply chain management effort to date and a discussion of upcoming difficulties are presented.

Key words: Supply Chain Management; Operations Management; Manufacturing; Service; Logistics; Sourcing; Outsourcing; Procurement; Competition; Information; Technology; Globalization; Sustainability.

1. Introduction

One of the most crucial elements of running a business is supply chain management. The fact that this is not widely known by those in the immediate community (in research and industry) is due to the average customer frequently only notices its consequences. Think back to the instances when the thing you Remember how many times you desired something, and it wasn't available at your favourite clothes or the grocery store. at the conclusion of the season, I got a terrific "bargain," but I'm reminded of the unexpected rises in gas costs because shortfalls, think back to instances where your e-commerce site indicated availability but afterwards was unable to deliver. or gave you the incorrect product or think back to instances when your A customised product (such a computer or kitchen cabinet) was significantly delayed. Consumer experiences like the ones mentioned above and several others are a direct result of supply chain management strategies used by

businesses. Supply chain practises have a direct impact on business-to-business transactions, as opposed to business-to-consumer interactions.

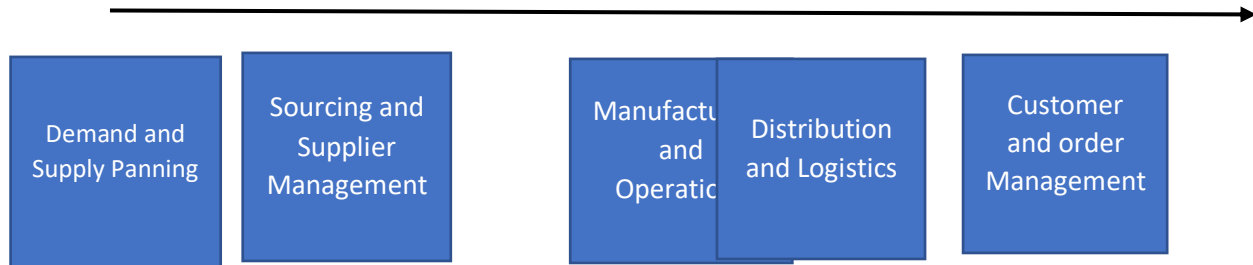
Due to problems with its heavily outsourced supply chain for the Dreamliner 787 in the late 2000s, Boeing had a significant launch delay and spent more than \$2 billion on support and expedited component supplies. Due to battery quality difficulties, Boeing was instructed to halt manufacture of the Dreamliner 787 less than two years after the first delivery in 2011. Tens of millions of toys made in China had to be recalled by Mattel in 2007, which served as the poster child for issues with the quality of products produced abroad. While some businesses experienced the negative effects of poor supply chain management, others, like Amazon, Walmart, and Zara, have consistently beaten their rivals because of their strong supply chain capabilities.

2. Definition

Since the term was first used in 1982 by Keith Oliver, a consultant at Booz Allen Hamilton, supply chain management has developed from being initially understood as only logistics to a complex, multifunctional corporate undertaking that includes everything from distribution and after-sales service to procurement and demand forecasting. People frequently define supply chain management differently based on their own experiences because it is such a broad issue. For some, managing the supply base, choosing what to outsource and to whom, and maintaining relationships with the numerous suppliers is the entirety of supply chain management. Others view it as an effective method of moving commodities between locations while taking into consideration the expenses of distribution and transportation. Another group of experts focus on the integration of information systems and inventory management procedures among the many companies involved in the distribution channel or value chain. Another group sees it as efficient management of the fixed and movable assets needed to run the company. All these definitions are analogous to the blind men's definition of the elephant based on its various organs. The following is a detailed definition of supply chain management. A supply chain is the group of parties involved in the development of new goods and services, the acquisition of raw materials, the transformation of those resources into semifinished and finished goods, and the delivery of those goods to the final consumers (Swaminathan 2001). Supply chain management is the effective management of the entire end-to-end process, beginning with the product or service's design and continuing through the time it has been sold, consumed, and ultimately disposed of by the customer. This entire process entails the creation of the product, its acquisition, its planning and forecasting, its manufacture, its distribution, its fulfilment, and its post-sale support (see Fig. 1).

