

Supply Chain Management

Structure:

1.1 Introduction to supply chain management

1.2 Definition of supply chain management

1.3 What is logistics?

1.4 Green logistics

1.5 Supply chain decisions

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Objectives: In this chapter an attempt has been made to understand supply chain management, logistics management, green logistics and supply chain decisions.

1.1 Introduction to supply chain management

For many of the researchers and educationists Supply Chain Management (SCM) has been grand passion now a day's. Intense competition in global markets and the heightened expectations of consumers have forced business enterprises today to invest in and focus attention on, this aspect. While the need for increased efficiency in organizational operations persists, modern management thinking advocates the need to develop a successful competitive strategy. It is within this context that Supply Chain Management (SCM) has become part of the senior management agenda in western countries since the 1990s, particularly in the manufacturing and retailing industries. More recently,

interest in SCM has also been growing in the developing countries. Just as their counterparts in manufacturing and retailing, executives of all enterprises are becoming aware that successful management of key business processes across members of their supply chains will ultimately determine their competitive success.

The increased interest in SCM has also been spurred by advancements in Information and Communication Technology (ICT) that enable frequent exchange of huge quantum of information among chain participants. Consequently, there is a need and an opportunity for a joint approach of business partners towards the establishment of more effective and efficient supply chains networks. These networks play an important role in providing access to markets for producers from developing countries, as well as for local, regional and export markets. The chapter starts with an overview of SCM in the western world and then focuses on the specific characteristics of the developing world and on what can be learned. During the 1960s U.S. manufacturers were using the concept of mass manufacturing to reduce the cost and improve the productivity. In 1970s material requirement planning (MRP) systems and manufacturing resource planning (MRP-II) were developed. The term supply chain management coined in late 1980s and came into widespread use in late 1990s. The literature shows that prior to this time business terms such as operations management and logistics management, business process reengineering, total quality management, just in time were in widespread use (Chopra et al., 2010).

1.2 Definition of a Supply Chain

Supply Chain as a sequence of (decision making and execution) processes and (material, information and money) flows that aim to meet final customer requirements, that take place within and between different stages along a continuum, from production to final consumption. The Supply Chain not only includes the producer and its suppliers, but also, depending on the logistic flows, transporters, warehouses, retailers, and consumers themselves. In a broader

sense, supply chains include also new product development, marketing, operations, distribution, finance and customer service.

In the early 1990s, academics first explained SCM from a theoretical standpoint to clarify how it differs from more traditional approaches to managing the flow of information and materials (Christopher, 1998). SCM have the following agglomerations:

SCM consists of integrated planning, implementation, coordination and control of all business processes and activities necessary to produce and deliver the products and services, as efficiently as possible, to satisfy market requirements.

SCM consists of series of physical and decision-making activities inter-connected by material and information flows and associated flows of money and property rights cross the organizational boundaries.

SCM is a 'business process' that can be seen as a structured, measured set of activities designed to produce a specified output for a particular customers or markets. The logistical processes in the supply chain, which include activities such as operations, inventory management and distribution.

According to Stock and Lambert (2001), "supply chain integrates the key business process of an organization from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders".

More recently, the value addition concept has coined i.e. the values associated with the so called '3P': People, Planet and Profit (or Prosperity). So, in addition to the financial performance, the social and environmental dimensions are incorporated in performance evaluation. These latter two lead to attributes that are generally associated with the product itself, the companies producing it and

the raw materials and the resources used. For example a food processing company may develop a reputation for its concern with environmental protection, either because it uses agricultural inputs that are free of pesticides or because its packaging is made of recyclable materials, among other reasons. This concept evolved the concept of green supply chain management. A schematic SCM process is shown in the Fig 1.1 below:

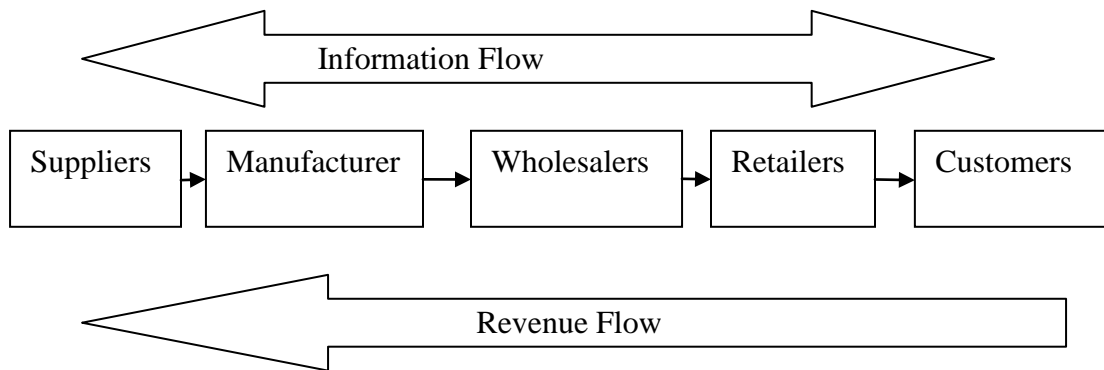


Figure: 1.1 Schematic diagram of a Supply Chain within the total Supply Chain network.

Figure 1.1 depicts a generic supply chain. It is shown within the context of what is usually referred to as a 'total Supply Chain network'. In such a network, each firm belongs to at least one supply chain; i.e. it usually has multiple suppliers and customers. A milk producer, for instance, obtains inputs such as feeds and veterinary medicines from a number of different suppliers. He or she delivers milk to one or more processors, who in turn, distribute the processed products through one or more retail outlets. One traditional view of a Supply Chain is the so-called 'cycle view'. In this view, the processes in a Supply Chain are divided into a series of cycles, each performed at the interface between two successive stages. Each cycle is decoupled from other cycles via an inventory, so it can

function independently, optimize its own processes and is not hindered by 'problems' in other cycles. As an example, we may think of a cycle where retailer inventories are replenished by delivering products from a processor's end-product inventory. Another cycle takes care of replenishing the processor's inventory, by the production of new end-products. A cycle view of the Supply Chain clearly defines the processes involved and the owners of each process and their roles and their responsibilities. Although this might seem a satisfactory situation, the next section will discuss some negative effects from a Supply Chain perspective.

1.3 What is logistics?

According to the Council of Logistics Management, logistics is a part of SCM process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point-of-origin to the point-of-consumption in order to satisfy the customers' requirements and satisfies the requirements imposed by other stakeholders.

(Cooper et al., 1997) Included in this definition the aspects such as customer service, transportation, storage, plant site selection, inventory control, order processing, distribution, procurement, materials handling, return goods handling and demand forecasting. In addition, aspects of new product development, such as packaging design variations and associated product labels are also important.

