Supply Chain Management

CONCEPTS, PRACTICES, AND IMPLEMENTATION

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1 Introduction to Supply Chain Management

Let us first analyse the term and concept of a 'supply chain', as put forward by various scholars. Mentzer (2001) categorized and defined a supply chain as follows:

- A 'basic supply chain' consists of a company, an immediate supplier, and an immediate customer directly linked by one or more of the upstream and downstream flows of products, services, finances, and information.
- An 'extended supply chain' includes suppliers of the immediate supplier and customers of the immediate customer, all linked by one or more of the upstream and downstream flows of products, services, finances, and information.
- An 'ultimate supply chain' includes all the companies involved in all the upstream and downstream flows of products, services, finances, and information from the initial supplier to the ultimate customer.

These supply chains are outlined in Fig. 1.1.

Lambert, Stock, and Ellram (1998) define a supply chain as the alignment of firms that brings products or services to a market. Christopher (1992) defines a supply chain as the network of organizations that are involved, through the upstream and downstream linkage in different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

Ayers (2001) defines supply chain as life cycle processes comprising physical, information, financial, and knowledge flows where the purpose is to satisfy end-user requirements with products and services from multiple linked suppliers. It may be noted that these processes range from sourcing and manufacturing to transportation and distribution of products and services. Also, the supply chain is not limited in terms of flow direction, i.e., backward flows such as product returns, rebates, incentive payments, etc. could be as important as forward flow of products and services. The other features are as follows:

1. Supply chain is made up of processes that cover a broad range, such as sourcing, manufacturing, transporting, and distributing products and services.

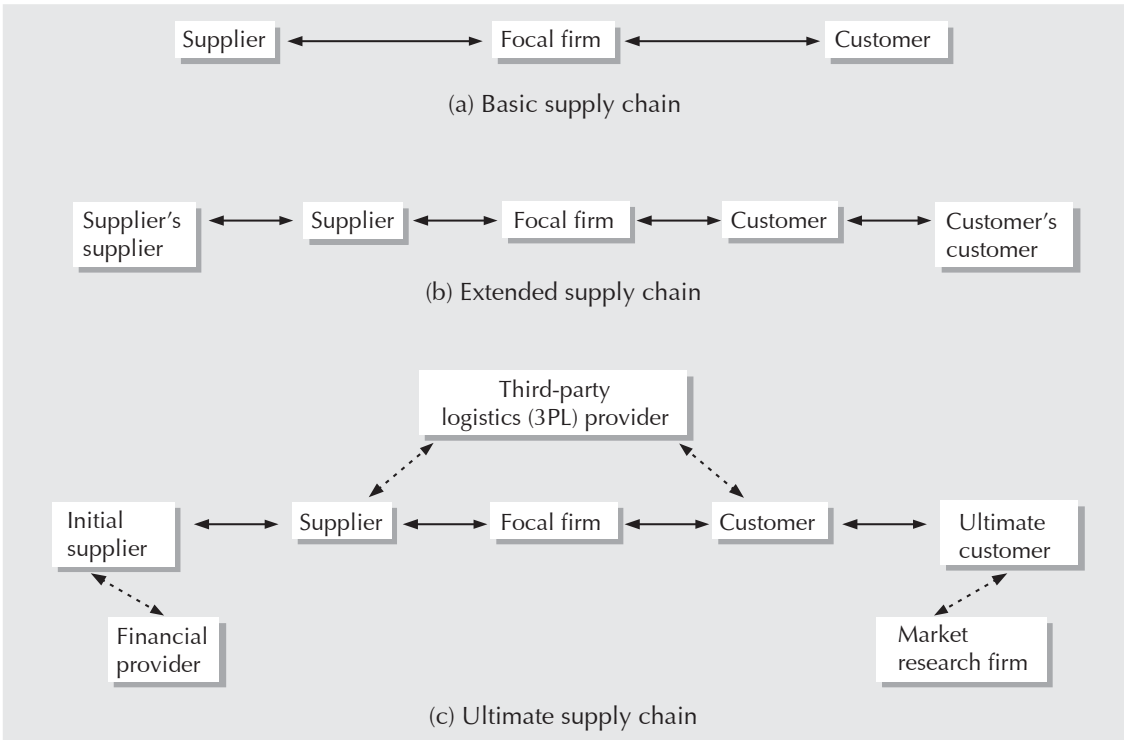

FIG. 1.1 Types of supply chain
Source: Mentzer 2001

2. Information and financial flow components are as important as physical flow in supply chain over the life cycle of product and services, i.e., market life cycle and usage life cycle.
3. The supply chain should support the satisfaction of end-user requirements.

Fawcett and Magnan (2001) refer to supply chain management as the collaborative effort of multiple channel members to design, implement, and manage seamless value added processes to meet the real needs of the end customer. The development and integration of people and technological resources as well as the coordinated management of materials, information, and financial flows underlie successful supply chain integration.

A typical supply chain in terms of various types of flows and their directions is described in Fig. 1.2. Needless to mention that coordination of these flows across various business partners right through supplier to customer requires a lot of information processing in an integrated manner, thus inevitably needing facilitation by the information technology (IT) systems and practices.

Supply chain management (SCM) thus refers to the PODSCORB (planning, organizing, directing, staffing, controlling, reporting, and budgeting) decisions as related to the coordination of flows (including reverse ones) of information, cash,

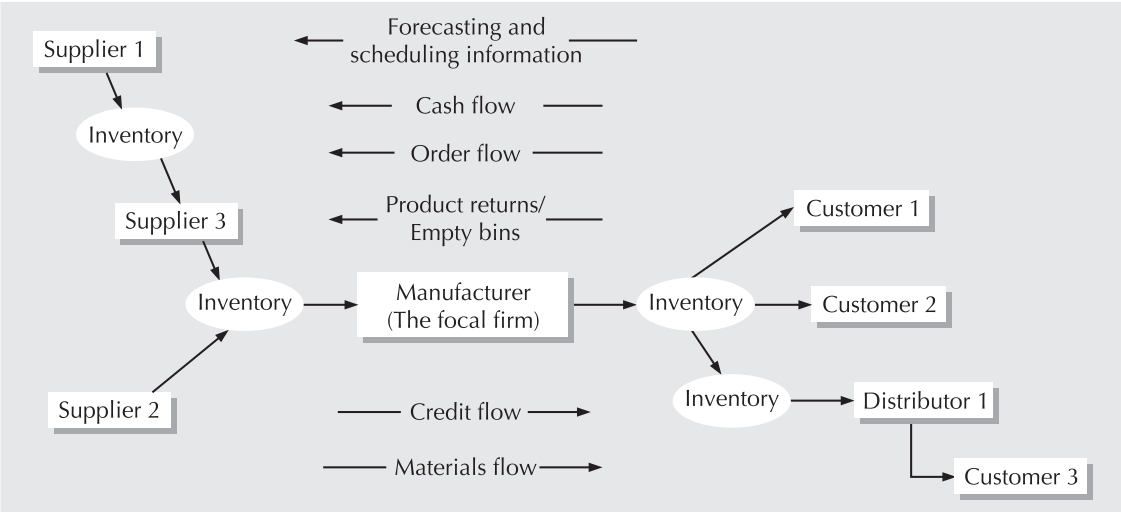

FIG. 1.2 Supply chain and the flows therein
Source: Mentzer 2001

credit, order, and materials right from supplier(s), the point of origin to the ultimate customer, the point of consumption in a logistical and preferably an IT-enabled environment, in tune with the corporate goals for being competitive in the marketplace. The flows of information may pertain to sales, pricing, forecasted demands/orders, scheduling of operations, and deliveries, downstream and upstream, as the case may be.

Let us take for example a manufacturing company such as Maruti Udyog Ltd (MUL), where all kinds of flows—tangible and intangible—are envisaged. To start with, the company's production department makes a schedule based on aggregate forecasts of components and sub-assemblies based on the sales/demand patterns in the market for various variants. The information related to these forecasts and schedules is passed on to tier 1 suppliers who in turn pass it on to tier 2 and onwards, if any. The materials then flow from supplier(s) to the company with the credit offered by them. The focal firm, i.e., MUL will then assemble the final automobile product which will be supplied to warehouses and dealers based on orders received from them, on the basis of orders flowing from customers. After the deliveries are realized, cash starts flowing from customer to dealer, and then to the company, who would make or would have made payments to the supplier, in a way, converting some part of cash received from customers in making payment to suppliers. The time elapsed between the two activities of receiving the payment from customers and making payment to vendors is referred to as cash-to-cash cycle time, which is an index of efficient cash flow in the supply chain. Finally, there could be reverse flows, i.e., reverse logistics where there could be product call backs or returns from customers to dealers, and then to the company and the company may have reverse

flows of empty bins/containers to suppliers in order to have deliveries on the (just-in-time (JIT) basis. So, all these flows have to be coordinated for the supply chain to function and deliver.

LOGISTICS VS SCM

The terms 'logistics' and 'supply chain' are many-a-times used interchangeably without much regard to the marked difference between the two. Logistics is that part of the supply chain that plans, implements, and controls the efficient, effective, forward and reverse flow, and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.[1] The Institute of Supply Management (ISM), which was founded way back in 1915 and has currently over 49,000 members, refers to logistics as an entire process of materials and products *moving into, through and out of firm* (Kauffman 2002). While logistics has conventionally focused its attention on coordinating the product, information management, and flow of activities of an individual firm, SCM is concerned with coordinating product, information, cash movement, and flow activities in a *logistical channel environment.*

Logistics is a part of the bigger supply chain, or SCM is an expanded version of the logistics process. While supply chain involves strateg(ies), tactics, and operations, logistics concentrates on the actual ways and means to fulfil the overall supply chain strategy. Both are incomplete without each other. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and from firm to firm.

PURCHASING VS SCM

Purchasing refers to any major function of an organization that is responsible for acquisition of required materials, services, and equipment. This comprises processes of buying, recognition and ascertainment of need, determination and description of quality and quantity, locating and selecting supplier, negotiating price and arriving at other contractual terms and conditions, and following it all up to delivery. While, another similar term, procurement, is referred to by ISM as a broader term that includes purchasing, stores, traffic, receiving, incoming inspection, and salvage.

There are four views on purchasing vs SCM (Larson 2000). The *traditional view* conceives SCM as a strategic aspect of purchasing, with emphasis on supplier development and partnerships with tiers 1 and 2 suppliers. The *relabellers* simply change the name of purchasing to SCM which narrows the scope of the latter. In the same manner, logistics and channel management could also be rechristened, which

[1] Adapted from a definition given by the Council of Logistics Management, USA.

is not so. However, purchasing managers could be relabelled 'supply managers' with no change in their job description. The *unionists* view purchasing as a part of SCM that completely subsumes purchasing including logistics, marketing, operations management, purchasing, etc. Here, the supply chain managers have greater decision-making authority. The *intersectionists'* view is that SCM is not the union of logistics, operation, and purchasing. Rather, it includes elements from all these disciplines, bringing about coordination of cross-functional efforts across multiple firms. SCM is thus considered a broader strategy cutting across business processes, both within the firm and through the channels.

In a way, logistics, which comprises inbound (from supplier) and outbound (to ultimate customer), together with purchasing would be referred to as SCM, while only inbound logistics together with purchasing would refer to supply management.

EVOLUTION OF SCM

SCM has evolved from the typical materials management function possibly in the following manner:

Materials management → Physical distribution management → Logistics management → Integrated logistics management → Supply chain management

The concept of SCM has evolved over a period of time with change in business environment and ever changing requirements of customers. The stages are represented in Fig. 1.3. The evolution starts from the stage of materials management and ends with that of integrated SCM.