Supply information flow: Cost, capacity, product design, etc.

Material Flow



Demand information Flow



Configuration and coordination challenges in the supply chain can be categorised into two groups. Coordination-level concerns pertain to tactical choices and ongoing supply chain operations, while configuration-level issues deal with the supply chain's high-level architecture and fundamental infrastructure.

2.1 Configuration-level Issues

Information support decisions

Should a company's functional divisions use the same enterprise resource planning software?

Should the supply chain operate using open standards like XML (extended markup language) or closed-source protocols?

Product portfolio decisions

What types of goods and services will the supply chain be able to support? How many options should you offer your customers? What degree of similarity should the product portfolio have?

Plant location decisions

In a worldwide production distribution network, where should manufacturing, distribution, or retail locations be located and how many should there be? What kind of capacity must be installed at each of these locations? Which distribution method—traditional brick and mortar, direct to consumer over the phone or Internet, or a combination of both—should a company use?

Supply base decisions

What types and how many suppliers are needed? Which components should I keep in-house, and which should I outsource? How can procurement procedures be made more uniform and efficient? Should one invest in creating highly integrated supply alliances instead of using vertical marketplaces for auctions? How long or brief should supplier contracts be?

2.2 Coordination -level Issues

Capacity decisions

How can the current capacity in terms of labour and equipment be used most effectively? How should production lines be scheduled to finish work on time? How much buffer space should be left over in case of unusually high demand?

Configuration and coordination problems are related. Coordination problems are medium- to short-term decisions, whereas configuration problems can be seen as strategic long-term decisions. Typically, businesses create a plan for configuration-level decisions and then base coordination decisions on that plan.

Cash flow decisions

When are suppliers compensated for the deliveries, they make? Which cost-cutting measures are implemented throughout the supply chain (or demanded of suppliers)? Which currency will a supplier receive payment in a multinational company?

Information flow decisions

What format—paper, speech over the phone, EDI (electronic data interchange), or XML—does information exchange between various supply chain participants take? What extent does supply chain collaborative

forecasting occur? What level of visibility is offered to other supply chain participants while execution is taking place? How closely do the supply chain partners work together when creating new products or services?

Material flow decisions

How much of each sort of product's inventory should be kept on hand? Should finished or semifinished merchandise be kept on hand? How frequently should stock be refilled?

Is it preferable for a business to let the vendor handle the inventory, or should it make all inventory decisions? Should vendors be obligated to ship items on time?

3. Complexities Associated with Supply Chains

As was discussed in the previous section, supply chain management crosses a few functional and geographic boundaries. This adds complexity to the supply chain's design and implementation. The following are some important factors that make judgments on supply chain management more difficult.

3.1 Multiple Agents

It is necessary for several entities with occasionally conflicting interests to decide on supply chain concerns. For instance, a store may need extremely high product availability from the distributor while also requesting that they not be charged any additional fees. Although the store might not wish to provide information about real customer sales, the distributor may occasionally agree to that. There may be incentive problems even when decisions need to be made within the same company. For instance, the manufacturing department, a cost centre, receives the projection of future demand from the marketing or sales department, which is often a revenue centre. It is obvious that the former has a motivation to overestimate, while the latter has a motivation to under-produce (in comparison to the forecast). This presents a number of challenges when determining how much inventory has to be stocked. Another similar problem is when the marketing department might advocate for a great deal of variation in the product/service offers, but the production department might not want to accept that because it would add more complexity to the execution.

3.2 Uncertainty

The goal of efficient supply chain management is to precisely match supply and demand, but this is made more difficult by uncertainty at different stages of the process. In the development of products and technologies, in forecasting consumer demand, in daily operations and manufacturing, and in supply, there is uncertainty. Uncertainty typically makes the system less efficient. For instance, if the final demand for a sweater at a retailer cannot be predicted with accuracy, the company would either produce too much (resulting in stock-outs) or too little (resulting in having to sell off all of its inventory at the end of the season). Similar to this, the supply unpredictability can call for more buffer stock.