Historically, logistics has been considered an issue deserving modest priority in organizations. Earlier it was regarded as a cost component but nowadays' it is seen as a value-adding component that directly supports the primary objective of the organization; being competitive in terms of high customer service levels. It also enables competitive price, quality and compliance with rules and regulations, in order to satisfy exclusive qualitative information and service requirements of consumers and other stakeholders of the supply chain.

1.4 Green Logistics

Environmental issues affect numerous logistical decisions throughout the value chain. Firms that exhibit more intense commitment to environmentalism than their peers augment use of these universal strategies with various specialized thrusts, such as environmental audits. There is little input that environmental issues have become an important consideration for many business organizations in recent years, with some corporate executives having referred to the 1990s as the "decade of the environment." Many companies are designing and developing their products to be more eco-friendly, and many are using more environmentally friendly packaging materials. Estimates of the current environmental, or green, market range upwards of \$200 billion. While there is a burgeoning body of literature involving environmental issues in other business disciplines such as marketing, the corresponding literature involving logistics has been characterized as "small but expanding."

Spurring this expansion is the recognition by a number of researchers, such as Lambert et al. (2011) as well as Murphy & Poist (2000). They represent that environmental issues will be one of the major challenges facing logistics and supply chain management in the near future. Such recognition tends to confirm the view that environmentalism has "come of age" as a major topic in logistics and no longer can be regarded as simply a peripheral concern or fad.

Wu and Dunn demonstrate that environmental issues can impact numerous logistical decisions, including the procurement of raw materials, inbound logistics, and outbound logistics, throughout the value chain. With respect to the procurement of raw materials, some organizations are specifying their vendors to meet certain types of environmental norms. In fact, the International Standards Organization (ISO) has developed an international environmental standard known as ISO 14000, which is to be applied to vendors worldwide.

Many companies today such as; Xerox, Eastman Kodak, Mobil, Hewlett Packard, Sears, and Home Depot are taking a proactive value-seeking approach to reverse logistics. They have launched reverse logistics programs, which offer benefits such as tightened inventory management, reduced costs and better cost control, enhanced revenues and customer service, better data regarding the RL process, and improved public image.

1.5 Supply Chain Decisions

Successful supply chain execution needs to take major decisions regarding the flow of product, information, and revenue. These decisions are directed to harvest supply chain surpluses to compete with competitors beating the uncertainties and risks. These decisions can be classified under three categories depending on the frequency and duration of supply chain phase (Chopra et al., 2010). These are discussed as follow:

1. Design of Supply Chain Strategy: The supply chain strategists majorly focus on supply chain structure that may last for several years. The major decisions are taken regarding structure of supply chain, in-house or outsourcing of business activities, plant or warehouse locations, modes of transportations, capacity management, production planning, and target markets to serve. These are generally strategic decisions taken by the top levels of management. Companies build plants and warehouses to cater different market keeping in mind competitive priorities. For example the import tariff of iPhone to India was higher as compared to producing in India. This compelled Apple to produce iPhones in India. Also, TATA has build NANO manufacturing plant in Singur in 2007 and pulled plant out of it to Gujarat due to agitation and unrest in 2008.

2. Supply chain planning: Supply chain planning focuses of demand/supply matches for delivery of goods and services with emphasis on flow of products/services, information and revenues to meet real time customer commitments. The major responsibilities include demand planning, supply

planning, production planning, sales & operations planning. The markets or the customers to be served are kept in mind by incorporating flexibility in the supply chain operations, time horizons, and efficient and effective operations policies. For example during COVID-19 pandemic many pharmaceutical companies have incorporated flexibility to produce new medicines and surgical equipments to serve patients immediately. Also, newly launch vehicles plan time horizons to serve customers.

3. Execution of supply chain operations: During this phase companies focus on customer orders by fixing supply chain policies decided in the previous phase. The major emphasis is on inventory planning, warehousing, production schedules, resources allocation and delivery management. During this phase the major focus is on the reducing delivery uncertainty. For example during festival seasons companies produce products and provide services as per forecasted demand to better serve customers.

1.6 SUMMARY

Supply chain management is concerned with sending the right product at the right time at the right place with minimum cost. The major role regarding movement of goods and services is taken care by logistics. The logistics serves the inbound and outbound business requirements. The in-bound logistics serves and internal or in-house business transportation requirements while out-bound logistics connects with suppliers, customers and markets. As logistics consumes major costs, managers lay special emphasis on it. Also the globalization and liberalization of the economies promoted the flow of goods and services across national boundaries resulting extant pollution. Sensing the needs of people, planet and profit for sustainability, green logistics focuses on minimizing the waste to save environment and cost. To meet all ends the supply chain decisions play major roles. These majorly focus on design of supply chain strategy, supply chain planning, and supply chain operations. These decisions are taken at the strategic, operational, and tactical levels to remain competitive in the business.

Practical Questions:

1. Define supply chain management. What is the difference between logistics and supply chain management?
2. What is green logistics? Explain with suitable examples.
3. Consider an automobile manufacturing company in India and identify supply chain decisions taken at the various managerial levels.
4. In what ways supply chain flows affect success or failure of a company? Explain it with the help of suitable examples.
5. What is a logistics strategy? Explain logistics strategy of Apple in details.
6. List out the strategic, planning, and operational decisions that a pharmaceutical

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Strategic Supply Chains

Structure:

2.1 SCM strategy

2.2 Types of supply chains

2.3 Bullwhip effect

2.4 The Beer game

2.5 Causes of bullwhip effect and its potential solution

2.6 Supply chain management and its benefits

2.7 Summary

References

Objectives: In this an attempt has been made to understand supply chain strategy and its benefits, supply chain classification, bullwhip effect and its causes.

2.1 SCM Strategy

Intense market competition forced the companies to think strategically. This strategic thinking includes; setting of goals and objectives, offering more product variety, design and configuration of policies and procedures for competitive position in the market, and choice of appropriate level of scope and diversity. This led the organizations to develop and maintain competing supply chains in terms of availability of the right product, at the right time, to the right place/person and at the minimum cost. Executing successful supply chain strategies really translate into choosing and implementing the right mix of elements. It is a

verifiable reality that the level of complexity of the present systems in the scope of Defense is increasing progressively because of the appearance of new technologies in an environment that changes continuously. The time taken since the identification of an operative need to the development of a new system is longer, and the costs associated to the development, production, use and support to the operation of the systems increase progressively. In summary, there is a set of factors that constitute a challenge in the present environment at the time to conceive and obtain the new systems. From the economic point of view, we find out that the costs generated throughout the life cycle of the systems are completely unknown. In many systems, the design and development costs are relatively well known; nevertheless, this is not the case for the maintenance and operation support costs. Additionally, we find out that a great part of the life cycle cost foreseen for a certain system is consequence of the decisions taken during the phases of preliminary planning and conceptual design of it. The following guidelines shall help to evolve a supply chain strategy:

- **Strategic Planning:** Many organizations have developed proper guidelines for strategic planning of various supply chain elements. These strategic components may include; inbound logistics, outbound logistics, market forces etc. Strategically aligning these components in the competition shall to the organizational benefits.
- **Strategic Upgradation:** The organizations should upgrade themselves to face the market competition e.g. technological Upgradation of Indian Railway has led from losses to profits, communication sector Upgradation has added very large number of customers in the Indian market.