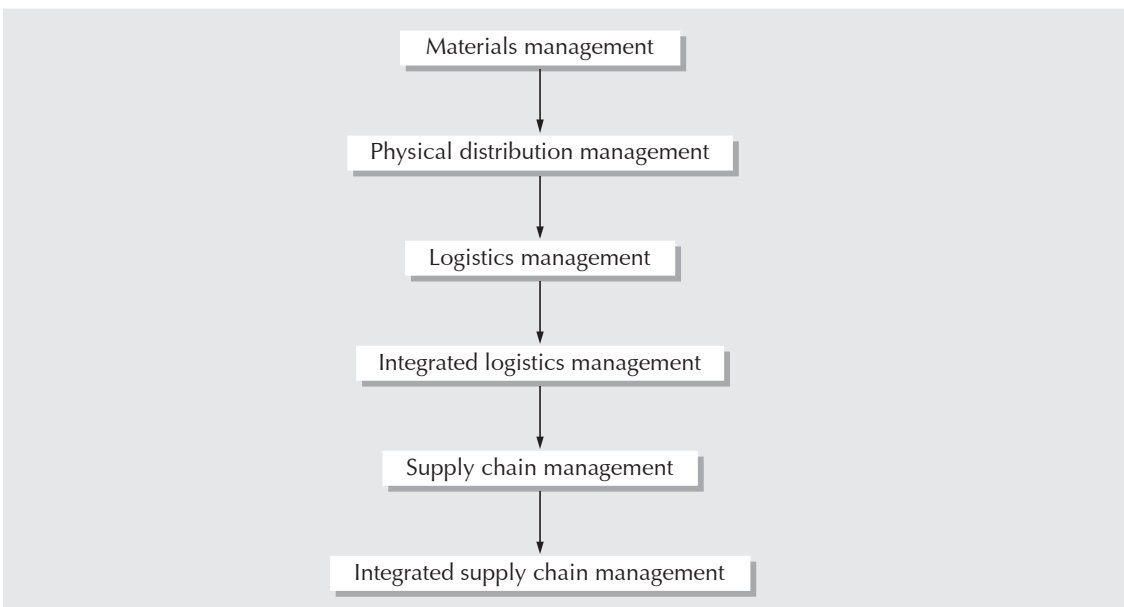

FIG. 1.3 Evolution of SCM

Phase One—The Origin of Materials Management

The early years of materials management and purchasing history can be traced back to the beginning of 1850. However, the purchasing of materials had received attention even before this period. The book of Charles Babbage—*On the Economy of Machinery and Manufacturers*—published in 1832, mentioned the importance of materials purchasing function. This function developed after 1850 with the introduction and development of railroads. Materials purchasing gained importance during World War I because of its role in receiving war supplies. So traditionally, materials management was responsible for various aspects related to material flow within an organization. This included the services of transportation, inventory management, acquisition of materials, the storage of materials acquired, and handling of those materials during manufacturing processes.

The ISM refers to materials management as a coordinating function concerned with inbound movement and storage of raw materials. It is one department responsible for flow of materials from supplier through production to consumer. It is responsible for planning and coordinating materials flow, with objectives of maximizing the firm's resources and provide the required level of customer service.

Phase Two—Development of Physical Distribution Management

This period witnessed that physical distribution was playing a key role in maintaining certain inventory levels and transporting them to the market, ultimately maintaining the market share of the company. An effective physical distribution involved addressing the issue of inventory (raw material as well as finished goods inventory at the point-of-sale), all outbound transportation, warehousing, storage, and communication from the focal firm. The difference between materials management and physical distribution was that under the latter, the importance of outbound transportation as well as storage, packaging, and warehousing increased significantly so that the finished goods could be delivered to customer(s) without any damage in transit. It can be said that physical distribution was total outbound logistics minus the non-physical part of customer order management.

Phase Three—Emergence of Logistics Management

Prior to World War II, business firms were small with limited market coverage. At the same time, easy availability of required materials for continuing the operations of firms made it easy for them to handle and solve different materials and logistics problems through their personal experience and gut feeling. However, during World War II, problems involving the movement of huge quantities of supply made the operations of logistics a distinct technical field for smooth functioning of the firm. Post World War II, rising interest rates and oil crisis made business firms think

about the cost aspect also. Rapid recovery and industrialization activities around the world gave rise to severe competition within every industry. These developments made it tough for any firm to get the required materials or items easily and sell the finished products after adding profit margin over the actual cost incurred without concern towards the cost. It was recognised that with a fairly large number of players, organizations could not maintain huge inventories just to ensure uninterrupted flow of materials as it reduced their flexibility to respond to the changing customer demands. In a nutshell, organizations could not enjoy the smooth flow of resources with their physical distribution system and it forced them to adopt cost saving practices with full utilization of resources for meeting well-defined goals, particularly in terms of deliveries with respect to *time* and *place*. These developments gave rise to logistics management, which made the organizations' span of activities in managing the flows of raw materials, components, manufactured parts, and packaged products, through and out of the firm, wider.

Phase Four—Development of Integrated Logistics Management

In the previous phase, it was evident that inclusion of raw materials, components, manufactured parts, and packaged materials within the overall flow of materials expanded the responsibilities of management into a broader logistical concept. This broader view of management emphasized on strategic decision-making. As organizations expanded their wings for reaching a wider market base, it resulted in more complex requirements in terms of (inbound) sourced materials from different suppliers, their transportation, handling work-in-process (WIP) inventory, finished goods (FG) inventory as well as the outgoing traffic and transportation requirements together with the flows of information at respective points and levels. At times it included reverse flows of materials, products, empty bins, information, credit, cash, etc., reverse logistics, such as product returns, recalls, claims, refunds, discounts, and rebates. All different flow activities and their associated costs got interrelated. The logistics thus got implicated in every major function of management from purchase through production, warehousing, and dispatch to customer order management, which ultimately gave rise to the concept of integrated logistics management—integrating inbound, outbound, and the reverse one. Therefore, the integration of logistics function as a single unified system to optimize and control the entire process of materials, products, and information moving *into, through, and out of the firm*, i.e., inbound and outbound, is the essence of integrated logistics management.

Phase Five—Introduction of SCM

This phase started from the mid 1980s. Logistics has traditionally focused its attention on coordinating the physical flows of products and information across various

departments within and outside a firm, whereas SCM is concerned with coordinating the flows of product, information, cash, credit, order, and materials in a *logistics channel environment* i.e. SCM is an expanded version of the logistics process (Coyle et al. 2000). All materials, finished goods with complete information, and all transactions flow through the supply chain loop as one continuous process. Introduction of supply chain became a necessity with the opening and widening of the economy all over the world. Rapid spread of information with IT-enabled services (ITES) and communication technology gave rise to the concept of the unified world as a global business village. Under these circumstances, organizations could not encash the opportunities existing throughout the world just by its own efforts. They needed business partners to pool the efforts and expertise of others to derive benefits of the same. This attitude within organizations changed the way of its operations. Prior to this stage, organizations were somewhat 'stand-alone' in nature, in terms of the inward thinking process related to improvements within themselves. However, under the changed scenario, organizations had to broaden the horizon of their (strategic) thinking process to achieve synergy within and outside the organization. SCM was an organizing and operating concept that started with customer service and resulted from the cumulative efforts of the entire channel partners (Sautter et al. 1999). Mentzer (2001) defines SCM as 'the systemic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for improving the long-term performance of the individual companies and the supply chain as a whole.' The various elements which came to be clubbed under SCM can be listed broadly as the following:

1. An integrated systems approach with an outward strategic thinking
2. Long-term partnerships with vendors to focus on vendor development in all areas
3. Close cooperation and coordination throughout the supply chain
4. Free flow of information amongst different members of the chain
5. Mutual sharing of channel rewards and risks by all the members
6. Integrated objectives and goals with the single goal of best customer care
7. Integration of processes within and outside the organization under joint planning of operations especially with suppliers
8. Maintaining a long-term relationship with customers as well as supply chain partners, such as sources, subcontractors, third-party logistics (3PL), distribution centres, retailers, and even the customers
9. A self-regulating and control mechanism at every level of the supply chain to take care of the quality and delivery aspects of products/services

Phase Six—Convergence into Integrated SCM

This phase started in the mid 1990s. The basic idea behind the integrated SCM is that at each level the use of materials facilities, people, finance, and system must be coordinated and harmonized as the part of a single integrated system. The development of an integrated supply chain requires the management of material and information flows to be viewed from three perspectives: strategic, tactical, and operational (Mohanty and Deshmukh 2001). While the impetus for the development of the strategy may be a top-down approach, its success is likely to be achieved by a bottom-up approach. However, the realization of the full potential of inter-relationships among the components and partners of the supply chain is possible by designing an integrated system to manage and ensure customer product and service expectations, while taking care of cost, quality, delivery flexibility, and service factors without fail. Moreover, since the extent of outsourcing has increased especially in non-core competent activities by more and more companies for long-term cost reduction and with developed suppliers of critical activities for cost savings, the need for integration of purchasing with both inbound and outbound logistics in the supply chain across the extended enterprise has also increased. Also, the concept of integrating supply chain invariably involves channel alignment that is required to create a right balance between material order quantity, capacity requirements, prices, ownership of materials, transportation, and information processing requirements across all the channel partners. The purpose is to deliver the best value to the customer or the end-user.

OBJECTIVES OF SUPPLY CHAIN

The objectives of a supply chain are manifold but most of them are derived from the primary objective. The primary objective comprises creating a superior mutual value for the customer in terms of the product and service delivered at a time and place in response to customer needs and demand. By value, it is meant that the worth of the product and service delivered to the customer must far exceed the efforts and expenses put in by the company in fulfilling the customer's order, which gets paid in the form of price by the customer.

The derived or secondary objectives are given as follows.

Profitability

There must be supply chain profitability all over the chain, not only at individual stages or to individual partners. The revenue must exceed the expenses or the costs of the supply chain. In a competitive market, this implies decreasing the costs and not increasing the price to ensure supply chain profitability.

Reliability

A supply chain aims to provide time and place specific delivery with a superior service level in fulfilling the order, practically with negligible stock-out rates. However, stock-out rates of 2.5% are still common.

Flexibility/Agility

A good supply chain must be flexible to absorb fluctuations in demand without any extra costs. It refers to the upside production flexibility that can absorb extra demand. A flexibility to absorb 20 per cent extra demand is quite desirable.

Responsiveness

It refers to how much time it takes to meet the customer's needs, particularly when the design and volume needs to undergo a change.

Turnover Rate

It is important that a high turnover rate of assets used in the supply chain, whether financial, space, inventory, or machine resources, is set as only a fast turnover would not block capital, reduce the risk of obsolescence, increase productivity, and thus profitability or the return on investment used in these resources or assets.

Communication and Coordination

A supply chain objective is to provide good communication, coordination, and information sharing ability and competence across all the channel partners, right from suppliers to the distributors/retailers, the 3PLs and finally the customers.

SUPPLY CHAIN PLANNING FRAMEWORK

Fleischmann and Meyr (2003) provide the framework that encompasses the operational, tactical, and strategic analysis for decision-making at short-term, mid-term, and long-term levels respectively, consisting of different components as outlined in Fig. 1.4.

The model is supported by the following pillars.

Supplier Collaboration

It refers to collaboration with suppliers by sharing information and resources to ensure efficient delivery schedules from them. It also involves collaboration with them in terms of new product/design development, initiatives for long-term relationship, and commitment.

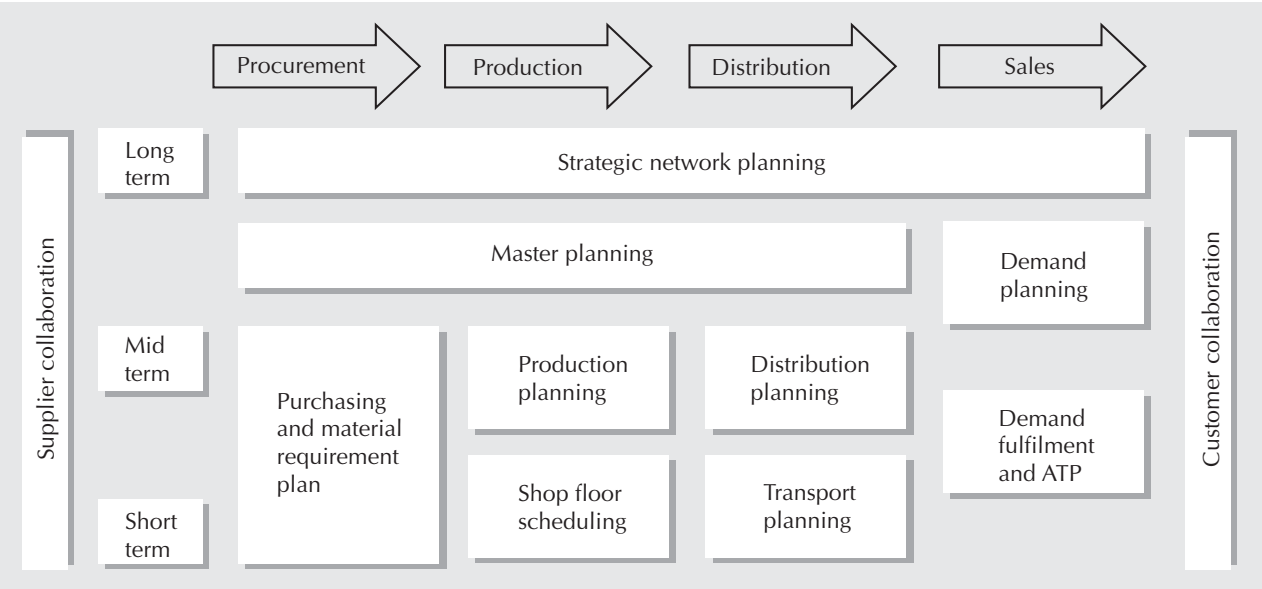

FIG. 1.4 Modules in supply chain planning framework
Source: Fleischmann and Meyr 2003

Customer Collaboration

This is in terms of demand planning, having regular feedback from customers, managing relationships, rendering services to customers, and meeting contractual obligations in a collaborative manner so as to make the order fulfilment process a satisfying one.

