

Concept Paper on Supply Chain Management

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Abstract: Supply chain management is the management of the flow of goods and services and includes all processes that transform raw materials into finishing products. It involves the active smooth-running of a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace. Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and competence for the market being served. The goal of supply chain management is to increase sales of goods and services to the final, end use customer while at the same time reducing both inventory and operating expenses.

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I. Introduction

Supply chain management encompasses the planning and management of all activities through which products and services are created and distributed to customers. Such activities include sourcing and procurement, manufacturing/operations, as well as warehousing, logistics and transportation. Importantly, it also includes coordination and collaboration with channel partners including suppliers, intermediaries, third-party service providers and customers. In essence, supply chain management integrates supply and demand management within and across companies. Integrated supply chain management is a proven business strategy that has gained wide acceptance in recent years due to increasing customer demands for quality, delivery, and speed. New and radical ways of communicating, coupled with cost reduction and more interdependent supplier, provider, and customer relationships, have contributed to the emergence of an integrated supply chain approach. Supply chains can exist in both manufacturing and service organizations, and they are principally concerned with the flow of products and information between supply chain member organizations (procurement of materials, transformation of materials into finished product, and distribution of that product to end customers). Today's information-driven, integrated supply chains are enabling organizations to reduce inventory and costs, add product value, extend resources, accelerate time to market, and retain customers.

The trend towards developing a green supply chain is now gaining popularity but most companies are still coming to terms with how this can be achieved and where do they start. For years, businesses have been concentrating on improving supply chain visibility, refining efficiency and minimizing cost. Despite the focus being moving towards a green supply chain the goals of visibility, efficiency and cost reduction do not have to be discarded. By examining the companies who have already strived towards a green supply chain, we can begin to see some best practices that will help others to begin their own transition. This paper initially gives the historical perspective and background of supply chain, followed by the differences between the concept of supply chain management and the concept of logistics. It also discusses important aspects like the elements, levels, participants, key steps of supply chain and how the chain functions. The impacts and benefits of the supply chain are then highlighted. Finally, the paper speaks about the green supply chain for the improvement of the business.

II. Historical Perspective and Background

The practice of supply chain management is guided by some basic underlying concepts that have not changed much over the centuries. Several hundred years ago, Napoleon made the remark, "An army marches on its stomach." Napoleon was a master strategist and a skillful general and this remark shows that he clearly understood the importance of what we would now call an efficient supply chain. The term "supply chain management" arose in the late 1980s and came into widespread use in the 1990s. Prior to that time, businesses used terms such as "logistics" and "operations management" instead. Some definitions of a supply chain are offered below:

"A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves." "A supply chain is a network of facilities and distribution options that performs

the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers". If this is what a supply chain is then we can define supply chain management as the things we do to influence the behavior of the supply chain and get the results we want. So, supply chain management may be defined as "The coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served."

Concept of Supply Chain Management Vs Concept of Logistics: There is a difference between the concept of supply chain management and the traditional concept of logistics. Logistics typically refers to activities that occur within the boundaries of a single organization and supply chains refer to networks of companies that work together and coordinate their actions to deliver a product to market. Also, traditional logistics focuses its attention on activities such as procurement, distribution, maintenance, and inventory management, whereas, supply chain management acknowledges all of traditional logistics and also includes activities such as marketing, new product development, finance, and customer service. In the wider view of supply chain thinking, these additional activities are now seen as part of the work needed to fulfill customer requests. Supply chain management views the supply chain and the organizations in it as a single entity. It brings a systems approach to understanding and managing the different activities needed to coordinate the flow of products and services to best serve the ultimate customer. This systems approach provides the framework in which to best respond to business requirements that otherwise would seem to be in conflict with each other.

III. Elements of the Supply Chain

A simple supply chain is made up of several elements that are linked by the movement of products along it. The supply chain starts and ends with the customer. The various elements of supply chain are as following:

Customer: The customer starts the chain of events when they decide to purchase a product that has been offered for sale by a company. The customer contacts the sales department of the company, which enters the sales order for a specific quantity to be delivered on a specific date.