2.2 Types of Supply Chains

A simple supply chain consists of three components; i.e. supplier, manufacturer and consumer. As the complexity increases the more number of suppliers, distributors, wholesalers and retailers are introduced. Some of the important types of supply chains (Chopra et al., 2010) are as follow:

1. **Arm's length supply chains:** These supply chains imparts close competitive setting of seller and buyer. The examples may include; competitive bidding, tenders and share trading.
2. **Partnership Supply Chains:** These are the supply chains where all the supply chain components work as a team to achieve the common goal. The examples may include; organized retailing.
3. **Lean supply chains:** Here the focus is on minimizing the waste and these chains are competitive in nature. The examples may include Toyota and General Motors.
4. **Virtual Supply chains:** These supply chains widely use internet connectivity in the virtual space for more speed the close contact with the customers. The example may include; Amacon.com for selling books and Dell Computers.
5. **Agile supply chains:** These supply chains are generally used for specialty items need fast delivery. The company has follows agile model to charge premium prices.
6. **Custom-configured supply chains:** These supply chains are combination of agile and continuous flow supply chains generally used for prototype designs or unique products in small quantities.

2.3 The Bullwhip Effect

Supply chain coordination among all the stages can improve total supply chain profits and smooth flow of various activities. A lack of coordination may occur either because of conflicting objectives and delayed or distorted information. As a result at each stage the stage holder tries to maximize his profits and takes actions that may distort the supply chain profits. Many companies today observed the bullwhip effect due to distorted information. It is defined as the

fluctuation in order increase as they move up the supply chain from retailer to the wholesalers to manufacturers to suppliers. This affects the supply chain performance in the following ways (Chopra et al., 2010):

1. **Increase in inventory cost:** The distorted information caused by bullwhip effect adds to the inventory and hence results in more warehousing cost and other costs associated with it.
2. **Increase in transportation cost:** The bullwhip effect increases the transportation cost in the supply chain. This is due to excessive and fluctuating demands for raw material as well as for finished goods.
3. **Increase in the manufacturing cost:** This effect adds to the manufacturing pressure and as result of over production the high level fatigue and dissatisfaction occurs among supply chain actors.
4. **Increases the replenishment time:** This effect increases the replenishment lead time in the supply chains. The increased variability due to bullwhip effect makes it difficult to compare with the situation of level demand and hence adds to the replenishment time.
5. **Product availability level:** The bullwhip effect adversely impacts the product availability due to fluctuation in demand and supply. The lower availability level of products at the retailer results in lost sale and goodwill loss.

2.4 The Beer Game

To illustrate the challenges and complexities of managing a supply chain, the 'Beer Distribution Game' is used here as an example. This is a classical management game is developed at the prestigious Massachusetts Sloan School of Management in the USA. Managers and students are provided with an insight into the consequences of managerial actions taken independently by the actors of the successive stages of a supply chain. It provides an effective means of illustrating the impact of a Supply Chain view on overall systems performance

and it is often referred to in SCM literature as the starting point of Supply Chain research. The Beer Distribution Game is a role-playing game in which the participants are expected to minimize the costs of a supply chain by managing inventory levels in a number of production and distribution operations associated with different chain stages (Chopra et al., 2010). The schematic diagram for Beer Game is shown below in Fig 2.1

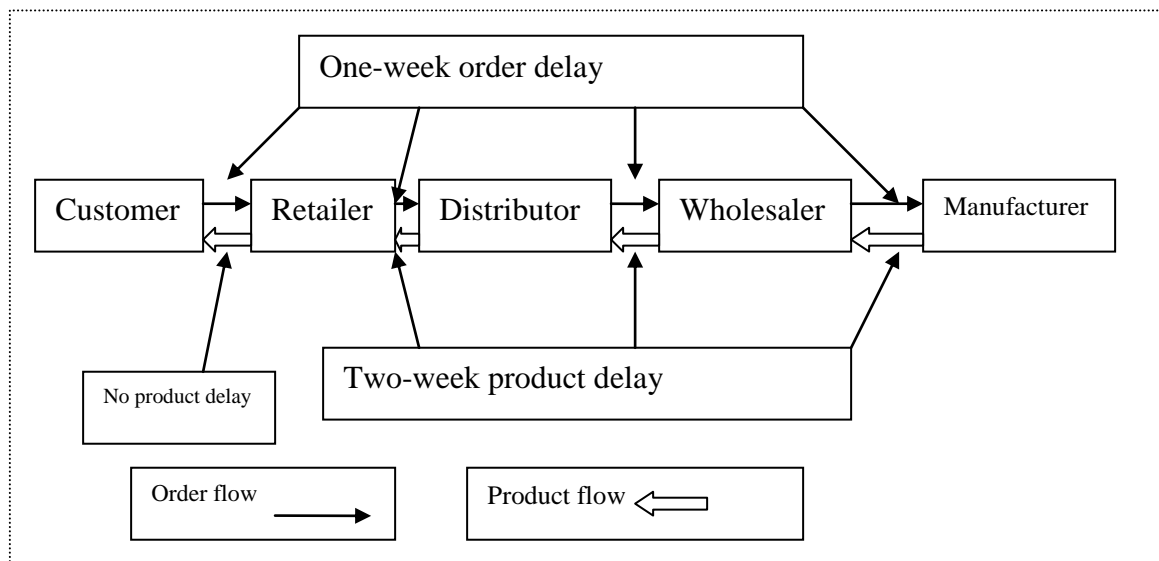


Fig 2 .1 The Beer Game Supply Chain

The game consists of four supply chain stages: producer, distributor, wholesaler and retailer. Players are assigned to each of the different stages. At the beginning of the game, each stage has its own small buffer stock of beer to protect it against random fluctuations in final consumption. A player needs to fill the orders received from his or her direct customer and then decide how much needs to be ordered from his or her supplier. The game is designed so that each stage has good local information (customer orders and inventory levels), but severely limited global (chain) information about inventory levels and orders of other actors in the chain. It represents the 'cycle view' just presented previously. This means that only the retailer knows real consumer demand. In the game, it takes two weeks for an order to reach the supplier and two weeks for the supplier

to ship the requested amount of beer from one stage to the next. It is not possible to cancel orders. Stock-out costs (i.e. having no stock, which can lead to loss of customers) are considered twice as high as the weekly.