The activities at the three levels can be described as the following.

Strategic/Long-term level This involves designing the supply chain network for all partners, namely suppliers and their suppliers, customers and their customers, and the 3PLs. Supply planning on the supplier side and demand planning on the customer side in a collaborative manner are also dealt with at this level.

Tactical/Mid-term level This refers to sales and operations planning that involves allocation of resources and stipulating the order requirements/service level agreements (SLAs). The material requirement planning (MRP), capacity resources planning (CRP), master production scheduling (MPS), distribution planning and mid-term sales planning also occur at this level.

Operational/Short-term level This level comprises planning and scheduling of materials, and production on the supplier side and transport, warehousing replenishment, and short-term sales on the customer side.

A similar supply chain planning framework was suggested by Accenture India, as given in Fig. 1.5.

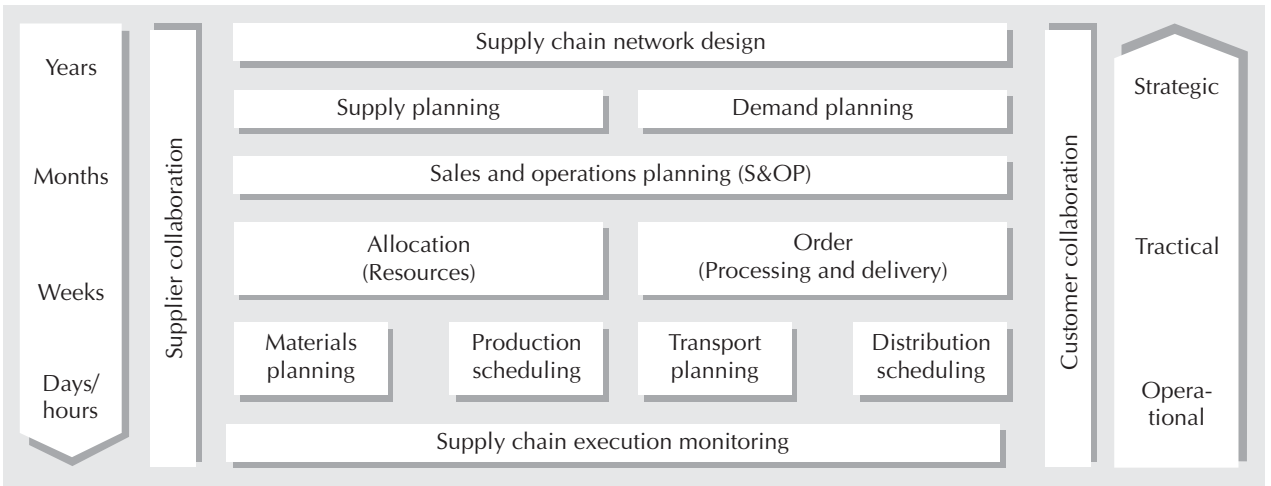

FIG. 1.5 Supply chain planning framework
Source: Accenture India

From both the supply chain planning frameworks, it emerges that the supply chain network design and planning is at the strategic or long-term level, while all the master planning for supply and demand is a tactical or mid-term level planning activity. The sales and operations planning (S&OP) is an aggregate planning activity in the mid-term range with planning horizon of about 6–18 months. This is the most important planning activity and horizon, particularly from production point of view. At the operational level, in terms of weeks/days, the supply chain comprises four activities, namely

- material planning
- production scheduling
- distribution scheduling
- transport and warehouse planning

This is followed by a transaction-based execution and monitoring of supply chain, say on an hourly basis, and doing follow-up and expediting of job and shop orders on real-time basis. As stated earlier, all these planning activities are supported by supplier collaboration on one side and customer collaboration on the other, particularly in the form of information sharing.

THE STRATEGIC FIT MODEL FOR SUPPLY CHAIN

The strategic fit means that both the competitive and supply chain strategies have the same goal. As is known, corporate success in a given environment is linked to the following considerations.

(i) The competitive strategy and all the functional strategies must fit together to form a coordinated overall strategy. The functional strategies must be related to product development, supply chain, marketing and sales, IT, finance, and human resource. Each functional strategy including supply chain strategy must support other functional strategies and help a firm attain the competitive strategy goal. The sub-strategies in supply chain must align or coordinate with other functional strategies in the area of

- manufacturing
- inventory
- lead time
- purchasing
- transportation

(ii) A company must appropriately structure the processes and resources to be able to execute these strategies successfully. Since processes and resources are structured to support functional goals, a conflict in functional goals would lead to conflicts during execution. For instance, if the marketing and sales department of a company publicizes the company's ability to provide a large variety of products very quickly in a *responsive* manner at a desired point-of-sale (PoS), it is possible that the distribution department of the same company may like to batch orders in order to get better transportation economies (*efficiency*). Both might be conflicting to each other. The issue is always to have a balance between the degree of flexibility and *responsiveness* (ability to supply different products quickly) versus the degree of *efficiency* (ability to supply with cost efficiency). It actually implies that flexibility and responsiveness comes at a price.

To attain the strategic fit, the company must ensure that the supply chain capabilities support the ability to satisfy the targeted customer segments. The various stages in attaining the strategic fit are as follows:

(a) The company must understand the customer and supply chain uncertainty.
(b) The company must ascertain the customer's needs for each targeted segment and the *implied supply uncertainty* the company would face to meet that uncertainty. The needs may be laid down in terms of the desired cost and service requirements. The company must be able to identify the extent of supply disruptions and the degree of its impact, severity, and tolerance by the company at a certain cost.

On the other hand, the company must be able to estimate the supply chain capabilities and strengths. If a mismatch occurs between the supply chain capabilities and the needs of the customer, the company would need to restructure the supply chain to

support the existing competitive strategy or alter its strategy. Generally speaking, as Chopra and Meindl (2004) also put it, the customer needs from different segments may vary along several attributes, namely the following:

- Lot size of the delivery required
- Response time that customers are willing to have
- Variant of the product needed
- Service level required
- Pricing of the product
- Rate of innovation

Understanding Customer Needs

Each customer need can be translated into the metric of implied demand uncertainty that exists due to the portion of demand that the supply chain is required to meet.

Compared to demand uncertainty, which refers to uncertainty of customer demand for a product, the implied demand uncertainty is the resulting uncertainty from the specific customer desires for only that portion of demand which the supply chain must be able to handle. Various customer needs in terms of quantity, lead time, quality/variety, number of channels, rate of innovation, and required service levels increase the implied demand uncertainty.

Fischer (1997) pointed out that the correlation between the implied demand uncertainty and the other attributes is as following.

1. Products with uncertain demand are often found to be less mature in their product life cycle (PLC) stage and have less direct competition thereby resulting into high margins as well.
2. Forecasting errors tend to be lesser when demand is more certain.
3. An increase in the implied demand uncertainty leads to higher stock-out rate (10–40%), while low implied demand uncertainty leads to a lower stock-out rate of 1–2% per unit.
4. Mark-ups are kept high for products with high implied demand uncertainty which results into over-supply.

According to Lee (2002), requirements of specific capabilities would increase the supply uncertainty. The negative characteristics or weaknesses in capabilities would cause the supply uncertainty to increase. These weaknesses could be in terms of frequent breakdowns, low process yields, poor quality, limited fixed capacity to supply, and an evolving product/process technology.

As the product technology matures and process yields improve, companies are able to follow a fixed delivery schedule resulting in better service levels and resulting in low supply uncertainty.

Trade-off between Efficiency and Responsiveness

Supply chain efficiency mainly refers to the cost of making and delivering a product to the customer. For any strategic choice to increase responsiveness, there are additional costs which would ultimately lower efficiency.

On the other hand, a company would like to have a level of supply chain responsiveness that would refer to the supply chain's ability for the following.

- Respond to a wide range of quantities required
- Meet requirements of a short lead time
- Respond to requirements of a large variety
- Design, develop, and quickly deliver/market new innovative products
- Meet a high service level
- Handle stock-outs

In order to meet the aforesaid requirements, the company may have to invest in developing the capabilities and augmenting the capacities for manufacturing and distribution which would form the costs of responsiveness.

Getting the Right Fit

This last stage is to ensure that all the supply chain actions are consistent with the customer's needs and the supply chain uncertainties. To attain this, a mapping is done of supply chain responsiveness with the implied uncertainty. There is a positive correlation between the two. The greater the implied uncertainty, the more responsive the supply chain would be. The relationship is shown by a *zone of strategic fit.* As Chopra and Meindl put it, for a high level of performance, companies should move their competitive strategy (and thus the implied uncertainty) and supply chain strategy (and the resulting responsiveness) towards the zone of strategic fit. All the functional strategies within the value chain, as outlined earlier, must support the supply chain's level of responsiveness.

As it is acknowledged that at the maturity phase of the product life cycle, the demand becomes more certain, supply becomes predictable (low supply uncertainty), and margins are low because of increase in competition. Also, the price becomes a significant factor in customer buying. However, delivery schedules and distribution points are pre-established and standardized, which can make the supply chain less responsive. The opposite is true in the case of a product/variant in introduction or growth case. So, finally it can be inferred that in order to get that right strategic fit, the supply chain strategy must be adjusted over the PLC with the changing competitive scenario.

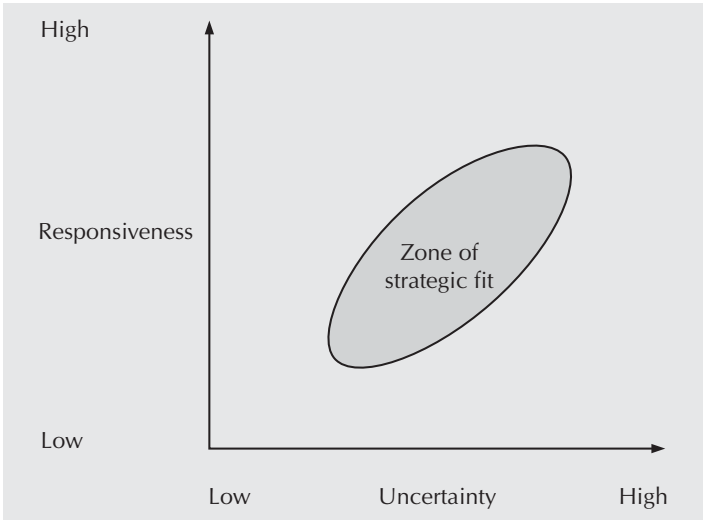

FIG. 1.6 Zone of strategic fit

However, getting the right fit might be rendered difficult because of

- increasing variety of products and services on offer by competitors to meet a broader market segment particularly in lean times
- decreasing PLCs
- disintegration of ownership

The last reason is reflective of the latest trend where many companies are shedding their vertical integration and relegating non-core competent functions to suppliers or third-party providers. The problem now is that each partner at each stage is prone to making decisions that meet business objectives at his level rather than the whole chain, which may adversely affect the overall supply chain profitability. Figure 1.6 illustrates the zone of strategic fit between a continuum of responsiveness and uncertainty in demand.

SUPPLY CHAIN DECISION-MAKING FRAMEWORK—THE SUPPLY CHAIN ENABLERS

As is assimilated by now, the companies begin with a competitive strategy and then decide about supply chain strategy like the other functional strategies. The strategy would be decided depending upon the extent of responsiveness and efficiency required keeping in view the customer needs, resources available, and foremost, the certainty in demand. The supply chain strategy in turn translates into a decision-making framework that would dictate a certain performance level, for which a supply chain uses certain *enablers* or *drivers*. However, the reverse is also true when depending

upon the structure and the resources at disposal, supply chain strategy may have to be re-orientated.

Marien (2000) for the first time identified four key supply chain enablers based on 200 responses, which are given as follows.

Organizational Infrastructure

It refers to the way business units and various functions including SCM and its sub-functions are organized, de-centralized, and their activities coordinated and how the management initiatives are led and steered for change within the existing infrastructure.

Technology

It includes not only information technology (IT) but also 'materials design, processing/manufacturing and handling' technologies.

Strategic Alliances

This refers to developing long-term partnerships with all supply chain partners for collaboration.