Planning: The requirement triggered by the customer's sales order will be combined with other orders. The planning department will create a production plan to produce the products to fulfill the customer's orders. To manufacture the products the company will then have to purchase the raw materials needed.

Purchasing: The purchasing department receives a list of raw materials and services required by the production department to complete the customer's orders. The purchasing department sends purchase orders to selected suppliers to deliver the necessary raw materials to the manufacturing site on the required date.

Inventory: The primary purpose of inventory is to act as a buffer against uncertainty in the supply chain. The raw materials are received from the suppliers, checked for quality and accuracy and moved into the warehouse. The supplier will then send an invoice to the company for the items they delivered. The raw materials are stored until they are required by the production department.

Production: This activity includes the creation of master production schedules that considers plant capacities, workload balancing, quality control, and equipment maintenance. Based on a production plan, the products ordered by the customer are manufactured using the raw materials purchased from suppliers. After the items have been completed and tested, they are stored back in the warehouse prior to delivery to the customer.

Location: Where should facilities for production and inventory storage be located? Where are the most cost-efficient locations for production and for storage of inventory? Should existing facilities be used or new ones built? Once these decisions are made they determine the possible paths available for product to flow through for delivery to the final consumer.

Transportation: Air freight and truck delivery are generally fast and reliable but they are expensive. Shipping by sea or rail is much less expensive but usually involves longer transit times and more uncertainty. When the finished product arrives in the warehouse, the shipping department determines the most efficient method to ship the products so that they are delivered on or before the date specified by the customer. When the goods are received by the customer, the company will send an invoice for the delivered products.

Information: Timely and accurate information holds the promise of better coordination and better decision making. With good information, people can make effective decisions about what to produce and how much, about where to locate inventory and how best to transport it.

Level of Supply Chain Management Activities:

Supply Chain Management has three levels of activities that different parts of a company focus on:

Strategic: At this level, company management will be looking to high level strategic decisions concerning the whole organization, such as the size and location of manufacturing sites, partnerships with suppliers, products to be manufactured and sales markets.

Tactical: Tactical decisions focus on adopting measures that will produce cost benefits such as using industry best practices, developing a purchasing strategy with favored suppliers, working with logistics companies to develop cost effective transportation and developing warehouse strategies to reduce the cost of storing inventory.

Operational: Decisions at this level are made each day in businesses that affect how the products move along the supply chain. Operational decisions involve making schedule changes to production, purchasing agreements with suppliers, taking orders from customers and moving products in the warehouse.

Participants in the Supply Chain:

In its simplest form, a supply chain is composed of a company and the suppliers and customers of that company. This is the basic group of participants that creates a simple supply chain. Extended supply chains contain three additional types of participants. First there is the supplier's supplier or the ultimate supplier at the beginning of an extended supply chain. Then there is the customer's customer or ultimate customer at the end of an extended supply chain. Finally, there is a whole category of companies who are service providers to other companies in the supply chain. These are companies who supply services in logistics, finance, marketing, and information technology. In any given supply chain there is some combination of companies who perform different functions. There are companies that are producers, distributors or wholesalers, retailers, and companies or individuals who are the customers, the final consumers of a product. Supporting these companies there will be other companies that are service providers that provide a range of needed services. The main participants are producers, distributors, retailers, customers and service Providers.

How the Supply Chain Works:

The goal or mission of supply chain management can be defined as "Increase throughput while simultaneously reducing both inventory and operating expense." In this definition throughput refers to the rate at which sales to the end customer occur. The elements discussed previously where companies can make decisions that will define their supply chain capabilities. We can define these elements as performance drivers. Effective supply chain management calls first for an understanding of each driver and how it operates. Each driver has the ability to directly affect the supply chain and enable certain capabilities. Let us see few drivers individually.

Production: Production refers to the capacity of a supply chain to make and store products. The facilities of production are factories and warehouses. The fundamental decision that managers face when making production decisions is how to resolve the trade-off between responsiveness and efficiency. If factories and warehouses are built with a lot of excess capacity, they can be very flexible and respond quickly to wide swings in product demand. Facilities where all or almost all capacity is being used are not capable of responding easily to fluctuations in demand. On the other hand, capacity costs money and excess capacity is idle capacity not in use and not generating revenue. So, the more excess capacity that exists, the less efficient the operation becomes. Factories can be built to accommodate one of two approaches to manufacturing:

Product Focus: A factory that takes a product focus performs the range of different operations required to make a given product line from fabrication of different product parts to assembly of these parts.