2.5 Causes of the Bullwhip Effect and its Potential Solution

The problem that is predicted in the beer distribution game is commonly observed in real life. It is not caused by external factors, e.g. consumer demand, but created by the independent actors within the supply chains themselves. The main causes are the perceived demand, the quantum of information and the inherent delays that are observed within the supply chain. To sum-up, the lack of adequate coordination among chain actors is directly concerned with poor chain performance. In this game, as in many real life cases, there is no timely information on fluctuations in demand and one has to deal with a long lead time between placing an order and receiving the products. Due to this long lead time, the reaction time is also too long; in the game it takes over four weeks to respond to sudden changes in demand. This leads to 'misperceptions of feedback', i.e. people tend to disregard the inventory in the pipeline they ordered earlier and keep on placing more orders. Several redesign strategies are proposed to reduce the problem of demand amplification and improve supply chain performance (Chopra et al., 2010). In one way or another, they all show the importance of better coordination:

- Eliminate all the time delays in receiving goods and information flows from the supply chain; this can be achieved by better planning, use of efficient ICT and improved logistics.
- Exchange information concerning exact market demand with parties upstream in the supply chain. Hence again, ICT and collaboration among chain partners are important issues.
- Remove one or more intermediate echelons in the supply chain by business take-over. This is called as vertical integration; where activities in one stage (e.g.

production) are absorbed by another (e.g. processing) is an example of this strategy.

- Improve the decision rules at each stage of the supply chain to modify the order quantity procedures or their parameters using information from the supply chain. Chain partners can develop contracts to establish parameters, standards or procedures to facilitate and streamline their transactions.

Current research shows that the 'bullwhip effect' is present in all types of supply chains (food, health, insurance, and so on). Current designs of supply chains are still causing inefficiencies and inflexibility. To improve supply chain performance, a new way of managing the supply chain is required that should focus on the alignment of supply chain processes, i.e. SCM.

2.6 Supply Chain Management and its Benefits

Managing supply chains requires an integral approach where supply chain partners work together to plan and control the flow of goods, information, technology and capital from 'farm to fork'. It means managing supply from the suppliers of goods and services to the final consumers and vice-versa. In order to react effectively and quickly to the customer demand, supply chain management shall be made customer-oriented. The major aim here is coordinating production processes (Lambert and Cooper 2000, Handfield and Nichols 1999) to produce products and services as per demand. Efficient and effective supply chain management shall result in lower transaction costs and increased profits. Demand satisfaction is a multi-disciplinary approach based on sustainable trade relations. These trade relations are based on supply chain partnerships based on interdependence, trust, open communication and mutual gains. The major advantages of supply chain management are discussed as follows:

- Reduction of losses in transportation, handling and storage.
- Potential increase in sales.
- Increased customer satisfaction.
- Dissemination of technology, advanced techniques, capital and

knowledge among the supply chain partners.

- Better information about flow of products, markets, and technologies.
- Supply chain transaction transparency.
- Tracking and tracing supply chain flows.
- Better control of product quality and delivery.
- Ensuring safety and security of supply chain flows.
- Sharing risks and uncertainties among supply chain partners.
- Optimising distributions.
- Efficient and effective use of organizational resources.

2.7 Summary: The supply chain management has emerged as a competitive strategy now a days'. Gone have the days when focus was made on mass manufacturing only. To compete in this competitive environment the selection of appropriate supply chain strategy is important. The knowledge of competitive supply chain strategy and role of quality information is important to survive.

Practical Question:

- 1. What is supply chain strategy ? Discuss in details with the help of suitable examples.**
- 2. How would you characterize competitive strategy of cold drinks produced at Coca-Cola company? What are the key customer need that Coca-Cola aims to fulfill?**
- 3. Give arguments to support the statement that TATA has achieved very good strategic fit between its competitive and supply chain strategies.**

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SCM Tools and Techniques

Structure:

3.1 Supply chain management tools

3.2 Critical success factors for supply chain management

3.3 Summary

References

Objective: The knowledge component of this chapter shall help the students to know:

- 1. Supply chain management tools and their selection for a particular chain**
- 2. Supply chain success factors**

3.1 Supply Chain Management Tools

A range of new supply chain management tools have been developed over the past decade. Efficient consumer response (ECR) has been used to increase the consumer/customer orientation and cost saving in supply chains (Kurt Salmon Associates, 1993). Many management systems have been implemented to; improve logistics, effective use of information and communications technologies and boost quality management (Lambert and Cooper, 2000). Safety concerns have led to the development of 'integral chain-care' tools as; social accountability, better SCM practices, total quality management, and JIT. Implementation of such tools throughout a cross-border supply chain enables chain partners to ensure the quality and safety of their products and guarantees socially acceptable chain. Supermarkets in many countries, for example, have initiated total quality management programs and rules for perishables like fresh

fish and meat. Retailers (e.g., Walmart, Carrefour, Reliance, Tesco and Birla) have increasingly established their own quality standards, which suppliers must meet. Product tracking and tracing systems are used to certify the quality of products and ensure transparency in the flow of goods throughout the supply chain. Implementing such standards and systems impacts not only the organization of supply chains, but also financial aspects of chain cooperation (Chael et al., 2001). Some tools and techniques used for developing effective supply chains are as hereunder:

1. Radio frequency identification (RFID): This electronic device is used by many retail organizations to automatically identify the products using bar codes and to record the transactions.
2. Soft wares: Many types of software are used to automatize the supply chains. The examples include i2, oracle, Idea.
3. Use of Internet: Internet is widely used nowadays' for business transactions. The successful examples include; amazon.com, and dell.com.
4. Use of Operations Research techniques: Many operations research techniques are used are; vehicle routing, sequencing, network design, scheduling and inventory management, dynamic programming etc.
5. Efficient Consumer Response: This technique is widely used nowadays' for maintaining customer loyalty.
6. Coordination, Collaboration and Integration: These techniques help the players to act as true supply chain partners to target the common goal.