Human Resource Management

It refers to the manner in which supply chain job descriptions are designed, positions filled, and people's work is recognized and compensated.

Chopra and Meindl (2004) and the company Flextronics identified four key drivers of supply chain structure that would provide a decision-making framework to SCM.[2] These four drivers are

- facilities or physical network
- inventory
- transportation management
- information systems and other technologies

Later on, Chopra and Meindl (2007) added two more drivers, namely sourcing and pricing. While the first three were grouped as *logistical drivers*, the rest three were grouped as cross-functional drivers (Fig. 1.7). The author feels that the list is not complete and keeping in view the importance of SCM as a profit-centre and the kind of staffing, management commitment, and leadership required for this approach, it is inevitable that one more cross-functional enabler/driver be added. Advocated by Marien (2000), the new enabler would be 'organisation structure and human

[2] www.flextronics.com/en/markets/logistics/performancedrivers

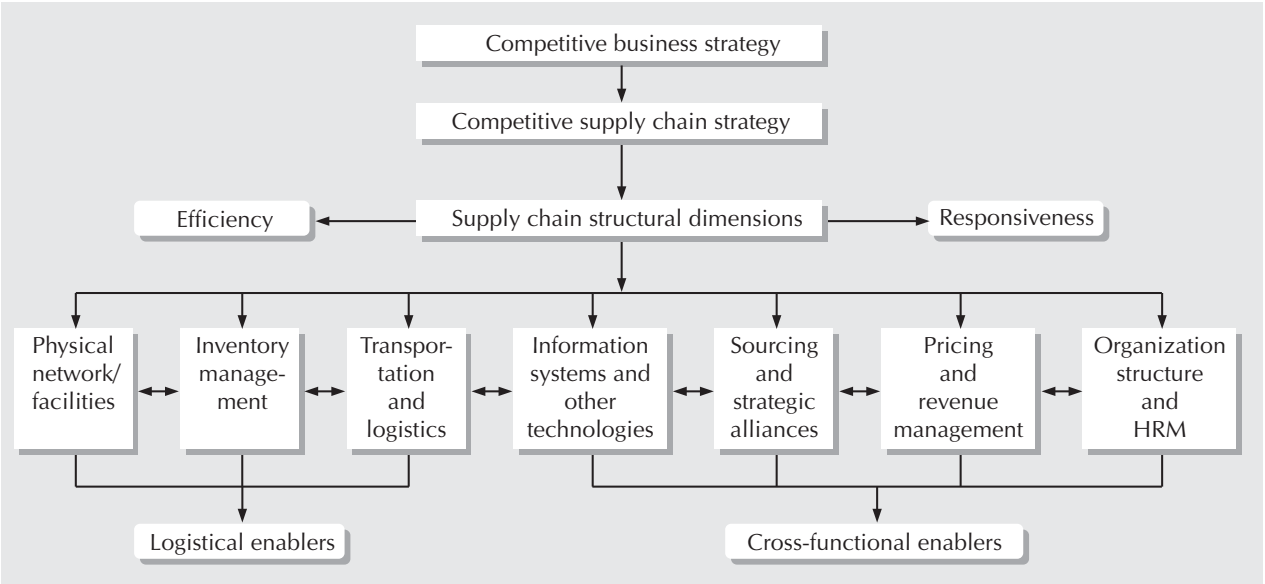

FIG. 1.7 Supply chain structural dimensions and enablers
Source: Partially based on Chopra and Meindl 2007

resource management'. The total list of SCM drivers/enablers now reaches seven. It is also recommended that strategic alliance be added to sourcing in that context, while the term 'physical network' be preferred over facilities, and revenue management be integrated with pricing, as also discussed by Chopra and Meindl (2007).

Together these enablers or drivers determine supply chain structure and thus a certain level of responsiveness and efficiency in it. Let us briefly discuss these.

Physical Network/Facilities

The facilities serve as nodes in the physical network of the company used for material design, supplies, processing, warehousing, order distribution, and fulfilment services, connected with each other in a spatially co-related manner. The facilities location aims to establish manufacturing, assembly, distribution centres (being closest to customers), near to the location of suppliers so as to yield minimum shipment costs. However, subjective factors, such as macroeconomic factors, quality of work-life, infrastructure, tax benefits and governmental guidelines, and legislations may also impact decision-making.

The design, planning, and operation of capacity of the facility is also an important factor. Although excess capacity is at the cost of efficiency yet it allows the facility to be flexible and responsive to demand variation. A limited capacity may be economical to operate but it results in difficulty in responding to demand fluctuations. A capacity higher than 20 per cent may result in efficiency as well as significant responsiveness.

The type of technology and production systems being followed would also determine the facility design. A product focus in the production system, such as an assembly line set up where only a single kind of standardized product is being made, may have more efficiency but no flexibility or responsiveness. On the other hand, a process focus in the system where machines are laid out on the basis of functions they perform rather than on the basis of sequence of operations (assembly line) will have more variety being churned out resulting into more responsiveness (to meet volume and variety fluctuations) but less efficiency. A trade-off can also be made using cellular processing or group technology where moderate volume and moderate variety can be processed for using a combination of product and process focus. Such technology is finding better acceptance today, particularly in the lean environment, having a significant blend of efficiency and responsiveness, not compromising on customer needs in a consolidated manner, which in marketing is known as *clustered customer preferences*.

The other factor which affects facilities' design and planning is the kind of warehousing and storage being required. The storage can be stock-keeping unit (SKU) based where one type of product is stocked together, which proves to be quite an efficient, particularly spacewise, way of storage.

The storage could also be job-orderwise where all the materials required for a job/order or customer are stored together. It might require more space but it facilitates more efficient picking and packing or technically speaking, positioning, lifting, and transferring (PLT) functions related to the same job.

However, things are quite different when no warehousing/storage is required as such, but what is required is a transit point where trucks from suppliers, each carrying a different product, deliver goods to a facility where orders are broken/sorted/re-sorted/re-packaged into smaller lots to be quickly loaded onto store bound trucks. This is especially true in retail industry where suppliers supply the finished goods and some accessorization or final assembly is done at the cross-docking point. Such facilities are better outsourced than being managed by the core firm itself.

Some facilities planned for distribution may also cater to light manufacturing/product customization or differentiation as a part of the postponement strategy, i.e., postponing the final product structure till the customer's end depending on the order. These may even cater to small product repairs in addition to other reverse logistics (reverse flow of products from retailers and customers).

Inventory Management

The location and quantity of inventory can be very instrumental in determining the cost and responsiveness of the supply chain. The company must exploit its capabilities and services to attain a mix of cost efficiency and responsiveness by maintaining

optimal inventory levels. The best option is to manage the inventory at the vendor's end, preferably through hubs or cross-docking centres. The strategic procurement and outsourcing and collaborative planning, forecasting, and replenishment (CPFR) with the vendors helps in facilitating vendor-managed inventory (VMI) or facilitating online delivery of parts. As pointed out, the accessorization at customer's end also minimizes the inventory. The storage and warehousing policies, such as the re-order point (ROP) and lot-sizing for different materials, are key drivers of supply chain for attaining the desired mix of efficiency and responsiveness in it.

Transportation and Logistics Management

Choosing the right modes and routes can determine the effectiveness and efficiency of distributing the product to the customer's end. It could entail mode, route, and network selection, carrier selection, providing merge-in-transit services, cross-docking and tracking, and tracing services. It covers the inbound and outbound logistics. The use of material handling principles, such as load unitization, use of gravity and techniques such as automated storage and retrieval systems (ASRS), and palletization for multi-modal transport would also affect the output from logistics systems. Reverse logistics or a milk run to and from a cluster of proximal vendors would facilitate on-line delivery of parts and synchronization of delivery schedules with the production schedules. Thus, efficiency and responsiveness of transportation and logistics is going to be a very important factor for supply chain structure designed for performance.

Information Systems and Other Technologies

In today's environment, all the supply chain processes are IT-enabled and need information exchange across all the supply chain partners right from suppliers to customers. Further, the Web enablement of SCM has become important for 24×7 online order placement by customers and its capturing by the company, better order management, particularly in terms of build-to-order capabilities, tracking and tracing of order by customer herself, and integration with other e-commerce solutions. Systems like enterprise resource planning (ERP) have come a long way in enabling the supply chains to adopt information systems. Such systems provide end-to-end operational services and seamless integration right from purchasing and sourcing function to manufacturing to supply chain and logistics and distribution to customer's end. Technologies like electronic data interchange (EDI) and radio-frequency identification (RFID) have also been useful in this respect. Needless to mention, installation of information systems must be preceded by business process reengineering (BPR) of all the supply chain processes.

The technologies related to material design, processing/manufacturing, and handling also form an important part of the supply chain structure, particularly

with regard to its efficiency in performance. So, these should also be included together with IT, as strongly put forward by Marien (2000).

Sourcing and Strategic Alliance

Decisions related to sourcing are very critical to supply chain structure in terms of efficiency and responsiveness, particularly through purchasing and distribution. In fact, the first decision is whether to insource/make or outsource/buy. The efficiency and responsiveness requirements would dictate such decisions. The next decision is whether to follow single or limited sources or multiple sources. The decision that follows next is to identify the criteria that would be used to select vendors on the basis of a set of subjective and objective factors. Selected vendors can also be undertaken for vendor development to meet specific needs. Based on their technical and subsequently commercial qualification at a bidding stage, negotiations might be entered into for arriving at (mutually) suitable terms and conditions of the contract. The structure of the contract is re-looked to improve the supply chain performance on a combination of both efficiency and responsiveness as per organizational requirements.

After the contracts with the suppliers are finalized, what follows is the procurement process by virtue of which supplier would ship the materials as per the delivery schedule—quantity and time-wise. Nowadays, more and more of procurement is done electronically and depending upon the degree of strategic importance of the material, organizations are going in for e-procurement aided by the Web and dedicated portals on it. They are organizing reverse-auctions on their specially designated portals to get the lowest price, facilitating decisions within a short time in a transparent manner thus bringing in transparency, effectiveness as well as efficiency in the procurement function of supply chains.

Organizations would make or insource materials and services if they have the core capabilities which they would like to retain. Activities in which the company is non-core competent would preferably be bought or outsourced for attaining efficiency and/or responsiveness. For instance, logistics could be outsourced to a third party if the core firm is non-competent in the same. However, all the sourcing decisions need to be frequently reviewed keeping in view the supply chain requirements.

Strategic alliances with select vendors are entered into for collaboration in terms of product design, cost reduction, and developing compatible information and processing/manufacturing systems and technologies. However, it should be done on a selective basis depending upon the nature of material to be purchased, specific requirements, if any, and the resources available for investment in vendors and their development.

Pricing and Revenue Management

The price of a product affects not only the buying behaviour of the relevant customer class but also its expectations. This in turn affects the demand profile that the supply chain would attempt to meet. Interestingly, pricing is also used as a *lever* that can be used to match supply and demand. For instance, short-term discounts can be used to decrease supply surpluses or flatten the spikes of peak seasonal demands. Also, some food chains such as McDonald's and Pizza Hut would offer *Happy Hours* discounts to average out demands, capacity use and planning. Same strategy is also followed by the hospitality chains.

Pricing is one sharp tool through which a firm can execute its supply chain strategy under the overall competitive strategy. Some customers do not mind low pricing for a late delivery while on the other hand, some others do not mind paying a higher price for delivery at a short notice or for responsiveness. For instance, the *Tatkal* service of Indian Railways provides responsiveness at a higher price, while *Apex* fares in airlines need a firm booking, no refunds are allowed, and fares vary depending upon how advance it is being booked—to facilitate the efficiency of the supply chain and bring about a better capacity plan and use. Another commonly cited case is that of Amazon.com, which provides a *menu pricing* based on what the customer can tolerate in terms of the shipping days on offer at a price (greater the shipping period, lesser is the price with certain limits on lower and upper sides).

So it has become important for a firm to structure its supply chain through menu pricing so as to meet the two divergent needs of customers in terms of efficiency and responsiveness and thus target a broader customer segment. Alternatively, some stores like Wal-Mart in the US and Big Bazaar in India offer everyday low pricing (based on their own efficient pricing from their vendors, bulk discounts, and efficient operations and logistics such as employing cross-docking) meeting the efficiency needs of their customers as well as keeping the demand stable over a period of time. On the other hand, some stores, such as Marks & Spencers in UK or Westside or Spencer's in India provide high-low pricing. This results in peak demand during discount weeks, say around Christmas and other festivals or off-season, followed by a drop in demand during other periods when merchandise is offered at high (normal) prices.

