

APPLICATION OF SUPPLY CHAIN MANAGEMENT IN A FOOD PROCESSING COMPANY

Parvesh Antil¹, Anish Kumar²,

¹Assistant Professor, MAE Department, NIEC, New Delhi, (India)

²ME Department, Delhi Technological University, (India)

ABSTRACT

Supply chain is an important activity in most of the industries and is the central focus of many industries. Effectiveness and efficiency of a supply chain effect companies to a great extent. With the growing interest in it, a lot of work has been done in this field in the past two decades. . In this work tried to explain various drivers and important factors in supply chain management with the help of a case study. We have tried to explore various aspects of supply chain with the help of a case study of a food processing company. With the help of a case study we have tried to probe into various issues and factors of a supply chain and supply chain management. The case study has been developed with a more physical view into supply chain..

Keywords: *Supply Chain, Supply Chain Management.*

I INTRODUCTION

From the raw material stage to final delivering of product, all the entities involved in supplying a product to a customer is called supply chain. Manufacturing unit, marketing, transportation department, supplier, warehouse, retailer and even the customer are all parts of supply chain.

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. It is a holistic approach and strategy to add value to the supply chain organisation. The SCM approach involves people, technology, activities, information directly or indirectly related to the product/services, involved in supplying the product/services from supplier to customer (sunil et al.).

Eg. here we have considered the case of a milk and milk products processing organization. The customer walks into the retail outlet, the supply chain begins with the customer and his/her need for the product. The retailer who has stocked inventory of different products in quantities in accordance with the daily demand and the life of each product. The retailer is supplied by the regional distributor or directly from the company. The distributor too is stocked by the company directly or the distributing unit of the company, which gets its stock from manufacturing unit. The manufacturing unit too need raw material like unprocessed milk, nuts and other additives in the milk, other materials which are required in daily plant running. The company gets its supplies from its suppliers and acts as customer to them thereby forming another supply chain which is procurement chain to it.

Thus supply takes place at different levels efficient management directly effects the customer satisfaction, sale, cost of product. This makes it a very important function to deal with.

Aim of Supply chain management is to recognize the strategic nature of coordination between trading partners, create sourcing, making and delivery process of products/services and logistics functions seamlessly across the supply chain to gain a competitive edge in the market. The objective of supply chain management is to be efficient and cost-effective. Thus, the emphasis is on taking a systems approach to supply chain management.

II LITERATURE BACKGROUND

SCM practices have been globally accepted by enterprises as an important factor to survive in the present global scenario. Numerous researchers have explored SCM on various issues viz. Definition, dimensions, performance measurement, strategy evaluation etc. Therefore a vast literature giving an insight into this evolving concept is there.

“A supply chain is the alignment of firms that bring products or services to market.”—from Lambert, Stock, and Ellram in their book *Fundamentals of Logistics Management* (Lambert, Douglas M., James R. Stock, and Lisa M. Ellram, 1998, *Fundamentals of Logistics Management*, Boston, MA: Irwin/McGraw-Hill, Chapter 14)².

Various definitions of supply chain are:-

“A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request” Chopra and Meindl³.

“The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.” Mentzer et al⁴.

“A supply chain encompasses all activities associated with the flow and transformation of goods from the raw material stage, through to the end user, as well as the associated information flows” Handfield & Nichols⁵.

“Supply chain can be defined as integrated process wherein a number of various business entities (i.e., suppliers, manufacturers, distributors, and retailers) work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified finished final products, and (3) deliver these final products to retailers”-Benita M. Beamon, “Supply Chain Design and Analysis: Models and Methods⁶”.

Acc. To Council of Supply Chain Management Professional – “Supply Chain Management encompasses the planning & management of all activities involved in sourcing & procurement, conversion, and all logistics management activities.”