3.2 Critical Success Factors for Supply Chain Management

SCM is to a large extent still only a target, despite considerable efforts by organizations and their customers and suppliers. Lack of visibility of true consumer demand and collaborative relationships based upon joint decision-making remain significant barriers to the goal of supply chain integration (Barratt and Oliveira, 2001). den Ouden et al. (1996) add two basic qualifiers for partner selection: strategic complementarities referring to the degree of compatibility of

the partners' assets, competencies, goals and strategies; and cultural congruence, referring to the degree of congruence of the partners' beliefs, value systems and norms. Many other barriers to the implementation of SCM may include; lack of trust and sharing information, individual targets, scalability and getting critical mass and insufficient information technology to share relevant data within the supply chains. The management literature needs to relate the definition of true partnership, which requires certain symmetry in power. Organizations often try to weaken a supplier or customer to ensure their own control on profits. This is understandable that shared power will lose bargaining power of the main organization - and therefore the ability to control profits - as suppliers or customers gain strength. Naturally, such companies tend to share very little information and consequently managers often lack knowledge of the activities elsewhere along the value-added chain. The trading partners should enable the implementation of SCM to develop an adequate environment founded on two aspects i.e. trust and technology. Such concepts can be considered to be mutually dependent, in that the development of information technology interfaces between trading partners cannot be completed without the development of trust between the trading partners. Developing trust is a long-term objective for organizations, although it must start somewhere. Barratt and Oliveira (2001) and many other researchers suggest a possible approach:

1. Define single point of contact for each trading partner; this ensures that the information is neither lost nor deteriorates during its flow between the trading partners.
2. Define agenda for collaboration (short-medium-long term); stabilizing the collaborative goals across the time.
3. Expand collaborative projects (scope and complexity); to gain critical mass the initiative must expand its scope and complexity across time.

4. Ensure continuous sharing of information; the need to keep continuous information flow is paramount.

5. Trust development: a real trust-based relationship shall prevail only after a relatively long period. Meanwhile, small barriers are eliminated from the path, which brings mutual confidence in the trading partners that their long-term vision.

6. Increased Collaboration: This shall increase the number of processes, products, and the level of detail and/or add trading partners. Because each relationship has its own set of motivational factors driving its development as well as its own unique operating environment.

7. Participative management style: Falconer and Hodgett (1999) have noted that as organizations face a requirement to become more agile, the role and techniques of human resource management will also need to be reviewed. Lancioni et al., (2000) supports this view by highlighting the need for coordination within companies seeking to be more agile. He points at the fact that agility will largely be a function of the ability of disparate functions to cooperate by working as teams with common goals. A participative management helps to understand the supply chain problems and to provide amicable solution for the same.

8. Computer-based technologies: The role of technology in facilitating agility has received significant support in theory. Schönsleben, (2007), states that agile companies compete through increased levels of "knowledge and competency", allowing them to broadly implement information technology. Bovel and Martha (2000), in quoting a 1999 survey by Mercer Management Consulting, indicate that the use of information technologies was a major indicator of supply chain management best practice, particularly if employed to connect customers, suppliers and value adding activities. This view is supported widely in the

literature (Lee and Billington,, 1995; Davis and O'Sullivan, 1999; Cachon and Fisher, 2000; Kaufman et al., 2000).

9. Resource management: The inventory management and production planning are central to the aspiring agile company. Flexibility of both process and product are pre-requisites for being nimble and responsive to changing market needs. Organizations have used many different methodologies to optimize the use of their resources (e.g. MRP, ERP, JIT, etc.). Tan et al. (1999) have noted that many organizations have gone beyond merely using resource management systems (ERP, etc.) for their own internal control and application requirements. Involving suppliers and customers in resource management decisions through the use of supplier scheduling and other vendor managed inventory (VMI) type practices has become a cornerstone of many supply chain management initiatives.

10. Continuous improvement enablers: Supply chain performance will be highly dynamic given the interdependencies that are being managed, and the partnerships that are encouraged. The need for a continuous improvement focus when trying to reengineer these complex relationships has been widely recognized by many authors (Lamming, 1996; Cohen et al., 2000; Handfield et al., 2000; Lancioni, 2000).

11. Supplier relations: The supplier relations in striving toward an agile supply chain have also received considerable support in the literature. Christopher (2000) quoted that confederations of partners linked into networks is a primary ingredient of agility.

12. Agile vs. lean decisions: The issues of leanness versus agility as a business characteristic have been argued from the two distinct concepts that should not be confused. Christopher (2000) makes the point that some organizations that are "lean" in their operations are far away from "agile" in their supply chain. Some

authors observe that the two models need to be balanced, rather than “traded off” (Slack, 1991), or that their relevance has more to do with the intensity of the requirement for ongoing innovation (Lamming et al., 2000). Magretta and Dell (1998) use case study evidence from Dell Computers to show that these two aspects are being combined successfully. Either way, it was decided to include these variables in order to test their relative importance in both “more agile” and “less agile” companies.

13. Technology utilization: Much of the literature focuses on the implementation of new and emerging technologies as a means of building an “agile” capability. It may be noted that a better alternative for some companies lies in the best application and use of existing technologies. Many organizations have gained competitive edge by using latest technologies. The examples may include in communication industry where latest technology products outperform the inferior technology products.

3.3 Summary: SCM is to a large extent still only a target, despite considerable efforts by organizations and their customers and suppliers. Lack of visibility of true consumer demand and collaborative relationships based upon joint decision-making remain significant barriers to the goal of supply chain integration. For successful SCM it is desirable to use JIT, TQM, ECR, CPFR etc along with the potential softwares to survive.

Practical Questions:

1. What are the critical success factors for supply chains?
2. Survey any industries in your locality using softwares for managing supply chain.
3. Imagine your warehouse runs out of stock. What would you do?
4. What are some important skills for being successful in supply chain management?

5. Imagine there is an unexpected delay for a shipment arriving at your warehouse. What would you do?

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Factors affecting Supply Chain Performance

Structure:

4.1 Introduction

4.2 Factors affecting supply chain performance

4.3 Summary

Reference

Objectives: This chapter shall help the students to know the factors affecting supply chain performance so as to adopt a competitive strategy.

4.1 Introduction

Perfect competition in today's global markets and the heightened expectations of customers have forced business enterprises to focus attention on, factors affecting performance of supply chains. Organised retailing in the last decade has emerged as one of the sunrise industry in India. The boom in the sector started after 1991 after liberalization. The retailing in India has received global recognition and attention. The global players like Wal-Mart, Tesco and Metro group are eying to capture the Indian market but the domestic players like Reliance, Aditya Birla, KK Modi, Tata Trent and Bharti group are at the good stage to develop organized retailing. While the need for increased efficiency in enterprise operations persists, modern management thinking advocates the collaboration among business partners and the responsiveness to client needs as additional thrusts towards a successful competitive strategy based on key performance indicators.