Functional focus: A functional approach concentrates on performing just a few operations such as only making a select group of parts or only doing assembly. These functions can be applied to making many different kinds of products.

Inventory: Inventory is spread throughout the supply chain and includes everything from raw material to work in process to finished goods that are held by the manufacturers, distributors, and retailers in a supply chain. Again, managers must decide where they want to position themselves in the trade-off between responsiveness and efficiency. Holding large amounts of inventory allows a company or an entire supply chain to be very responsive to fluctuations in customer demand. However, the creation and storage of inventory is a cost and to achieve high levels of efficiency, the cost of inventory should be kept as low as possible. There are three basic decisions to make regarding the creation and holding of inventory:

Cycle Inventory: This is the amount of inventory needed to satisfy demand for the product in the period between purchases of the product.

Safety Inventory: Inventory that is held as a buffer against uncertainty. If demand forecasting could be done with perfect accuracy, then the only inventory that would be needed would be cycle inventory.

Seasonal Inventory: This is inventory that is built up in anticipation of predictable increases in demand that occur at certain times of the year.

Location: Location refers to the geographical sitting of supply chain facilities. It also includes the decisions related to which activities should be performed in each facility. The responsiveness versus efficiency trade-off here is the decision whether to centralize activities in fewer locations to gain economies of scale and efficiency, or to decentralize activities in many locations close to customers and suppliers in order for operations to be more responsive. When making location decisions, managers need to consider a range of factors that relate to a given location including the cost of facilities, the cost of labor, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers. Location decisions tend to

be very strategic decisions because they commit large amounts of money to long-term plans. Location decisions have strong impacts on the cost and performance characteristics of a supply chain. Once the size, number, and location of facilities is determined, that also defines the number of possible paths through which products can flow on the way to the final customer. Location decisions reflect a company's basic strategy for building and delivering its products to market.

Transportation: This refers to the movement of everything from raw material to finished goods between different facilities in a supply chain. In transportation the trade-off between responsiveness and efficiency is manifested in the choice of transport mode. Fast modes of transport such as airplanes are very responsive but also costlier. Slower modes such as ship and rail are very cost efficient but not as responsive. Since transportation costs can be as much as a third of the operating cost of a supply chain, decisions made here are very important. There are six basic modes of transport that a company can choose from: Ship, Rail, Pipelines, Trucks, Airplanes, and Electronic Transport. Given these different modes of transportation and the location of the facilities in a supply chain, managers need to design routes and net-works for moving products.

Information: Information is the basis upon which to make decisions regarding the other four supply chain drivers. It is the connection between all of the activities and operations in a supply chain. To the extent that this connection is a strong one, (i.e., the data is accurate, timely, and complete), the companies in a supply chain will each be able to make good decisions for their own operations. This will also tend to maximize the profitability of the supply chain as a whole. That is the way that stock markets or other free markets work and supply chains has many of the same dynamics as markets. Information is used for two purposes in any supply chain:

Coordinating daily activities related to the functioning of the other four supply chain drivers: production; inventory; location; and transportation. The companies in a supply chain use available data on product supply and demand to decide on weekly production schedules, inventory levels, transportation routes, and stocking locations. Forecasting and planning to anticipate and meet future demands. Available information is used to make tactical forecasts to guide the setting of monthly and quarterly production schedules and timetables. Information is also used for strategic forecasts to guide decisions about whether to build new facilities, enter a new market, or exit an existing market.

IV. The Impacts and Benefits of Supply Chain Management

When applied in the private sector, supply chains have demonstrated superior customer responsiveness at about half the cost. Industry experts estimate that supply chain costs approach 75% of an organization's total operating budget. Effective management of the supply chain not only improves the flow of materials from the perspective of the end user, but it also reduces logistics costs. In the public sector, integrated supply chains play a critical role in optimizing logistics support and in improving management of secondary inventory. Secondary items include repairable parts (expensive items such as hydraulic pumps and navigational computers that can be fixed and used again); spare parts that support weapons systems; and commodities such as subsistence, medical materiel, and clothing.