SCM is a concept that has evolved since 50's and 60's, in 1950's, 1960's most manufacturers emphasised on mass production to minimize cost. Excessive inventory was maintained to take care of bottleneck operations. Information and technology sharing was seen as risk and not at all good for the organization. In place of Supply chain the term logistics was used which emphasized only on transportation function. In 1970's material requirement planning (MRP) was developed and managers realized new material management concepts to improve performance. In the 1980's due to global competition manufacturers were forced to offer low-cost, high performance and flexible products. JIT and more management programs were used to improve the efficiencies

of production and improve performance. The term Supply Chain Management came into use in 1990's when managers further extended improvement strategies to include strategic suppliers and logistics functions. The concept of supply chain has evolved to a great extent. Manufacturers and retailers are embracing the concept of SCM to improve efficiencies and effectiveness to a great extent (Tan, 2002)⁷.

Various entities perform different functions in a supply chain. Here we have discussed the following seven :- demand forecast, facility location, inventory, transport, information. Demand forecast is an important function which is heavily dependent on information sharing and connectivity in a supply chain and is a strategically important decision.. According to Vives⁸(1994) demand is directly influenced by market competition, nature of goods and degree of product differentiation. Yue et. al⁹ assess the benefits of sharing demand forecast information in a manufacturer-retailer supply chain, consisting of a retail channel and a direct channel. Both the manufacturer and the retailer set their price based on their forecast of the primary demand. Information also has great effect on demand forecast. Information sharing can be very valuable to both the manufacturer and the retailer, especially in situations where the accuracy of the retailer forecast is low, the accuracy of the manufacturer forecast is high, and the correlation between forecasts is low. It also assesses the effects of demand information sharing in a manufacturer-retailer supply chain. (Ren et. al.)¹⁰.

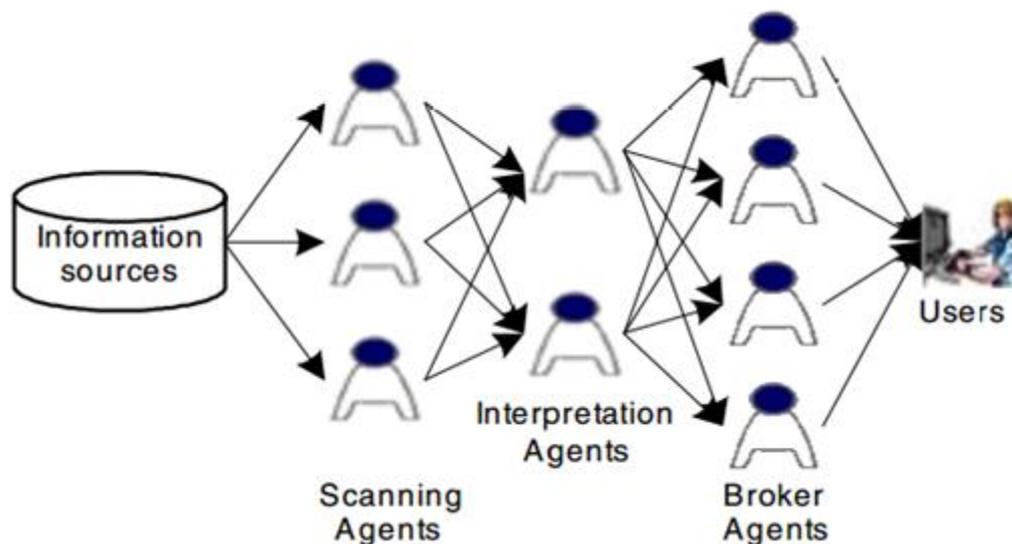
Facility location has great strategic and financial importance in a supply chain. It has been extensively studied. A crucial aspect of many practical location problems regards the existence of different types of facilities, each one of which playing a specific role (e.g., production, warehousing), and a natural material flow (that is, a hierarchy) between them (Melo et al)¹¹. Simchi-Levi et al.¹² state that "the strategic level deals with decisions that have a long-lasting effect on the firm.". Although typically no location decisions are made on the tactical or even operational level, a number of issues are strongly related to them such as inventory control policies, the choice of transportation modes and capacities, warehouse layout and management, and vehicle routing (among others) (Melo et. al.)¹³.