It is within this context that Supply Chain Management (SCM) has become part of the senior management agenda in western countries. The term “supply chain management” arose in the late 1980s and came into widespread use in 1990s. Prior to that time businesses used terms such as “logistics” and “operations management” instead. According to Stock & Lambert (2001), “Supply chain integrates the key business processes of an organisation from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders”. More recently, interest in SCM has also been growing in the agriculture retailing industry, both in developed and developing countries. Just as their counterparts in manufacturing and retailing, executives of agrifood enterprises are becoming aware that successful coordination, integration and management of key business processes across members of their supply chains will ultimately determine their competitive success. Moreover, agri-retailing businesses increasingly realize that they no longer compete as solely autonomous entities. Instead, competition occurs more and more among entire supply chains.

4.2 Factors affecting Supply Chain Performance

4.2.1. Flexibility

Flexibility refers to the firm’s ability to rapidly design and implement new services for its customers. Slack (1983) defined flexibility as “The range of state a system can adopt, the cost of moving from one state to another, and the time which is necessary to move from one state to another”. Organisations typically compete along several competitive dimensions like cost, quality, delivery, flexibility, cycle time etc. (Wheelwright, 1994, Porter, 1999) in today’s hyper-competitive and unpredictable dynamic environment (Brown and Eisenhardt, 1998). Flexibility helps the customer service in sending right product at right time at the right place at the right price at the right information.

4. 2. 2 Agility

Fast technological advances, reduced product life cycles, increased demand for variety and increased market uncertainty has led the organisations to cope with the speed of change by making use of agility. Zhang et al. (2002) defined agility as, “The ability to cope with unexpected challenges, to survive unprecedented threats of business environment, and to take advantage of changes as opportunities”. Goldman et al.(1994) defined agile organisation as, “Dynamic and having the potential to achieve a competitive advantage...To be dynamic, an organization’s competitive strategy focuses on knowledge development and flexible processes that enable it to respond to these changing circumstances” . Agility is all about customer responsiveness and mastering market turbulence (van Hoek *et al.* 2001) and it is regarded as an essential ingredient to improve competitiveness (Yusef *et al.*1999).

4.2. 3 Demand Visibility

A wide variety of investigations regarding the impact of increased demand visibility has already shown its positive effects on supply chain performance. Many investigations (Stank *et al.*1999; Lee *et al.*2000, Lambert and Cooper 2000, Lin *et al.*2002) concluded that increasing demand visibility as to share information among all echelons of a supply chain should remarkably diminish these inefficiencies and thus lead to smoother production, lower inventories, less delayed deliveries and lower service level gaps. Cachon and Fisher(2000) identified a lack of unflawed demand information as the major cause of inefficiencies and delays within delivery and production scheduling. Lee *et al.* (2000) study shows that incorporating shared information into decision making can lead to reduced inventories and reduced supply chain costs.

4.2. 5 Collaborative Planning

Kenneth *et al.* (2005) showed that the effective collaborative planning efforts were associated with significant improvement in supplier quality, responsiveness, and delivery performance, as well as inventory turnover and material cost. The results also provide valuable insights into some of the antecedents of effective collaborative

planning. These include both objectives (i.e. information quality) and behavioral (i.e. trust) elements. Collaboration between supply chain partners strongly impact supply chain performance (Prahinski and Benton 2004; Vakharia 2002). The increased collaboration among supply chain participants leads to lower cost, enhanced performance (Daugherty and Keller 2000) and competitive advantage (Simatupang and Sridharan 2005). Collaborative practices within UK retail industry reduced demand amplification and costs (Ireland and Bruce 2000).

4.2. 6 Coordination

Shipment coordination has been a subject of research in the past (Silver *et al.* 1998). Thomas and Griffin (1996) pointed out that companies have an opportunity to reduce operating cost by coordinating the planning of the three fundamental stages of the supply chain, procurement, production and distribution. They review the literature addressing coordinated planning between two or more stages of the supply chain and emphasize that firms can reduce operating cost by coordinating plans of production and ordering. Coordinated replenishments can help to reduce the inventory and order costs (Federgruen *et al.* 1984 and Atkins and Ivogun 1988) as well as transportation costs (Reinman *et al.*1999). Kumar *et al.* (1995) quantified the inventory benefits of having the allocation of stocks to customers be postponed until arrival to the customers. Kirstin Zimmer (2002) showed that coordination mechanism ensures the decentralized system to perform well as a centralized one.

4.2. 7 Integration

A company's supply chain divide an organisation into a sequence of primary activities, inbound logistics, outbound logistics, marketing, sale and service, along with primary and secondary support activities (Porter 1985).Supply chain management integrates these activities to provide value added products and services to the customers. This is possible by reducing uncertainties such as, demand, delivery time, quality and competition in the supply chain. The reason for these uncertainties is poor, insufficient and inaccurate flow of information. Porter and Millar (1985) pointed that the diffusion

of IT into the activities of the supply chain amplifies its value-creating potential. Information technology (IT) offers the potential to enhance information-sharing function between buyers and sellers firms by improving accuracy, speed and simplification of data. Supply chain management based on the need for coordination between supply chain partners has been particularly impacted by the growth and development of information technology (Prahinski and Benton 2004).

4.2.8 Supplier Relationship

Supplier partnerships and strategic alliance represents the relationship between organisations and their upstream suppliers and downstream customers. In today's competitive environment many firms have taken bold steps to break inter and intra firm barriers to form alliances. These alliances increased the financial and operational performance of each channel through reduction in total cost, inventories and increased sharing of information (Maloni and Benton 1997). Larson and Kulchitsky (2000) found that closer relationship between buyer and supplier firm is associated with better delivery performance by supplier. Information can be more readily shared and knowledge identified, captured and disseminated throughout the organizations in the chain (Mowery 1998).

4.2.9 Cycle Time

The supply function established itself as a strategic contributor ,often driving competitive advantage through improvements to cycle times, quality, service, price and total cost .Hult *et al.* (2004) explained, order cycle time as the time between taking an order and delivery of needed product to the customer. Cycle time is the emerging performance criteria for purchasing and supply chain management. It balances the suppliers' and customers' demand by maintaining reasonable inventory levels. Cycle time is a key metric for assessing supply chain functioning (Nichols *et al.* 1996).

4.2. 10 Strategic Purchasing

Purchasing plays an important role in supply chain management .It influences the firm's quality performance (Anderson *et al.* 1995), guides product innovation(Landeros and Monczka 1989), customer responsiveness and the firm's financial performance (Chen and Paulraj 2004). The cooperative behaviour with suppliers can improve supply chain performance, service to other functions and firm's competitive position (O'Toole and Donaldson 2002).