3.3 Information Asymmetry

There is a high degree of information asymmetry since supply chain procedures include several functional units within a corporation and frequently involve separate firms. The lack of adoption of information technology and the unwillingness to share information with other supply chain partners are the two key causes of this. Numerous issues arise during real fulfilment as a result of the information gap. For instance, a customer who visits an e-commerce site and purchases anything from the online catalogue anticipates receiving the goods promptly. The customer is unaware that the information on the website can be out-of-date and that the inventory status for the product may only be updated once a week. As a result, when the goods do not arrive on time, the customer is unhappy.

3.4 Lead Time

Each and every step in the supply chain process takes time to complete, and the processing power of the available resources (people, machinery, or computers) is constrained. Because of this, not all jobs can be finished after the actual demand is recognised; certain work must be accomplished up front (which may or may not get utilised based on the actual demand realized). Additionally, the constrained capacity of the resources causes variability in the actual realised lead-time, necessitating more resources at the following level in the supply chain. The supply chain has a variety of inefficiencies as a result of the aforementioned complexity, which are sometimes seen as the "negative effects" of inadequate supply chain management. The following categories can be used to group some of the key inefficiencies.

3.5 Competition

Businesses must consider market competition while making supply chain decisions. For instance, developing exclusive business relationships with important suppliers helps stop the leakage of secret technology to rivals who might source from the same providers. Another illustration is how competitors' actions can influence how businesses decide to outsource (see Feng and Lu 2012). Many businesses in the computer and electronics sectors rely on contract manufacturers to put the finished goods together. These contract manufacturers typically have lower cost structures than OEMs since they are situated in low-cost areas with scale economies. In order to support its build-to-order business strategy, Dell operated its own assembly operations in North America for a while. Dell had to alter its supply chain strategy by outsourcing assembly work to contract manufacturers as a result of growing market demand to reduce costs; this is a technique that its main rivals have long used.

4. Inefficiencies of Supply Chain Management

4.1 Customization Challenges

Late deliveries of customised products are one of the primary consequences of subpar supply chain management as the level of customization in the market has increased. Businesses are creating a number of techniques to offer variety while reducing expenses. Delaying product diversification is one of these, as is increasing product line commonality and flexibility.

4.2 Stock-outs

Ineffective supply chain management also contributes to massive stockouts and delayed deliveries. Fundamentally, these consequences result from the company's failure to forecast the demand for raw materials and equipment capacity as well as the unpredictability related to receiving timely product deliveries from its suppliers. According to Fisher et al. (1994), precise projections in the garment sector might help to lessen this inefficiency.

4.3 Distortion of Information

The bullwhip effect, which is caused by a lack of visibility of demand and supply information throughout the supply chain, is another consequence. This effect explains how a modest change in consumer demand may be amplified further along the supply chain since the various supply chain participants independently create and update their own projections and do not cooperate and exchange actual demand data. According to Lee et al. (1997), this effect's causes, and controls are discussed.

4.4 Poor Utilization of Inventory Assets

Having surplus inventory at different points in the supply chain while experiencing shortages at other points is a common result of inadequate supply chain management. Inventory makes up a sizable portion of a company's working assets, so bad management could result in significant inefficiencies. A good review of the challenges and chances related to inventory management in supply chains is given by Lee and Billington (1992).

5.New Developments in Supply Chain Management

5.1 Global Supply Chains

Even a modest manufacturing company may find it difficult to manage an overseas supply connection in the increasingly globalised world economy. Globalization is not a new phenomenon, but the tendency that emerged in the first decade of the twenty-first century flattened the world more than ever before. The cost difference between emerging economies and developed economies has been significantly decreasing in recent years, nonetheless. Numerous businesses are being forced to reevaluate their supply chain setups, especially their cost-driven outsourcing strategies. Large and small manufacturing companies have both recently brought production that had been produced overseas back home. Meanwhile, expanding one's global supply chain footprint has become a more alluring choice as a result of the expanding market size of the developing economies. Finding the ideal balance between onshore and offshore sourcing will remain a crucial component of supply chain strategies for businesses.