Revenue management through pricing is significant as supply chain management is seen as a profit-centre. So, in addition to reducing costs, it can yield more sales if price levels are properly manoeuvred. It would specially refer to the use of differential pricing over time or customer segments to maximize sales revenue, hence the profits from a select set of supply chain assets, particularly the level of finished goods (FG) stock. So, supply chain managers must have good information about the assets or

stock availability, customer demand over a select frame of time/season, and customer buying patterns when customers are exposed to different levels of pricing. This is a cross-functional driver as it needs close coordination and working with the marketing department.

Organization Structure and Human Resource Management

Organization structure refers to the way business units and functional areas like SCM and its sub-functions are organized, how they are aligned towards the same goal, and their activities are co-coordinated within the existing structure. It is possible that the organization structure may have to be re-orientated in terms of providing a suitable context (such as climate) for implementation of SCM. It is also important that the new management initiatives and programmes are led and steered towards continuous improvement in supply chain processes. It is especially important to understand the way management interprets and aligns SCM goals with organizational goals in a given period. The organization structure should always facilitate cross-functional SCM project implementation, the sharing of information, and supporting a spirit of collaboration and group decision-making among the staff, irrespective of their functions and levels.

Human resource management (HRM) in the context of SCM would refer to the manner in which the job descriptions of SCM staff are designed, responsibilities fixed, and positions with specific skill requirements are filled. It is significant that the work of SCM staff, particularly those working in cross-functional projects is recognized, appraised, and compensated for. The importance of the way the management directs and motivates them to achieve a high level of performance and achieve professional goals and objectives in SCM cannot be undermined. The management may also choose to assign certain change agents or team leaders to manage SCM initiatives or implementations.

Interestingly, Ayers and Odegaard (2007) have suggested the following six SCM drivers exclusively for the retail industry.

- Innovation cycle from internal to external services
- Extended product design
- Globalization
- Flexibility imperative
- Process-centred management
- Collaboration

Detailed discussion about these is beyond the scope of this book. Readers can refer to the book *Retail Supply Chain Management* by Ayers and Odegaard.

MANAGING UNCERTAINTY IN SUPPLY CHAIN

Supply chains usually operate in uncertain and unpredictable environments. Some of the factors contributing to the uncertainty in supply chains are mentioned below.

Gap between Supply and Demand

In reality, a long time before the demand is finalized due to the supplying, manufacturing, and administrative lead times involved, advance commitments are executed at the production and in-turn at the supply level. It involves investments in workforce, inventory, and machines. Because of the unexpected gap, particularly when supply far exceeds demand in a competitive market, it involves lot of financial and supply risks. In a lean and recessionary environment that is in vogue today across the globe, particularly in developing countries, investments in supply chain have significant associated financial risks.

Accurate Demand Forecast—A Distant Dream

In reality, estimation of precise levels of demand, particularly geographically disaggregated ones, is not possible because no forecasting technique can yield the accurate forecast when a lot of environmental variables are involved. The only tool that works is monitoring the point-of-sale (PoS) data and supplies triggered by demand from retailers on a pull basis only.

Variations in Inventory, Back-order Levels, and Dynamic Priorities

More often than not, companies may have to face fluctuations in inventory levels and the order status, especially back-order ones, depending upon the real-time problems and priorities. A case in point is that of the bullwhip effect, dealt in the section that follows, in which there is wider fluctuation in demand at the distributor and onward level than at the retailer level.

Miscellaneous Unforeseen Factors

This holds true for India, where we may not have service levels of more than 95 per cent on an average, particularly when it comes to meeting the infrastructural requirements of supply chain and logistics. It can be attributed to poor transportation systems, power availability, and Net connectivity, delivery lead times, administrative lead times, poor manufacturing yields, difficult availability of critical components and even strikes or natural or man-made disasters in this part of the world.

While it may not be possible to eliminate the uncertainty in supply chains, the effect of these can surely be minimized by proper planning and designing the supply chains that are agile such chains have been discussed in a later chapter.

BENEFITS OF SCM

Key benefits accrued by implementation of SCM, mainly using an SCM decision-making framework with enablers approach would include the following.

- Reduction in working capital deployment (inventories, warehousing, and financial costs
- Re-engineering, simplification, and optimization of processes across different components and stages at different levels
- Optimization of workforce across various orders/clients at different levels and locations
- Reduction in time to market through disintermediation and better logistics
- Reduction in processing and administrative lead times at all stages
- Capturing and tracking of feedback from all supply chain partners at each stage and better collaboration based on the feedback
- Bringing about accurate inventory forecasting and planning
- Streamlining incoming material flow and synchronizing it with production at the plant level, particularly in a lean environment
- Ensuring a certain in-process/work-in-process (WIP) material and finished goods flow
- Tracing and tracking of order information, its fulfilment status, and maintaining a certain promised service delivery level
- Improved satisfaction levels of internal and external customers

SCM MARKET IN INDIA

India had a Purchasing Power Parity (PPP) equivalent to US$1.5 trillion in 2008 and thus she constitutes one of the fastest growing markets of the world.[3] The Growth Competitiveness Index survey conducted by the Geneva-based World Economic Forum (WEF) for 2006–07 puts India at the 43rd position among 125 countries in the Global Competitiveness Report and 27th in the Business Competitive Index.[4] These factors, together with shortening of PLC, proliferation of product variety, low reliability of supply chain networks in India have forced companies to adopt SCM and associated systems and practices. However, lack of proper logistics framework, poor infrastructural support together with poorly designed supply chains with low efficiency leads are the major obstacles to reap full advantages through large scale implementation of SCM. This is also cited in the UPS Asia Business Monitor

[3] economywatch.com as accessed on 27 September 2008

[4] weforum.org/en/initiatives/gcp as accessed on 27 September 2008

Survey, 2004.[5] Although latest figures are not available, figures estimated by Economic Times Intelligence Group (ETIG) in 2002 indicate the Indian market value for supply chain/logistics at 13 per cent GDP, i.e., around Rs 2,35,000 crore (approx. US$50 billion), a large share of which (35% + 9% = 44%) is accounted for transportation, handling, and warehousing, as shown in Fig. 1.8. As compared to 13 per cent of GDP spent in India, the spend is 15 per cent in China, 10 per cent of GDP in US, 10.6 per cent in UK, 11.6 per cent in France, and up to 12 per cent of GDP in rest of the world (ETIG, 2002). According to a working paper by Raghuram and Shah (2004), the logistics cost estimates as per cent of GDP are 8.5 per cent in USA, 8.7 per cent in Japan, 16.5 per cent in Korea, and 12.3 per cent in India.

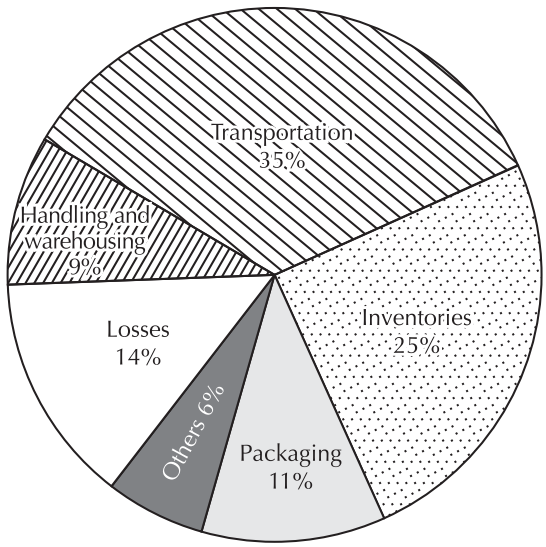

FIG. 1.8 Logistics cost estimates in India
Source: Centre for Monitoring Indian Economy (CMIE), as reported by ETIG, 2002

Though supply chain and logistics business in India is still at its infancy, there is tremendous potential ahead. The reason for the late start of supply chain and logistics business in India is that it took sometime for Indian industry to stream-line and reorganize their business processes and restructure their supply chain. According to an ETIG study, the state of the Indian industry in various SCM elements as compared with the state in the West and the relevant focus is highlighted in Table 1.1.

In most industries, such as automobiles, fast moving consumer goods (FMCG), consumer durables, foods, pharma, garments, paints, cement, and steel, SCM has been in the process of implementation or already been implemented or supply chains are being restructured and integrated, while in some other industries, the concept of SCM is yet to find takers. So, there is a lot of variability in terms of the extent of implementation of SCM in different industries in India.

As per the Centre for Monitoring Indian Economy (CMIE) data available in 2006 and given in Table 1.2, the industries have been reported to spend a total of 4.1 per cent (1.4% for inbound and 2.7% for outbound/distribution) of their net sales on logistics. However, these figures may not include losses, transaction, administration, and personnel costs together with costs of reverse logistics and marketing costs related to supply chain. Also, the costs of IT hardware and software

[5] eintelligence.com as accessed on 27 September 2008

TABLE 1.1 State of Indian industry vs that in the West with respect to various SCM elements

	SCM element	State in West	State in India
1.	Approximate costs	9% of GDP	13% of GDP
2.	Transportation	Fleet management concept	Tracking concept
3.	Warehousing and inventory	Collaborative/Vendor-managed inventories (VMI)	Minimal disruption of line, stocking at various stages of the chain
4.	Inventory costs	Increasing far slower than rise in other costs	Rising
5.	Information	Free flow, real time	In islands of knowledge, reluctance to share
6.	Personnel	Trained logistics managers	Personnel move from distribution stores and sales, few professional managers
7.	Organization structure	Logistics function is separate (stand-alone) with its own defined objectives, roles, and targets	Only leading companies are giving logistics a full functional status
8.	Infrastructure	Supports and enables sophisticated and efficient logistics solutions	Poor quality, spread, and facilities

Source: Adapted from Economic Times Intelligence Group (ETIG)

TABLE 1.2 SCM spend in major Indian manufacturing industries

SCM spend indicators	2000–02	2002–03	2003–04	2004–05
Inbound transportation costs as percentage of net sales	1.5%	1.4%	1.3%	1.4%
Inventory related costs as percentage of net sales	13.3%	13.9%	13.1%	13.1%
Distribution expenses as percentage of net sales	3.0%	2.8%	2.8%	2.7%
Total SCM spend as percentage of net sales	17.8%	18.1%	17.2%	17.2%

Source: CMIE, 2006

can only be collated using data as supplied by the companies and there are no reports on any such expenditure in Indian databases. Estimates, however, range from 3 to 5 per cent of sales for industries which have implemented SCM or are in the process of doing so. Overall, these kind of industries spend up to 9–10 per cent of total revenues on logistics. Variation in implementation of SCM is also attributed to the type of industry and the level of professionalism and adoption of new technology in a particular sector.

With more than half the goods being moved by road, the transportation costs in India accounts for almost 40 per cent of the cost of production. Trucking accounts for nearly 70 per cent of transportation and accounts for 60 per cent of all logistics costs. 67 per cent of truck ownership is in the hands of small unorganized players. Road is followed by rail and finally by coastal shipping. The freight movement of Indian railways rose to 492.31 metric tonnes in 2007–08. The railways have 222,147 freight wagons and freight operations information systems (FOIS) at 235 locations, equipped with the Rake Management System (RMS).[6] The total national highways length is 66,590 kilometres.[7] Though numerous maritime routes are available, poor government vision and policies and total lack of participation from the private sector, water—probably the cheapest mode of transport—is barely used and riverways are hardly developed. Air as a mode, on the other hand, is limited to a small percentage of courier shipments. Various SCM spend indicators, such as inbound transportation costs, inventory related costs, and distribution expenses as percentage of net sales vary from industry to industry. However, as per CMIE, these are coming down over a period of years. The aggregate of the same for nine major manufacturing industries for four years have been shown in Table 1.2. These industries spent nearly 17–18 per cent of their net sales on various supply chain activities, including distribution, warehousing, and inventory. Global averages are around 9–12 per cent. So, there is ample scope to reduce spend on logistics. This in turn allows companies to protect operating margins during downturns and make above-normal profits during upturns.

The focus on costs and information and communication technology (ICT) enabled services is leading to electronic (e-) procurement, which cuts time and costs (including transaction costs) and brings in transparency and speed. The enterprise resource planning (ERP) industry in India is worth US$300 million and is growing at over 15 per cent a year. Fifty two per cent of the respondents in the Economic Times Intelligence Group (ETIG) SCM 2004 survey have implemented ERP and three-fourths of these find ERP to be extremely effective in business. Forty four per cent of the companies surveyed had already implemented data warehousing and mining applications, and another 26 per cent had plans to do so. Almost every firm found this practice to yield good results in revealing sales and ordering patterns, potential segments, and integrate various functional areas in a seamless manner.