4.2. 11 Supply Network Structure

The physical SC consists of suppliers, plants, warehouses, distribution centers, and the retail outlets as well as raw materials, work in process inventory, and finished goods that flow between facilities. Network planning is the process by which the firm structures and manages the supply chain in order to: match demand and supply; find right balance between inventory; manufacturing and transportation costs. The topics of interest are the task, authority, and coordination mechanism across distinct firms or organizational units that enhance supply chain performance. Thorelli, (1986) characterized network structure by strong linkage between supply chain members and low levels of vertical integration. In addition, the lack of influence or power, personified in terms of independence is also seen as a key determinant of effective network structure. Besant (1990) indicated that there is move away from power-based relationships in which there is some hierarchical dependence, towards a network model with more sense of mutual development within a partnership.

4.2. 12 Bullwhip Effect

Gunasekaran and Sarkis (2007) found out that bullwhip effect represents the information distortion in customer demand between order to supplier and sales tom buyer. This effect in observed in traditional as well as e-commerce based situations. The longer lead time and poor selection of forecasting parameters leads to strong bullwhip effect in e-SCM. In contrast, and rather surprisingly, increased seasonality reduces the bullwhip effect. The reduction in lead time will reduce this effect.

4.2. 13 Product Variety

Thonemann and Bradley (2001) in their research study on manufacturing organisations find out that product variety increased in many industries to meet the customer's requirements. This high product variety reduced the supply chain performance. This is due to the fact that average lead time for high product variety is higher as compared to low product variety and the longer lead time deteriorates the supply chain performance. Many research studies in the field of operations management find out that product variety decreases production efficiency and increases inventory costs (Zipkin 1995). This increase in cost can be minimized by adopting JIT inventory management practices (Womack et al. 1990).

4.2. 14 Facility Location

The efficient and effective movement of goods from raw material to processing facilities, component fabrication plants, finished goods assembly plants, distribution centers, retailers and customers is critical in today's competitive environment. Approximately 10% of the gross domestic product is devoted to supply related activities (Simchi-Levi et al. 2003). Facility location decisions are to the efficient and effective operations of a supply chain. Poorly placed plants and warehouses can result in excessive costs and degraded services no matter how well inventory policies, transportation plants, and information sharing policies are revised, updated, and optimized (Marks et al. 2003).

4.2. 15 Cross-Functional Orientation

Supply chain management is concerned with the input of goods and services to create utilities for final user from procurement to end of product life. The input may include not only from the departments but also from the outside organisations. Such cross functional activities are exacerbated with the growth of globalization. This has developed the complex networks particularly across the departments and firm boundaries. This innate phenomenon in the supply chain is called as cross-functional orientation (CFO). Some researchers working on cross functions pointed that working

across functions increases conflicts (Weinrauch and Anderson,1982), slow down decisions(Cespedes 1995) and cause disharmony(Souder 1998).

4.2. 16 Culture of Competitiveness

Hult et al. (2002a), argue that a culture of competitiveness (CC) function is an intangible strategic resource that can be deployed by interaction and cooperation among supply chain members. It develops a chains approach to market by shared values and beliefs that asserts the importance of certain elements and omits others. CC is focused on three sets of cultural orientations-entrepreneurial, innovativeness, and learning. An innovativeness orientation refers to supply chain members' values associated with new generation. A learning orientation is defined as members' values associated with generation of new insights that have potential to shape supply chain activities.

4.2. 17 Price Fluctuations

The price fluctuations are one of the principal reasons for bullwhip effect and associated inefficiencies. As a result suppliers have resorted to ever day low price (EDLP). Srinagesh (2006), identified the relationship between price fluctuation, information sharing between suppliers and retailers and, supply chain performance. The study described that the price fluctuations in capacitated supply chains with information sharing can lead to improved supply chain performance Sriganagesh (2005). Munson and Rosenblatt (2001) explore the benefits of using quantity discounts in a three level supply chain and showed that savings can be significant. However no researcher directly looked at the direct impact of price fluctuations on the supply chain performance.

4.2. 18 Environmental Uncertainty

Uncertainty remained an important construct for manufacturing and service industries. The major sources of uncertainty include demand over the delivery lead time and the length of lead time. Davis (1993) suggested that there are three sources of uncertainty that plague supply chains: supplier uncertainty arising from on time delivery, average

lateness, and degree of inconsistency; Manufacturing uncertainty, arising from process performance, machine breakdown, supply chain performance, etc; and customer or demand uncertainty, arising from forecasting errors ,irregular orders, etc. Hahn et al. (1990) pointed out that the increased competition in the marketplace and increased pace for technological innovation are the two primary factors driving companies' needs for world-class suppliers and for supplier development.

4.2. 19 Customer Focus

The dynamic environment, unprecedented growth in technology and increased customer expectations has led the organisations to concentrate on customers' needs and wants. Despite the use of latest process improvement techniques and capable management, a firm's neglect of customers may lead to disaster (Kordupleski et al. 1993). Thus if, the organisations focus on customers to identify their wants, the more rewarding are the supply chain transactions (Carson et al. 1998).

4.2. 20 Top Management Support

The role of top management has been greatly emphasized in the literature of supply chain management (Krause 1999).The studies indicates that top management plays an important role by understanding the needs of SCM ; financial resources, time, commitment and manpower.

4.2. 21 Communication

Many researchers have pointed out the necessity of two way communication for successful SC working (Krause 1999). Joel et al. (2005) quoted that both formal and informal lines of communication should be set up to facilitate free flow of information. The high degree of trust, information can be customized to serve each other effectively. Lascelles and Dale (1989) also noted that poor communication was a fundamental weakness in the interface between a buying firm and its supplier, and that this undermines the buying firm's efforts to achieve increased levels of supplier performance.

4.2. 22 Information Sharing

Organisations have long been aware of the value of information sharing in supply chain management. The information consists of four stages: order information sharing; demand information sharing; inventory information sharing; shipment information sharing (So, and Tag, 2000). Seidmann and Sundrarajan (1998) classified information sharing as: order information sharing; operational information sharing; strategic information sharing; strategic and competitive information sharing. Many companies like, Dell, Cisco, Wal-Mart and P&G share information with suppliers and customers to reduce working capital and inventories (Tan et al. 2001). One important observation in supply chains is bullwhip effect. This effect is an important concern in supply chain management for many reasons like: increased order visibility; overstocking; and operating costs (Tan et al. 2001).

Lee, So, and Tang (2000) studies showed the use of shared information to improve the supplier's order quantity decisions with known autoregressive demand process.