Inventory accounts for significant capital investment in an organization. Blackburn(1991)¹⁴ Shorter and shorter product life cycles as well as growing innovation rates make demand extremely variable and the collection of statistics (which are required by stochastic models) less and less reliable, this makes efficient inventory management very important. Giannoccaro et. al.¹⁵ Inventory decisions in SCs are made independently at each stage (as it is often the case), they are usually based on the local inventory status and local performance objectives (local policies). The paper proposes to define a inventory management policies that are both easy to be implemented and near optimal for the whole SC. It presents a methodology to define a supply chain (SC) inventory management policy, which is based on the concept of echelon stock and fuzzy set theory. It presses for an periodic review policy then a continuous review policy, and asks for clear definition of inventory policy. In firms with better capital intensity tend to have lower numbers of days holding their inventories. Sahari et. al.¹⁶ has investigated into the correlation between the inventory day, return on assets and capital intensity as a measure of supply chain performance. It finds a significant negative relationship between inventory days and return on assets. Sahin et. al.¹⁷ explores the impact of radio frequency identity – RFID technology on supply chain operations and finds significant cost improvement and reduced inventory data record inaccuracies with its use.

Logistics acts as blood through a supply chain, it is the physical connection between different levels in a supply chain. Liu¹⁸ has presented a new management system of material supplies based on the modern Logistics supply

chain theory for the enterprise material supply management. Logistics outsourcing is one of the growing trends in supply chain management. The good choice of service suppliers is the key to success in logistics outsourcing. Pankaj et al.²⁰ has studies the challenges for logistics sector in Indian market. Evolving technologies, infrastructure, changing government policies play a significant role in the changing logistics sector in India. Logistics in India²¹ report by KPMG too provides a great insight in to the present scenario in Indian logistics industry.

Information sharing plays a vital role to match demand and manufacture, for demand forecast in supply chain. However, the benefits of sharing information among supply chain members are not always the same. They depend on the supply chain structure (e.g., serial or distributive systems) and its operational characteristics (e.g., demand patterns and costs involved) choi²². Yen²³ proposes Information sharing chain to balance demand and supply in a supply chain. Similar to a supply chain, an information supply chain (ISC) fulfills users' information requirements by a network of information-sharing agents (ISA) that gather, interpret, and satisfy the requirements with proper information.



An Information Supply Chain

Fig 1- Shuang Sun and John Yen²³, "Information Supply Chain: A Unified Framework for Information-Sharing"

III The Case

ABC Fruit and Vegetable Pvt. Ltd. , is a 30 year old organization . It generates annual revenue of 2000 Cr. and provides employment to 1500 employees. It is an IS/ISO-9002, Is-15000 HACCP and IS-14001 EMS certified organization. Setting high quality standard for itself, ABC has its own Quality Assurance Laboratory, certified by National Accreditation Board for Testing and Calibration Laboratory (NABL)-Department of Science and Technology, Government of India.

ABC has a wide range of products in markets like Liquid milk , Ice creams, Flavoured Milk, Dahi , Lassi, Ghee, Butter, Cheese, Range of edible oils, range of Fresh Fruits and vegetables. With this wide range of products, it has a national level sales and distribution network. ABC markets 3 million ltrs of milk daily in the markets of Delhi, Mumbai, Saurashtra and Hyderabad. It has a 66% market share in the branded milk sector in

Delhi, where it sells 2.3 million litres of milk daily. It sells 1 million litres Bulk Vended Milk and 1.3 million Polypack milk daily in Delhi-NCR. ABC conducts its operations through 14000 retail sellers and 1000 exclusive outlets of ABC. This all involves a lot of, marketing, quality management, supplier-customer relationship management, logistics services. Bringing milk from all the collection points to the plant and that too the volume of almost 2 million litres every day requires great logistics and supplier relationship management.