For supply chain tracking, the most preferred method is the truck driver reporting his location. Another method is use of short messaging service (SMS), where time lags can be pre-determined. Depending on the number of times the SMS signal is polled and sent to the base station, the location of the vehicle can be accurately

[6] http://www/indianrail.gov.in as accessed on 27 September 2008

[7] http://www.nhai.org as accessed on 27 September 2008

determined. With global positioning systems (GPS), determination of the location of the vehicle has become automatic. However, the use of GPS for SCM in India is relatively low. Service providers like Transport Corporation of India (TCI) have poured in US$0.34 million for installation of GPS in their trucks. Firms like Bajaj, Maruti Udyog Limited, TVS Motors and Bharat Shell are already using TCI's GPS systems.

CHANGES THAT LED TO MODERN SCM

(i) Until the late 1980s, most companies viewed logistics as comprising trucking, inventory, and warehousing activities only. However, many companies started appreciating the need for competition for their supply chains and associated networks also and not just for their products, by the fag end of the 80s.

(ii) From 1990s, the start of rapid improvement in telecom networks and a burgeoning IT industry together with increasing globalization of Indian business brought buyers and sellers closer, exploring new dimensions of buyers and supplier relationship.

(iii) In late 1990s, BPR came into vogue whereby companies streamlined their processes, making integration with customers and vendors at different ends. Suppliers came to be recognised as partners and by the turn of the century, they were recognised as business partners and had a role in cost reduction.

(iv) By virtue of emergence of ERP in late 1990s, companies further streamlined and mapped their processes, removed duplication, and carried out integration of different functions within the company as well as outside the company to suppliers and customers. A number of middle and small scale companies joined the race. Today, the ERP market in India is valued at around Rs 1200 crore.

(v) Advent and penetration of Internet in corporate buying and after-sales servicing has led to intensification of B2B commerce and reaching out to suppliers and customers. This has resulted in time and cost efficiency in order fulfilment and servicing, purchasing, procurement, and replenishments at the retailers level, ultimately leading to lower stock-outs, better service levels, and delivering better value to customers for a given price. The time to market a new product reduces as well. All these efficiencies result in a higher return on investment (ROI), more loyal customers, and higher market share. This also motivates the employees or internal customers of the company and so has a transforming impact on the organization culture in terms of communication, information sharing, developing a team spirit, striving for continuous improvement, focusing on customer satisfaction, and always considering supply chain partners as true business partners sharing risks and rewards on a pool basis rather than on individual basis.

It may be noted that while ERP integrates the corporate functional departments into a seamless organization, supply chain attempts to integrate the external factors into internal processes. Today, the extended enterprise concept of supply chain not only includes the core manufacturing company, customers, and vendors but also includes parties such as the following.

- Transporters
- Carrying and forwarding (C&F) agents
- Third-party logistics (3PL) providers
- Logistics consultants
- Consolidators
- Fleet operators
- Warehousing companies
- Software solution providers
- Telecom and hardware providers

CORPORATE SUCCESS THROUGH SCM

It is clear that SCM is at different developmental stages in different industries in India. While the apparel industry treats SCM as a fragmented entity constrained by various factors, automobile, consumer durables, and FMCG industries see SCM as a very tight, controlled, and integrated entity for their business. This can be gauged from the fact that there is a great amount of outsourcing in the automobile and consumer durables industry. While in automobiles and food industry, the critical SCM component is inbound logistics, in FMCG, pharma, apparel, cement, and paint industry, it is outbound logistics. However, there could be common cost, delivery, and cycle time measures at different stages of the supply chain. Post SCM

TABLE 1.3 Operational and business improvements in Indian FMCG industry post SCM implementation

(i)	Reduction in procurement cost	5–10%
(ii)	Reduction in processing cost	5–10%
(iii)	Reduction in inventory carrying cost	10–15%
(iv)	Reduction in distribution cost	10–15%
(v)	Reduction in procurement and manufacturing cycle times	15–20%
(vi)	Increase in online delivery	15–20%
(vii)	Increase in available to promise (ATP) performance	10–15%
(viii)	Reduction in time to market	10–15%
(ix)	Increase in sales turnover	15–20%
(x)	Increase in profits	10–15%

implementation, these would bring about marked improvements in business and operations, as is clear from Table 1.3.[8]

It is obvious that SCM results into better selection, streamlining of supply chain partners, fine-tuning of various SCM flows and their alignment because of

- value addition at all stages of supply chain processes
- cost efficiency
- volume flexibility
- variety flexibility
- delivery dependability
- delivery speed
- lesser product development times
- faster inventory replenishment

Reduction of cycle times, particularly by implementation of lean processing or single-piece flow, results in faster turnover of inventory and capital resources. It does not result in any blocked capital in the form of inventory or warehousing cost; the rejects and wastages are fewer; the obsolescence risks get reduced; and because of faster replenishments and virtually no stock-outs, customer service levels are higher. This ultimately results in better profitability by virtue of cost reduction or increase in net profit/ROI, thereby providing better products in lesser time at the retailer's end and then to the customer. Obviously, it will lead to increase in market share by virtue of being competitive in terms of time, cost, price, and better positioning of products in the marketplace. The focus on cost, time, delivery, and flexibility must percolate down from upstream supply chain members such as primary and secondary sources to distributors, retailers, and customers. Although it is targeted to shorten the supply chain by eliminating certain levels, ironically, while we can possibly eliminate some distribution channel members, we cannot eliminate their activities such as distribution, retailing, etc.

On slightly intangible fronts, SCM results in better customer reach, higher product availability, and better responsiveness to customers. It also invariably interacts with better adoption of customer relationship management (CRM) practices and fine-tuning of supply chain networks and flows for better transparency and faster processing at each stage. A case in point is that of value added tax (VAT). By introduction of VAT regime, facilities network and flows for SCM had to be redesigned by most companies, which resulted in savings in terms of reduction in number of warehouses, rationalization of transportation routes, and consolidation of fleet. Adoption of IT with VAT and outsourcing of non-core competence activities

[8] Unpublished PhD thesis by Ashutosh Mohan, completed under the supervision of the author, Faculty of Management Studies, University of Delhi, 2005

also augmented the concept of *hub and spoke*[9] in the logistics part of SCM. SCM results in better order fulfilment and management at the customer's end as 'time to market and distribute' decreases significantly by better management of supply chain, including redesign of supply chain and their networks and flows and their alignment and integration. Also it results in better customer retention and increased customer loyalty. For supply chain integration, the basic premises on which companies should act are given as the following.

(i) Collaborative planning and forecasting for better demand management (both volume and varietywise) and sharing the information with appropriate supply chain partners
(ii) Supply chain structure including facilities network design, taking into consideration the realistic transportation and logistics requirements including redesign and relocation of facilities (including fleet) and their capacities
(iii) Collaboration and partnership with various stakeholders like product developers, sources, channel partners, and endusers including 3PLs
(iv) Adoption of information and communication technology (ICT) to facilitate all of the above

All these four activities executed for supply chain integration would facilitate better demand and supply planning, order tracking and fulfilment, better procurement, and replenishment patterns. It may even help in marketing new product designs faster and provide better service levels to customers—both internal and external.

Many companies in the Indian FMCG market have reported operational and business benefits, after implementation of SCM as indicated in Table 1.3.

Although these estimates may not be 'breakthrough' achievements, the values vary in the range depending upon the nature of the industry, the level in implementation of SCM, and other functionally related systems and practices such as ERP and CRM. These figures are just reflective of how much potential lies in the implementation of SCM by various industries, particularly in view of its benefits after implementation as reported by some global giants, cited at a later stage in this book.

RECAPITULATION

The opening chapter of this book starts by defining SCM as an alignment of firms or network of organizations that comprise various kinds of flows, which delivers value to the customer through upstream and downstream linkages of different processes and activities. The noteworthy aspect is that a basic supply chain, comprising a supplier, the focal firm, and the customer, could assume different levels of complexity based on its extension to customers and suppliers and the type

[9] A *hub* is an IT-enabled consolidation centre that receives small frequent lot deliveries from a network of supplier networks (*spokes*), normally managed by a 3PL. See Chapter 4 for detail

and levels of networks and service providers involved. Also the flows are not only of material goods but could also comprise information, finance, knowledge, credit, cash or order flows. There could be even reverse flows in terms of product returns, empty bins/containers, rebates, incentive payments, etc. (*reverse logistics*). The chapter then focuses on the evolution of SCM from the conventional materials management to physical distribution and logistics management to integrated logistics management, ultimately leading to integrated SCM. The important characteristics of the new evolved SCM that emerged are given as the following.

(i) It is a holistic system approach and has strategic focus.
(ii) It involves long-term partnerships with vendors and customers.
(iii) It is facilitated by the flow of information across all the supply chain partners who mutually share the reward and rights to deliver the best value to the customer.
(iv) The SCM system should have a self-check and control mechanism at every link in the chain to maintain the quality of products delivered.
(v) SCM needs joint working and collaboration with all partners, particularly the suppliers. Also, the role of logistics in SCM, particularly the third-party logistics (3PL) providers cannot be undermined when it is required to develop an integrated SCM framework and plan.

The key and primary objective of supply chain at the focal firm is to create a mutually superior value for the customer in terms of the product and service delivered at a time and place in response to the customer needs and demand. The secondary objectives derived from this are to possess certain degree of profitability, flexibility or agility, responsiveness, asset turnover and to provide for communication, coordination, and information sharing ability across all the supply chain partners and not just one partner.

The planning framework for supply chain is supported by collaboration with suppliers as well as with customers. There are four operational fronts in this model, namely material planning, production scheduling, distribution scheduling, and transport planning.

It is necessary that the supply chain strategy is aligned with the competitive business strategy in terms of the goals, i.e., it must have a 'strategic fit'. This may require the supply chain a set of coordinated actions with other functional strategies in the area of manufacturing, inventory, purchasing, and transportation. In order to attain the strategic fit, the company must understand the customer needs and the implied supply chain uncertainty. Compared to demand uncertainty, which is uncertainty of customer demand for a product, the implied demand uncertainty is the resulting uncertainty for only the portion of demand that the supply chain must handle and the specific customer desire. The greater the implied uncertainty, the more responsive the supply chain should be. For a high level of performance, companies should move their competitive strategy (and thus implied uncertainty) and supply chain strategy (and the resulting responsiveness) towards an intersecting area, and is so called the 'zone of strategic fit'. The 'strategic fit' however, is restricted by the increasingly demanding customers, decreasing product life cycles (PLCs), and disintegration of supply chain ownership focusing only on the individual goals than the whole chain. The structure of the supply chain is determined in terms of two dimensions, namely 'efficiency' and 'responsiveness'. While efficiency refers to the cost of making and delivering the product to the customer, responsiveness refers to the supply chain's ability to respond to a range of fluctuations in the demand of a product variant with significantly high service level. Since one comes at the cost of another, these are to be traded off. A supply chain decision-

making framework is described by a set of enablers or drivers which influence the structure of the supply chain in terms of 'efficiency' and 'responsiveness'. Initially labelled as the facilities, inventory, transportation and information, the list of enablers or drivers can now be expanded to include sourcing and strategic alliances, pricing and revenue management, and organization structure and HRM. While the first three are logistical enablers, the latter four are cross-functional in nature. All these form elements of the supply chain decision-making framework.

There are multifaceted benefits of implementing a good SCM in terms of reducing working capital requirements, optimizing various processes, reducing time to market, reducing lead times across various levels, streamlining, and improving flow of inventory at in-process, work-in-progress, and finished goods stages. The prerequisite is obviously better forecasting and planning through information sharing with supply chain partners.

The supply chain market in India is promising. As per recent studies, supply chain costs normally stand at 12.3 per cent of GDP compared to the US where the figure is 8.5 per cent. A large share of the supply chain costs, roughly 44 per cent of it, is accounted for transportation, handling, and warehousing. According to another study by CMIE in 2006, companies spent 17.2 per cent of their net sales on logistics and supply chains (global average being 9–12%) out of which 1.4 per cent was spent on inbound logistics, 2.7 per cent for outbound logistics, and 13.1 per cent on inventory. The ERP market is also promising with around 15 per cent growth rate. Indian industries have reported significant operational and business improvements post SCM implementation.

CONCEPT REVIEW QUESTIONS

1. What are the types of supply chain and what are the kinds of flows involved in a typical supply chain? When do you see the possibility of reverse flows (reverse logistics)?
2. Why is supply chain different from logistics management? How do the two terms differ? Outline the relationship amongst purchasing, logistics, and SCM.
3. Trace the evolution of the conventional materials management function to the modern day SCM, particularly in the Indian context.
4. What are the objectives of a supply chain? How can these objectives can be linked to corporate goals?
5. What are the different levels and elements of a supply chain planning framework? What purpose can be served by such a framework?
6. What is meant by the 'strategic fit' of a supply chain strategy? How can this fit be attained and what can be its limitations?
7. What are the enablers or drivers that support the supply chain decision-making framework? How can these help in determining the efficiency and responsiveness of the supply chain?
8. What is the state of business and its potential in SCM and ERP market in India? What are the trends in West vs India?