5.2 Sustainable Supply Chains

Building sustainable supply chains has attracted a lot of interest from businesses, NGOs, and environmentalists during the past ten years. The supply chain strategies of numerous companies have been influenced by this society-wide sustainability project. Wal-Mart, for instance, introduced three overarching sustainability objectives in 2005: (1) use 100% renewable energy; (2) produce zero waste; and (3) market products that preserve our resources and environment (Denend and Plambeck 2007). The business looked at many facets of its supply chains to see which ones offered the most promise for sustainability in order to meet these objectives. Additionally, it used a variety of incentives to encourage its suppliers to support its sustainability objectives.

5.3 Humanitarian Supply Chains

More than 5.1 billion people were affected by 6,637 natural catastrophes between 1974 and 2003, and \$1.38 trillion USD in recorded damages (Ergun et al 2009). Even though it was difficult to predict when these disasters would occur, careful planning may have lessened their negative social and economic effects. For speedy reaction and relief efforts after disasters occur, it is possible to construct and maintain well-maintained humanitarian supply chains, i.e., supply chains for disaster preparedness and response. Supply and demand dynamics in humanitarian supply chains are different from those in conventional supply systems. Ergun et al. (2009) provide a thorough analysis of the topic. A vital aspect of humanitarian supply chains is the provision of necessities (such as food supplements, bednets, and immunizations) to those in need outside of emergency situations.

5.4 New Technologies Impacting Supply Chains and Big Data

Digital technology has changed the way supply chain operations are carried out over the past two decades. The top 10 technologies that have the biggest effects on supply chain operations, according to a recent study by Intermec, a top provider of supply chain solutions, are: (1) comprehensive connectivity - from Bluetooth, cellular networks, and 802.11 wireless LAN technologies; (2) voice and GPS communication integrated into rugged computers; (3) speech recognition; (4) digital imaging; (5) portable printing; (6) 2D & other bar coding advances; and (7) RFID (radio-frequency identification).

An enormous amount of data about company transactions, logistical activities, customer attributes, etc. has been produced as a result of the widespread use of the aforementioned digital and communication technologies in commercial and consumer applications. IDC estimates that 750 exabytes (EB) of data were generated online

in 2009, and that by 2021, this amount will surpass 35 zettabytes (ZB). "High-volume, high-velocity, and/or high-variety information assets that demand novel kinds of processing to enable enhanced decision making, insight finding, and process optimization," is how Gartner defines big data. Companies are just beginning to realise the potential afforded by the enormous amount of data being collected in their information systems, thus the true impact of big data on enhancing supply chain efficiency is still to come. The information business is undergoing a transformation as a result of the exponential growth of data, yet sophisticated tools have not yet been created to analyse supply chain-related data for performance enhancement.

6. Supply Chain Research: Past, Present, and Future

The study of supply chain management may be traced back to the early 1950s, when a number of researchers became interested in identifying the best practises for managing inventories. One of the earliest works in this field deals with the models created by Clark and Scarf in 1958 for controlling inventories at different levels. Since the 1950s, thousands of scholars have investigated linked stochastic and deterministic inventory problems.

The research guide prepared by Graves et al. succinctly summarises this study (1993). In the context of supply chain management, there is a wealth of literature in the fields of transportation, distribution, and plant location models. Traditional researchers assumed that the supply chain was under centralised control and concentrated on creating the best policies and procedures for particular supply chain problems. Researchers have begun to look into issues that involve a decentralised multi-agent approach to supply chain analysis, the integration of logistics decisions and information availability across the supply chain, the development of new models for supply contracts and demand forecasting, and the integration of product design and supply chain management. Tayur et al. (1998) and de Kok and Graves (2001) contain a collection of notable studies in this field (2003). Researchers began using data and empirical techniques to validate supply network theories and to thoroughly characterise supply chain behaviours after several decades of studying supply chains with mathematical models. For instance, Cachon et al. (2007) demonstrate the power of the bullwhip effect, or the phenomenon where demand variability rises going from the downstream of a supply chain to the upstream, using industry-level U.S. data. Cachon and Olivares (2009) analyse the variables that affect the variation in finished-goods inventories between six top vehicle manufacturers using firm-level data. As scholars become more resourceful in locating pertinent data on supply chains, the empirical stream of study will continue to expand.