ABC sale of has a daily of yogurt of 10000 kg which are sold in packed 200gm poly packs . Therefore 50000 poly packs every day. Other cultured products like lassi, mishit dohi, flavoured yogurt too have significant sales ABC also has also manufactures and markets a wide range of ice-cream. ABC is the third largest ice-cream manufacturer of ice cream in the country and has a market share of 20% presently. ABC has a daily sale of 5000 ltr per day which peaks up to 12000 ltrs per day in peak summer time. . The case here considered is based on all three chains of ABC.

IV SUPPLY CHAIN

4.1 Demand Forecast

In ABC, cultured chain process cycle is of 3 days, which starts with demand forecasting for two days forward. Demand is forecasted on the basis of last few days' sale, trend in the last week sales, weather conditions, seasoned demand. These factors contribute to the demand in Weather conditions directly affect the demand for curd, in hotter conditions demand increases as the temperature decreases demand too decreases. Last year sales are taken into account to forecast the sales for festive seasons like diwali, holi, marriage season etc. Inventory level is required to be kept at minimum because a daily sale forecast is done the inventory left for every day is adjusted in the demand prediction for the next day. Because the shelf life of curd is 8 days at 4°C temperature therefore it is required that each day production be sold on that every day and if not then on the next day this makes forecasting a very significant factor in cultured chain.

Demand forecast = Last day Demand + Trending Factor + 10% safety buffer

A 10% safety buffer is added to the equation to make sure that stock out may not happen. As left left over stock may be sold on the next day. On the basis of this demand forecast an invoice is generated to the production unit which is at a different facility.

For ice-cream shelf life is higher and it is only supplied on the basis of demand.

Milk has fixed routes and fixed daily supply, Supply can be daily changed in accordance with the demand. The retailer daily gives his demand for the next day, thus no forecast is required. But a good information system is required that makes sure that demand is correctly invoiced and supplied.

4.2 Facilities

Facilities are the actual physical locations in the supply chain network where product is stored, assembled or manufactured. ABC has two type of facilities- 1) manufacturing facility 2) distribution facility.

Manufacturing units are strategically placed such that it is close to the receiving point of unprocessed milk. Milk is procured from 8 different states in the country. Transportation of milk from different states takes place by insulated trucks and a daily train as well. Also capital cost to buy facilities is also a major factor. Distribution facilities are placed such that distribution cost is minimum whereas providing maximum access to the maximum customers in the target area. Distribution facility is to be placed at the heart of the distribution area..

Having a distribution unit at a strategically chosen location gives following benefits:-

- I. Responsive supply chain, making it more responsive to complaints, short notice orders
- II. Less transportation cost to due nearness to most of locations.
- III. Centralized distribution facility in proximity to customer.
- IV. Ease of marketing to individual parties.
- V. Better time efficiency of transportation.
- VI. More numbers of on time order are met.

4.3 Inventory

Inventory is a major cost factor in supply chain management. Being a continuous supply Chain inventory is kept at minimum. Daily unprocessed milk is procured and processed and distributed to all the booths and retail points. Any stock left is supplied on the next day. A storage capacity of 11 lakh ltrs of milk is maintained at 2-8°C.

Inventory of curd, lassi and other cultured product is maintained at 2-4°C . Inventory of ice-cream is maintained at -20°C temperature. Major inventory cost is incurred due to maintenance of such low temperature. A minimum stock level is always maintained to avoid any chance of stock out. Inventory is only maintained at the retail outlets to avoid supply on a daily basis. Outlets are supplied once in a week or twice in a week basis depending on their demand. The retail point owner gives his demand to the transporter or directly to company via its demand placing helpline. The inventory cost is directly incurred by the booth owner although this factor is directly included in the margin given to the retailer.

4.4 Transportation

Transportation refers to the movement of product from one location to another as it makes way from the beginning of a supply chain to the customer. Transportation is an important supply chain as raw material is not supplied from and consumed at the same place, also finished product is not produced and consumed at the same time. Transportation Cost is a major driver in ABC, which contribute upto 10% cost of the final product. Success of a supply chain is largely dependent on transportation efficiency.

Transportation efficiency = distance travelled by vehicle in loaded condition/ total distance travelled .