CRITICAL THINKING QUESTIONS

1. Why is modern SCM not only about forward physical flow of goods from suppliers to customers? How do the other types of flows emerge?

2. What are the challenges for management of logistics in the Indian context? How do you suggest these challenges to be tackled? What initiatives can be taken by the government in this regard?
3. What are the reasons of uncertainty in supply chain even when the demand is fairly stable? Cite a few reasons particularly with reference to the Indian context.
4. How does SCM affect the business performance and results in a competitive corporate world? Indicate some broad metrics of business performance and how these can be impacted by better SCM operations?

PROJECT ASSIGNMENTS

1. Interview a sales and distribution/logistics/supply chain manager of a company and find out how SCM has evolved from a conventional material procurement and storage system to an integrated supply chain management system.
2. Visit different sites on the Internet, e.g., economywatch.com, cmie.org, or eintelligence.com and sketch out a scenario about business growth in logistics and supply chain market in India.
3. Analyse in detail the reasons for the present stage of SCM in India (The reasons could pertain to economy, market, technology, and competitiveness).
4. Analyse how developments in Information and Communication Technology (ICT) have contributed to the pace of progress in SCM.

CASE STUDY

Global Case Study

HEWLETT-PACKARD (HP)[10]

Supply Chain Management Approach

HP is a major player in three highly competitive, price-sensitive businesses: printer and imaging solutions, personal computers, and technical solutions. The last one includes services as well as enterprise systems for mission critical applications. This broad product line positions HP against a large number of competitors. Other imperatives include a widely dispersed global operation that extends across 178 countries and a rapidly flowing new product pipeline, which launches hundreds of new products each year. HP's supply chain effort is overseen by its *Supply Chain Council*, which includes a Senior VP in charge of supply chain and the supply chain leaders from each of the company's three business groups. Each year, the council updates its three-year plan and then translates it into a 12-month schedule. To monitor progress and ensure that the objectives are met, the Supply Chain Council meets every month. HP serves four customer segments: consumer, small/medium business, public sector, and enterprises.

The Supply Chain Network at HP

Just a few years ago, customers received product or services from HP via one of the 35 different

[10] *Source:* Partially adapted from www.hp.com/hpinfo/globalcitizenship as accessed on 2 April 2008; www.managingautomation.com/maonline/magazine/read/view/supply-chain-mastery-HP-2588698 as accessed on 22 September 2008

supply chains. Now, the company has consolidated its business into five supply chains—no-touch, low-touch, configure-to-order, high-volume, and solutions and services. Says Dick Conrad, Senior VP, Supply Chain, Global Operations, 'One size does not fit all. Relying on just one supply chain limits the company's ability to grow and effectively serve different customer requirements and different market needs. Right now, five is the right number but it is possible, one or two could be added.' The Director of Supply Chain Strategy at HP, Gianpaolo Callioni says, 'We are always putting customer first.' To meet this objective, the company has built a powerful supply chain network that provides the flexibility it needs to deliver products to customers the way they want to receive them. There are four routes to market which the company has designed—value direct, volume direct, partner assisted value indirect, and partner assisted volume indirect. This flexibility in channels and routes allows HP to address complex customer needs. It also helps HP to optimize its supply chain costs as products move through their life cycle by emphasizing on velocity and focusing on cost management.

Sourcing Policies and Programmes at HP

HP operates the IT industry's largest and most complex supply chain (Fig. 1.9). HP purchases approximately $53 billion of products and materials, components and manufacturing, transport and other services from approximately 7000 suppliers globally, out of which about 400 are contracted manufacturing suppliers. Also, 600 suppliers account for 95 per cent of the HP's expenditure on product materials, components, and manu-facturing (Fig. 1.10).

HP has a global policy and programme to offer under-represented businesses equal opportunities to become HP suppliers and resellers. In the US, these businesses include small, minority-owned, women-owned, veteran-owned, service-disabled owned businesses. In other countries, they include aboriginal, ethnic minority, and immigrant-owned businesses. HP has in place a *corporate supplier diversity programme* for more than thirty years. HP's *Global Citizenship Policy* sets expectations for HP's human rights, labour practices, ethics, occupational health and safety, environmental impacts, and collaborations with non-governmental organizations (NGOs). HP's commitment to corporate social and environmental responsibility (SER) extends through their SER policy established in 2002 to their global supply base and aligning SCM with their global citizenship commitment minimizes supply chain risks while forging a clear connection to the corporate values. It is also committed to building SER capabilities at its suppliers' end by protecting workers' rights, suppliers' working conditions, health, and safety.

To offset some of the potential disadvantages of this concentrated sourcing approach, HP has maintained a *Corporate Multicultural Procurement Programme* for more than 30 years, a practice that continued to expand beyond the US into other markets like Europe, Canada, and South Africa. These efforts helped them to meet the expectations of the public sector and corporate customers while the consumers gained access to diverse ideas and contributed to the economic strength of the communities in which HP operates. Purchases from minority and women-owned businesses comprised 22.1 per cent of HP's total qualified procurement spending in the US during 2004. These exceeded all of HP's targets for awards in 2004, in particular to women-owned small businesses. It utilized these firms to provide logistics services, software development, and computer and electronic manufacturing services. These firms are involved in the repair, replacement, and warehousing of HP products and for providing temporary personnel. HP increased its goals for 2005, even though its qualified procurement spending still remained constant.

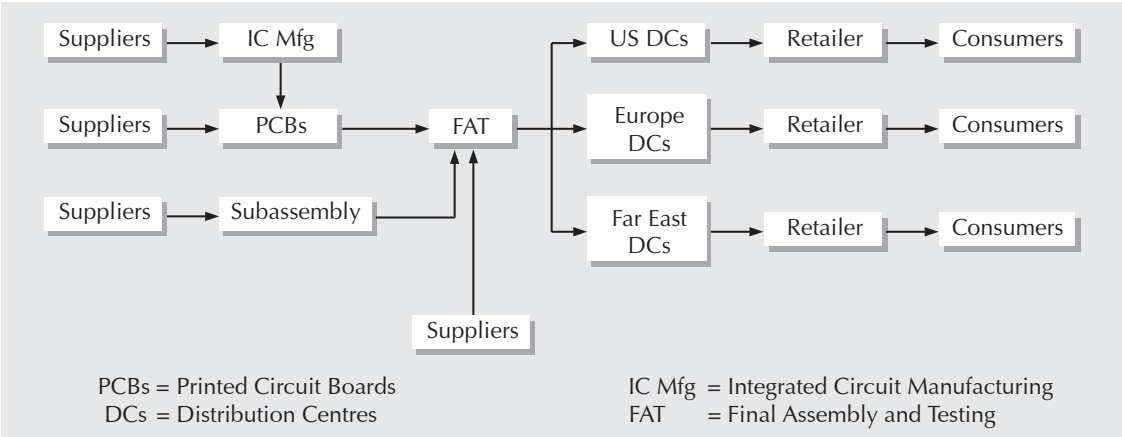

FIG. 1.9 The network of supply chain at HP

In addition to their procurement efforts, HP promotes supplier and reseller diversity in a number of ways. HP's minority reseller programme provides an opportunity to strengthen HP's relationships with minority resellers and customers and to exchange information and ideas on how they can work together to meet customer needs. HP's Micro Enterprise Development Programme focuses largely on stimulating economic growth in low-income US communities. Similarly, the work in microfinance and e-inclusion provides support to small, minority-owned, and women-owned businesses across the world. Finally, HP actively mentor their suppliers and host events with local business councils that introduce diverse suppliers to potential customers. The company also led the development of electronic industry code of conduct (EICC).

HP Connect

The company launched its unique HP Connect Supplier Diversity Summit in August 2007. These events are held twice in a year on HP campuses. These events facilitate in identification of potential suppliers, informing them about the opportunities available to do business with HP. It also facilitates face-to-face interaction with HP buyers. In 2007, 120 pre-screened minority and women business owners were selected for 15 minute one-to-one 'match making' sessions with HP commodity managers and tier I suppliers. In 2008, the figure was 70. Through HP PartnerONE diversity network, HP provided marketing and sales support to more than 350 direct resellers in 2007 and 300 in 2008.

Supply Chain Mastery at HP

Everyday, HP delivers 1.3 million inkjet cartridges, 1,10,000 printers, 75,000 personal computer (PC) systems, and 3500 servers. As per Global Competitive Report (GCR) 2008, HP ship more than 1 million printers per week and more than 4.8 million PC units annually. It has 600 contracted materials and manufacturing suppliers located at more than 1200 locations worldwide. It has 3,40,000 workers at audited sites that produce HP products. Most of these products are produced by contract manufacturers or original design manufacturers. The company spends about $50 billion, or about 64 per cent of its revenue, on supply chain activities. At this spending and complexity, supply chain mastery is an imperative discipline to control costs and foster collaborative relationships with suppliers. According to Derek Conrad, Senior Vice-President, Supply Chain Global Operations at HP, as quoted in *Managing Automation,* an online

magazine, 'Supply chain optimization has a direct impact on customer satisfaction, stock price and profitability.' As a result, HP management assigns supply chain optimization a high priority. They are continuously focused on supply chain improvement. The journey will never be done until they can do it for free or at a negative cost. They have to be vigilant to ensure that the supply chain is flexible and changes to meet ever increasing demands.

Benefits and Rewards

The supply chain organization and practices outlined above have reaped the company many benefits, such as saving HP over $1 billion since 2001, and earning HP the Managing Automation Progressive Manufacturer Supply Chain Mastery Award in 2005. With an increasing number of orders received directly from consumers using the HP website or working through an enterprise business partner, there's been considerable growth in the customer-centric, demand-driven, configure-to-order supply chain. 'We do more and more configure-to-order, especially on our mid to lower range of offerings,' said Randy Burdick, the then Vice-President and Group Information Officer, Adaptive Infrastructure and Supply Chain IT at HP. Combining SKUs and options just before shipping eliminates the need for custom builds and reduces inventory requirements. However, this direct-to-consumer business also necessitates different support functions such as call centers for customer service and website design for easy use. The company's e-visibility system has connected HP to its 3PLs to generate proof of delivery in 48 hours on 92 per cent of shipments, thereby significantly quickening the invoice/payment process and improving cash flow.

By integrating social and environmental requirements into its sourcing operations through its SER programme, HP particularly focused on suppliers of product materials, components, and manufacturing and distribution services, such as contract manufacturers, original design and original equipment manufacturers, product design support, transportation, and product repair services, representing 90 per cent of HP's expenditure and brought about significant efficiencies, decrease costs, and strengthened partnerships (Fig. 1.11). As per GCR, 2008, HP employed a risk-

Geographic distribution of supplies at HP

North, Central, and South America Region	Europe, Middle East, and Africa (EMEA)	Asia Pacific Region
Countries: Canada, Mexico, United States, Costa Rica, Brazil	**Countries:** Austria, France, Germany, Italy, Netherlands, Scotland, Switzerland, UK, Czech Republic, Hungary, Romania, Middle East and African countries	**Countries:** China, India, Indonesia, Japan, Korea, Malaysia, Phillippines, Singapore, Taiwan, Thailand
Business: Contract design and manufacturing, software, semi-conductors, storage, interconnect, power supplies, packaging materials	**Business:** Contract design and manufacturing, semi-conductors, media, packaging materials	**Business:** Contract design and manufacturing, semiconductors, displays, storage, interconnect, power supplies, media, packaging materials
Per cent spend: 20% of total spend	**Per cent spend:** 5% of total spend	**Per cent spend:** 75% of total spend

FIG. 1.10 Major regions of HP's product materials, components, and service suppliers
Source: Based on www.hp.com/hpinfo/globalcitizenship/gcreport/supplychain/auditresult as accessed on 19 February 2010