Effective supply chain management can impact virtually all business processes, leading to continuous improvements in areas such as data accuracy, reductions in operational complexity, supplier selection, purchasing, and warehousing and distribution. Other benefits include:

- ✓ Quicker customer response and fulfillment rates.
- ✓ Greater productivity and lower costs.
- ✓ Reduced inventory throughout the chain.
- ✓ Improved forecasting precision.
- ✓ Fewer suppliers and shorter planning cycles.
- ✓ Improved quality and products that are more technologically advanced.
- ✓ Enhanced inter-operational communications and cooperation.
- ✓ Shortened repair times and enhanced equipment readiness.
- ✓ More reliable financial information.

Aligning Green Supply Chain Goals with Business Goals:

Green Supply Chain Management encompasses a set of environmental practices that encourage improvements to the environmental practices of two or more organizations within the same supply chain. It is the process of incorporating environmental concerns into supply chain management including product design, material sourcing and selection, manufacturing, delivery of final products, and the management of product's end-of-life. GSCM can be achieved by considering environmental issues at the purchasing, product design and development, production, transportation, packaging, storage, disposal, and end of product life cycle management stages.

From an entrepreneurial perspective, entrepreneurial GSCM is a new approach to environmental management executed by green entrepreneurs across whole supply chains instead of thinking in terms of

individual non-environmental firms. This new holistic view can integrate individuals, companies, and supply-chains of different entrepreneurs from various countries together in an environmentally friendly way. Creating a green supply chain that has little to do with your business will not help a company to achieve its business objectives. For example, if a company decides to use biodegradable packaging for its products that costs 25% more than traditional packaging, this goes against the businesses goals of reducing costs. If a business has an overall goal to reduce costs then the move to a green supply chain should dovetail with the business goal. A company should look at its overall business goals and identify how a transition to a green supply chain can help achieve those goals. For example, if a business wants to reduce its energy costs it should start by looking at the consumption to see if a reduction can be made by using more energy efficient and greener equipment.

Companies do not often change their businesses processes and it is this attitude allows inefficient processes to continue unabated causing unnecessary waste and pollution. For example, ineffective processes in the US automotive industry allowed the innovative Japanese automakers to become market leaders. Businesses that want to transition to a green supply chain should take the opportunity to review all their business processes to identify areas where adopting a greener outlook can actually improve their business. Companies should review each process along the supply chain to identify if a more environmentally sound approach will help cure the inefficiencies that occur. Many companies that have been through this exercise have identified processes where raw materials were wasted; resources underutilized and unnecessary energy used due to inefficient equipment.

V. Conclusion

A supply chain is composed of all the companies involved in the design, production, and delivery of a product to market. Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served. The goal of supply chain management is to increase sales of goods and services to the final, end use customer while at the same time reducing both inventory and operating expenses.

A large percentage of the cost of complex commercial products comes from the "external" purchases of components that go into those products. These purchases are made from a large number of suppliers. Some suppliers may be multi-million dollar companies in other countries. Others may be small shops across town. This implies that supply chains play a vital role in the production of complex products made in the world today. We believe that one key to the successful management of these supply chains is integration. The business model of vertical integration that came out of the industrial economy has given way to "virtual integration" of companies in a supply chain. Each company now focuses on its core competencies and partners with other companies that have complementary capabilities for the design and delivery of products to market. Companies must focus on improvements in their core competencies in order to keep up with the fast pace of market and technological change in today's economy.

At the opposite end of the supply chain businesses should look at their return process. Many businesses have not developed a successful refurbishment program for their products that have been returned or exchanged. By offering refurbished items businesses can increase purchasing options to their customers and widen their customer base, whilst improving the environmental impact of their products. There are many ways in which businesses can transition to a green supply chain; however, it is important to realize that it is difficult to achieve results without strong focused leadership. In conclusion, we believe that a key issue in the success of supply chains is the synchronization of operations among multiple suppliers by using information technologies.

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