ABC has used its transportation to achieve its strategic goal. ABC uses a very responsive transportation with a goal to decrease its transportation and receiving cost while ensuring that product availability matches customer

demand. Routes for transportation are fixed and are daily generated by SAP software. The routes are subjected to change in case of any short notice demand, which makes the logistics of ABC more responsive.

4.5 Transport and logistics

ABC has opted for the methodology of outsourcing the outbound logistics. The poly-pack distribution is totally outsourced and loose milk distribution is partially outsourced.

ABC earlier had a fleet of 105 vehicles and 200 Driver-cum-Salesman(DCS) for loose milk distribution, which has now been reduced to mere 32 vehicles. This has led to substantial capital saving over the years showing in the balance sheets.

But the results has not been very satisfactory. Outsourcing has led to a great downfall in the service level of logistics. Brand ABC has also taken a setback because of it. There is lesser reliability and lesser confidence in the outsourced logistics.

The outsourcing vehicles are not maintained very well by their owners. General hygiene is being compromised. There is lesser dedication and lack of belongingness. Disciplinary issues are also there. Quality of outsourcing drivers is not good. Responsiveness has gone down which has lead to a loss of business too.

Although outsourcing has led to great savings on balance sheets but the loss of brand value and other factors are significant too. This is why ABC has not gone for 100% outsourcing. 15 new vehicles have been bought recently and more are on orders. A reassessment of outsourcing option is being done.

4.6 Information flow

Information deeply affects every part of a supply chain in many different ways. Information serves as a connection between various stages of a supply chain, allowing them to coordinate and maximize total supply chain profitability.

It is crucial to each stage in a supply chain eg. a manufacturing schedule is maintained, it uses daily demand information to forecast future demand and manufacture the product in accordance so that right amount of product is available at right time an position.

Such demand forecast is excessively used in milk and curd production in ABC , where daily demand is monitored to create the production schedule of 2 days ahead.

A warehouse management system uses information to create visibility of the warehouse's inventory as in the case of inventory if ice-cream in ABC.

Information management in ABC is totally through SAP software. In SAP Inventory level, stock level, Dispatch quantity, received quantity , date and time of dispatch and receiving, cost price and selling price of product, product code all are saved. A product is considered dispatched or received only when it is entered in SAP.

This has improved accuracy and smart information management system.

Demand information also form a major part of information system, Daily demand of different product from retailers and short term demands are received through a demand department. A special call-in demand centre in formed that takes in demand from retailer and enter the product code and demand of a product into the system. This makes the supply chain of ABC highly responsive and flexible to customer demands. Any complaints and queries are also addressed here.

4.7 Supplier Selection

ABC selects its suppliers from all over the country. Local Dairies, cooperative dairy societies, individual local suppliers are all include in it. Some local dairies supply their milk directly to ABC and therefore use the goodwill of ABC to sell their product. these dairies have to comply with the standards set by ABC for their product. Total transportation, packaging and quality is their responsibility.

4.8 Retailers

ABC has developed an extensive franchise network which perform key role of providing the customer service in ABC supply chain. Responsibilities of a ABC retailer are:-

Operate and manage store

Hire and pay staff

Order supplies

Provide Customer service

Maintain ABC outlet appearance.

ABC is responsible the following functions to its outlets:-

Pay for system operations, it is added to the margin of retailer

Provide ordering system

Develop supply and merchandise

Accounting services

Time to time training and educating the retailer as they represent ABC to the customer

Install and remodel facilities

V CONCLUSION

Supply chain is a very dynamic topic; different viewpoints can be used to explain it. We can explain supply chain from the view point of methodologies and strategies, from SCM practices, factors affecting SCM, physical entities of supply chain. Here in this work various entities of a supply chain are explained with the help of a case study of the supply chain of milk processing company. Supply chains of three products each varying with

inventory, product life and practices of supply chain. Methodologies that are used have been explained. Different entities of a supply chain have been explained at their very operations level, with the help of a case study of a food processing company.

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