In addition to academic research, a number of businesses created and effectively used sizable analytical and simulation models for supply chain execution and optimization in the 1990s. One such system created for Digital Equipment is described by Arntzen et al. (1995), and Motorola received the Franz Edelman Award from INFORMS (The Institute for Operations Research and Management Sciences) in 2004 for launching a comprehensive online negotiation system to support the company's sourcing process and generating savings of \$600 million as a result.

The demands of customers for greater variety, faster and more reliable delivery times, and lower pricing provide businesses in the twenty-first century with significant obstacles. The emergence of e-commerce has greatly increased prospects while also making businesses more susceptible to logistics hazards. Customers now purchase delivered goods in addition to physical goods. Fulfilment is therefore just as crucial as closing the sale. In contrast to traditional channels where inventory might be maintained to cover up other inefficiencies like long lead times and inaccurate estimates, such arrangements are less helpful in the quick-paced electronic business environment. As a result, businesses are starting to focus more on supply chain management. A number of supply chain management-related difficulties have been presented by both business-to-business and business-to-consumer e-commerce environments, and these concerns will likely be studied by scholars in the near future.

Due to the widespread use of the Internet, vertical marketplaces have emerged that claim to eliminate inefficiencies in the purchasing process across a variety of businesses. On the one hand, these marketplaces may lower the cost of goods for the producer because increased competition results in lower prices. According to this school of thought, supply chains may become more flexible in the future, and supplier relationships may become more focused on the short term. However, many businesses understand that bigger gains may be made if some of these marketplaces are actually used for process integration and supply chain collaboration. In such a setting, businesses must increase trust in order to encourage information sharing among supply chain partners. Today's researchers are attempting to determine the possible outcomes of each scenario and what new models and analyses are required. The development of international supply chains is a linked consequence of the Internet. Today, it is much simpler for any supplier in a far-off region of the world to submit a bid for contracts from huge companies in developed countries, even if they haven't previously done business with those companies. Future supply chain management research is likely to include topics linked to the coordination of the global supply chain. The management of sustainable supply chains is a crucial study area. In the past, experts have only focused on the effective transfer of commodities from the provider to the consumer. More academics are now looking into issues like recycling used goods, reusing outdated goods, creating environmentally friendly packaging, and selecting suppliers based on environmental factors in

addition to more conventional ones like price, quality, and dependability. The investigation of supply networks in the service sector is another recent area of inquiry. Due to the inability to keep inventory, service supply networks are more difficult than traditional manufacturing-oriented supply chains. In those circumstances, additional buffer capacity is used to accommodate uncertainty. Finally, scholars are starting to investigate potential behavioural problems in supply chain management, including trust, constrained rationality, mental accounting, etc.

7. Conclusions

This paper offers insights into the conceptualization and research methodological foundations of the SCM discipline through a thorough and organised review of the literature. The review gives us the opportunity to briefly characterise SCM, make suggestions on how it should be described from the standpoint of philosophy of knowledge, and set a research agenda for the future. The review demonstrates that the SCM is a relatively "new" field with academics' interest growing exponentially. A set of dominating traits was discovered, though. In particular, the conceptualization of SCM as primarily a process, the dominance of transaction cost economics and strategy-based competitive advantage theoretical grounding, the presence of mostly descriptive-type theories, the strong positivist paradigmatic stances in the research methods used, and the utilisation of analytical conceptual, as well as conceptual analysis are notable. In terms of how the region is conceptualised, conceptually characterised, and researched, these prevailing traits appear to have inhibited multiplicity of ideas, resulting in a narrowly concentrated field's development. In consequence, this has inhibited ideas outside of the functional domains that SCM has traditionally been associated with from being more widely disseminated and accepted. As a result, the theories underlying SCM have not been thoroughly examined for soundness and robustness. There is a chance that SCM will become limited to a specific intellectual foundation if this trend persists. This might cause the larger academic community to dismiss SCM as unworthy of serious study.

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