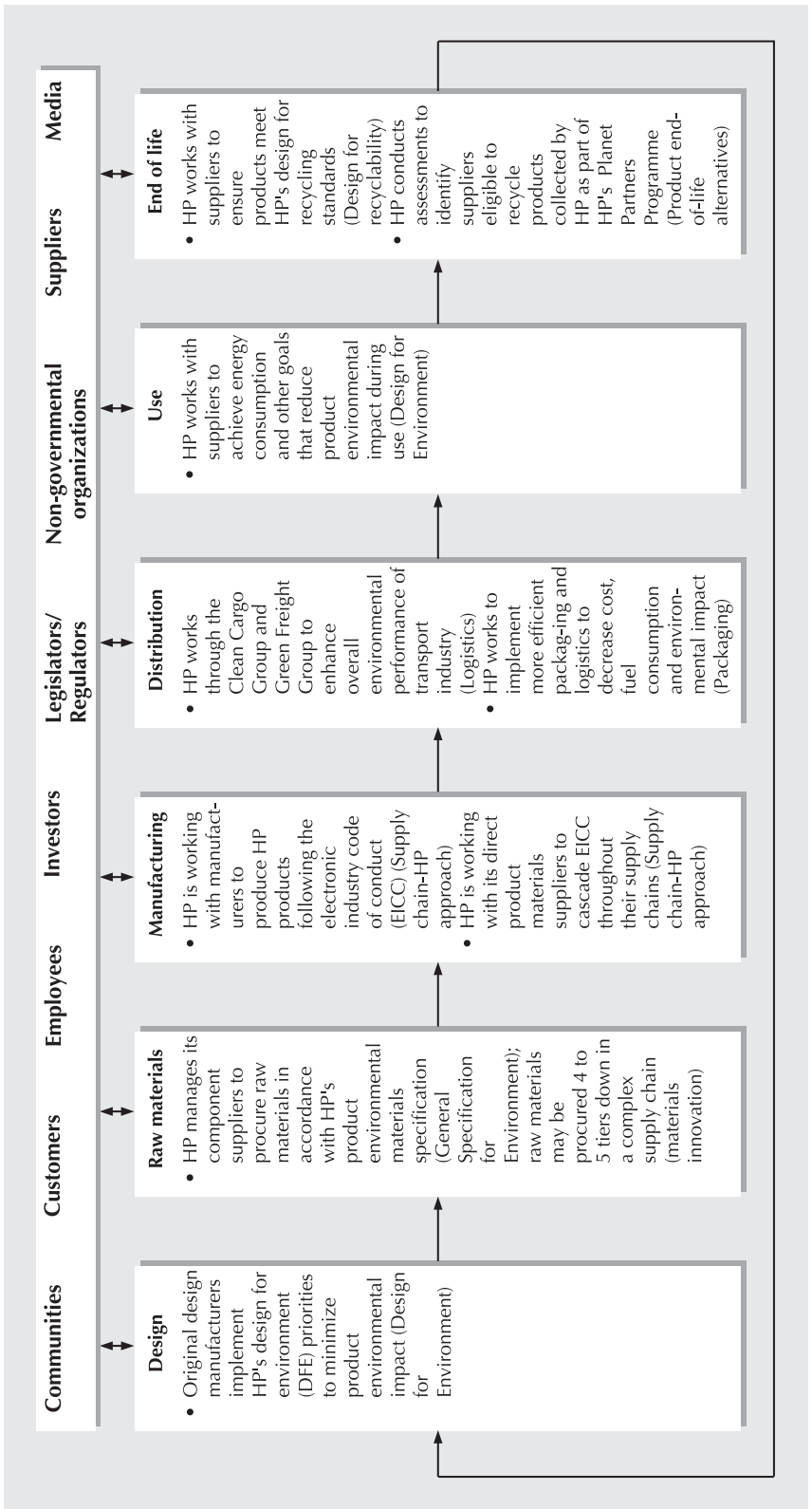

FIG. 1.11 Social and environmental responsibility (SER) expectations for HP suppliers across the HP product life cycle
Source: Based on HP's Global Citizenship Report 2006, 2007, and 2008

based approach to prioritize the implementation of the SER programme with tier 1 suppliers, who would then train the tier 2 suppliers in SER. Throughout 2008, HP audited 142 suppliers at 246 high-risk sites in different countries, out of which 85 suppliers would be reaudited at 122 sites in 2009. Four hundred and forty four low-risk suppliers are already engaged and assessed, i.e., no audits are necessary for them. However, 20 new suppliers are to be audited at 27 high-risk sites in 2009. To raise the standards in supply chain, audits are also done with respect to EICC. Capacity building in SER has been accomplished by various projects in collaboration with local organizations, e.g., workers' training and the Focused Improvement Supplier Initiative (FISI) in China, the hard-disk drive supply chain in Southeast Asia, the Central Europe Supplier Responsibility (CESR) project, and the Health Enables Returns project in Mexico.

Discussion Questions

1. Comment upon the structure and complexity of supply chain requirements at Hewlett-Packard (HP) that makes supply chain mastery at HP an imperative discipline.
2. What are the special programmes at HP that facilitate implementation of HP's strategies and policies towards SCM?
3. How does HP avoid concentration of sources at one place in the globe? How are the sourcing partners distributed globally? What do you think could be reasons for this kind of distribution?
4. Critically analyse as to how HP discharges its social and environmental responsibility through its suppliers across its product life cycles.
5. What are the kinds of benefits which HP reaped by mastering the art and science of SCM?

Indian Case Study

AMUL[11]

Overview

The Gujarat Cooperative Milk Marketing Federation (GCMMF) or commonly referred to as Amul, collects 4,47,000 litres of milk from 2.12 million farmers, converts the milk into branded, packaged products and delivers products worth Rs 6 crore to over 5,00,000 retail outlets across the country daily. Its supply chain would be easily one of the most complicated in the world.

Every GCMMF office displays a photograph that shows a long queue of Gujarati women waiting patiently for the union vehicle to come and collect the milk they have brought in shining oval brass containers. Amul never forgets its primary supplier, i.e., the farmer and it is a whopping Rs 2200 crore (Rs 22 billion) enterprise. The GCMMF now has 2.12 million farmers, 10,441 milk collection centres in villages, and 14 district level unions and their plants.

History

It was way back in December 1946 that a group of farmers from the village of Anand, in order to free themselves from intermediaries and gain access to markets to get due returns, started the Kaira District Milk Cooperative Union. It then joined hands with other milk cooperatives and made the GCMMF. Today 2.12 million farmers, 10,441 milk collection centres at village level, and 14 district level unions. Markets were relatively more primitive and poor in infrastructure. The federation felt that they just could not leave it to market forces and that a proactive strategy was required.

[11] *Source:* This case has been adapted from the case, 'The extraordinary story of Amul', *The Smart Manager*, September 2005, with the kind permission of its author, Prof. Pankaj Chandra, Director, IIM, Bangalore. The author expresses acknowledgement and thanks to Prof. Chandra

The Business Strategy and the Market Segment

The GCMMF identified two key action areas under the strategy.

(i) Matching demand and supply that would need heavy investment and the simultaneous development of suppliers and consumers
(ii) To engage professional managers and technocrats for effective management of the network and commercial viability

A hierarchical network of the cooperatives was developed while still retaining the focus on farmers. The vast supply chain of Amul has a spread from small suppliers to large fragmented markets. Although GCMMF is directly responsible only for a small part of the chain, a number of distributors, retailers, and third-party logistics (3PL) providers play a bigger role. Managing supply chain effectively and efficiently is critical as GCMMF's competitive position is driven by low consumer prices supported by a low cost system.

Initially, when Amul was formed, consumers had limited purchasing power and modest consumption levels of milk and dairy products. Then, with growth, Amul developed a low-cost price strategy making its products affordable and ensuring value for money for their customers. Making a product base with liquid milk, Amul enhanced its product mix through the progressive addition of higher value products while maintaining the desired growth in existing products. It has competition in high value dairy segments from giants like HUL, Britannia, and Nestle. However, GCMMF makes sure that the product mix is consistent with its basic value of providing milk at an affordable price.

The Federation uses Amul as an *umbrella brand* which covers various product categories produced by various unions like liquid milk, butter, ghee, cheese, cocoa products, sweets, ice-cream and condensed milk. Amul's sub-brands include variants, such as Amulya, Amulspray, Amulspree, and Nutramul. Edible oil products are branded Dhara and Lokdhara, mineral water is sold as Jal Dhara, and fruit drinks bear the brand name of Safal. By following an umbrella branding, GCMMF has been able to avoid inter union conflicts at the same time facilitating them to develop and improve products.

Distribution Network

As pointed out earlier, Amul products are available in over 5,00,000 retail outlets across India through its network of over 3500 distributors. There are 47 depots with dry and cold warehouses to buffer inventory of the entire range of products.

The GCMMF transacts on an advance demand draft basis from its wholesale dealers instead of the cheque system adopted by other major FMCG companies. This practice is consistent with GCMMF's philosophy of maintaining cash transactions throughout the supply chain and it also minimizes the inventory levels.

Wholesale dealers carry inventory that is just adequate to meet the transit time from the branch warehouse to their premises. The JIT inventory levels help improve the dealers' ROI.

Managing the Supply Chain Network

Given the large number of entities in the supply chain and the need for decentralized responsibility for various activities, effective coordination is critical for efficiency and cost control. GCMMF and the unions jointly achieve the desired degree of control. The unions get assured buy-ins as the plans are approved by the GCMMF's board. It is drawn from the heads of all the unions, and the boards of the unions comprise of farmers elected through village societies, thereby creating control through interlocking.

While the unions coordinate the supply side activities, the federation handles the distribution of end products and coordination with the retailers and dealers. The activities include monitoring milk collection contractors, the supply of animal feed

and other supplies, provision of veterinary services, and educational activities.

Managing Third-party Logistics (3PL) Providers

The union's core competence activity lies in milk processing and the production of dairy products. Accordingly, marketing efforts including brand development were assumed by the GCMMF. All other activities were entrusted to third parties. These include logistics of milk collection, distribution of dairy products, sale of end products through dealers and retail stores, provision of animal feed, and veterinary services.

It is worth noticing that a number of these third parties are not in the organized sector and many are not professionally managed, with little regard for quality and service. This is a particularly critical issue in the logistics and transport of a perishable commodity where the basic infrastructure is already ridden with weaknesses.

Establishing Best Practices

A key source of competitive advantage has been the GCMMF's ability to continuously implement best practices across all elements of the network: the federation itself, the unions, the village societies, and the distribution channel.

In developing these practices, the federation and the unions have adapted some of the global best practices. It could be the implementation of small group activities or quality circles at the federation or a total quality management (TQM) programme at the unions or housekeeping and good accounting practices at the village society level.

More importantly, the network has been able to regularly roll out improvement programmes across to a large number of members and the implementation rate is consistently high. For example, every Friday, between 10.00 a.m. and 11.00 a.m., all employees of GCMMF meet without fail at the closest office, be it a department or a branch or a depot, to discuss their various quality concerns. Each meeting has its pre-set format in terms of purpose, agenda, and limit (PAL) with a process check at the end to record how the meeting was conducted. Similar processes are in place at the village societies, the unions, and up to the wholesaler and clearing and forwarding (C&F) agent levels.

Examples of benefits reaped from recent initiatives include reduction in transportation time from the depots to the wholesale dealers, improvement in ROI of wholesale dealers, implementation of zero stock-out through improved availability of products at depots, and also the implementation of JIT in finance to reduce the float.

Kaizens—the continuous improvement projects at the unions, have helped improve the quality of milk in terms of acidity and sourness that it may have. For example, Sabar Union's records show a reduction from 2.0 per cent to 0.5 per cent in the amount of sour milk/curd received at the union.

The most impressive aspect of this big time roll out is that improvement processes are turning the village societies into individual improvement centres.

Technology and E-initiatives

GCMMF's technology strategy is characterized by distinct components, namely new products, process technology, and complementary assets to enhance milk production and e-commerce.

Only a few dairies of the world may have as wide a variety of products as produced by the GCMMF network. Village societies are encouraged through subsidies to install chilling units. Automation in processing and packaging areas is common as is the Hazard Analysis Critical Control Point (HACCP) certification. Amul actively pursues developments in embryo transfer and cattle breeding in order to improve cattle quality and increase in milk yields.

GCMMF has been one of the first Indian FMCG firms to employ Internet technologies to implement B2C commerce. Today customers can order a variety of products through the Internet and still be assured of timely delivery with cash payment upon receipt. Another e-initiative underway at GCMMF is to provide farmers access to information relating to markets, technology, and best practices in the dairy industry through Net enabled kiosks in the village.

It has also implemented a geographical information system (GIS) at both ends of the supply chain, which are milk sourcing, collection as well as the marketing processes aimed at delivery to customers.

Farmers now have better access to information on the output as well as support services which helps them in better product mix, planning, and marketing.

Discussion Questions

1. Why should a company such as Amul undertake a strategic management initiative of SCM?
2. Comment on the distribution network and its challenges at Amul.
3. Name some best practices in management in use in Amul which result in better performance of the supply chain.
4. How can initiatives based on information technology (IT) facilitate better management of the supply chain in a dairy industry unit such as Amul?

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Internet Resources

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