4.2.23 Strategic Alliance

As the growth of supply chain management continues, firms must also become more adept at managing their suppliers and more willing to help their supply bases improve their production and service capabilities. Strategic alliances are cooperative arrangements between two or more firms to improve their competitive position and performance by sharing resources. Various firms realized that strategic alliances result in better penetration to the market, access to new technologies, higher return on investment and better competitive position (Hitt et al. 2000). Effective alliances can be the engine of growth and profitability (Ernst, et al. 2001). Many firms seek access to necessary resources through alliances by selecting right partners. Supply chain management is the area where firms have to explore more to survive in this competitive world.

4.3 Summary: Perfect competition in today's global markets and the heightened expectations of customers have forced business enterprises to focus attention on, factors affecting performance of supply chains these factors are; flexibility, agility,

demand visibility, collaborative planning, integration, supplier relationship, cycle time, bullwhip effect, product variety, facility location etc. The knowledge of these factors shall provide the guidelines to concentrate on them.

Practical Question:

1. What are the factors affecting supply chain performance? Explain the role of each in organized retailing.
2. Select any manufacturing industry and identify the supply chain decision variables.

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Supply chain models

Structure:

5.1 Introduction

5.2 Supply Chain Models

5.2.1 Deterministic Models

5.2.2 Stochastic Models

5.2.3 Hybrid Models

5.2.4 IT driven Models

5.2.5 Balance Scorecard

5.3 Summary

References

Objectives: This chapter shall students to understand various supply chain models.

Introduction

The term “supply chain management” coined in late 1980s and came into widespread use in 1990s. Prior to that time the terms “operations management” and “logistics” were used. Now a day the concept of SCM has received much attention in academic and business culture due to its importance to business. The academics and practitioners have not fully grasped the constituents of supply chain and their implications. They are concentrating on logistics, purchasing, distribution, and manufacturing. In reality, SCM includes all these areas and more (Tracey 2001).

Thomas and Griffin (1996) identified material and information movement between and among the facility centers. Ballou et al. (2000) pointed out transformation,

flow and integration of management activities. Zheng et al. (2000) focused on optimizing a company's internal practices and improving interaction with external suppliers and customers. Stock and Lambert (2001) suggested that SCM consists of eight business processes: customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization and returns. The Institute for Supply Chain Management (ISM) defined SCM as "the identification and management of specific supply chains that are critical to a purchasing organization's operations". Lambert and Pohlen (2001) pointed out that a meaningful supply chain performance measures do not exist that span the supply chains. It is very difficult to gain insights to increase supply chain efficiency, competitiveness and effectiveness. To face the challenge an attempt has been made to review supply chain models and performance measures.

5.2 Supply Chain Models

A model is a representation to understand the actual situation that may be used to make better decisions or simply to understand the actual situation better. In the field of manufacturing and supply chain management the situation can be classified and suitable models can be developed. Under various situations the different models can be used. In these fields the models used are as follow:-

1. Models for purchasing, procurement, and strategic sourcing.
2. Logistics models, from manufacturing to delivery.
3. Models for inventory and order management.
4. Models for sales and operational planning.
5. Advanced planning and scheduling models.
6. Models for customer relationship management.
7. Models for supplier relationship management.
8. Collaborative planning, forecasting and replenishment models.
9. Models for collaborative design and manufacturing.
10. Models for supply chain network design.

11. Models for supply chain performance measurement.

A supply chain consists of integrated system which synchronizes a series of inter-related business processes which helps: procurement of raw materials; transformation of raw materials into finished goods; value addition to the products; distribute the products among various facility centers and information exchange among various facility centers (suppliers, manufacturers, distributors, retailers, and customers). The typical supply chain management process is shown in Fig. 5.1. The typical processes covered in supply chain management are:

- Inbound logistics (Materials Management)
- Outbound logistics (Physical Distribution)
- Information flows

Materials management is concerned with procurement of raw materials, parts/components, and suppliers. It includes purchase, production planning and control, warehousing, transportation, and distribution activities. Outbound logistics is concerned with sending the right product to right place, right person, at the right time and at the minimum cost. Information flow helps to coordinate, control, integrate and collaborating the business activities.

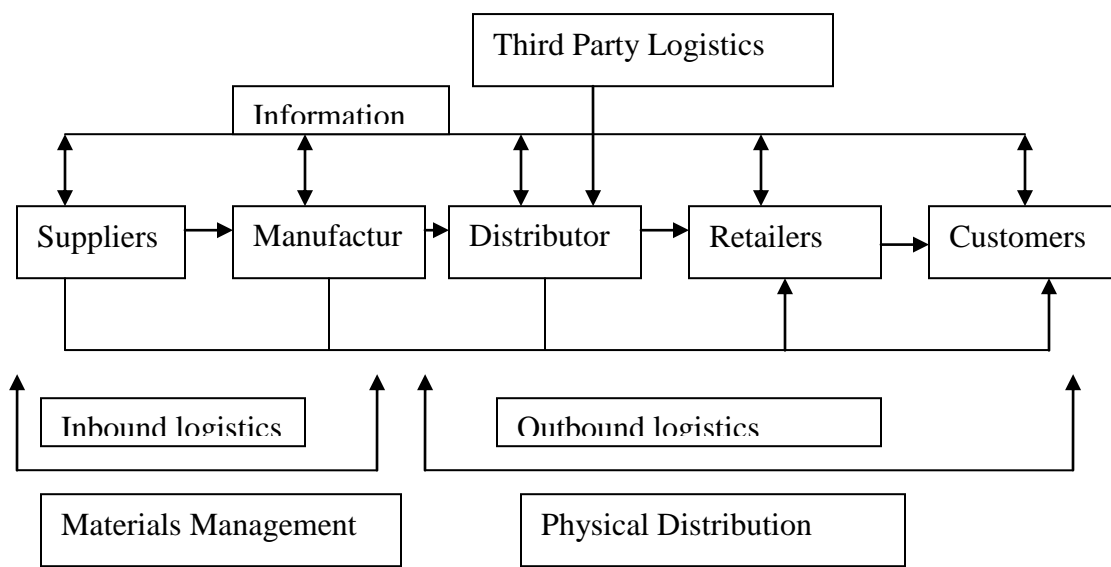


Fig.5.1 The Supply Chain Process.

The various types of supply chain models are classified as:

- Deterministic Models
- Stochastic Models
- Hybrid Models
- IT driven models

5.2.1. Deterministic Models

A deterministic model is model where the value of decision variables, the value of objective function and whether or not the constraints are satisfied is known with certainty. Glover et al. (1979) developed a computer- based network diagram for production, distribution, and inventory planning system (PDI). This model was used to integrate supply, storage/location, and customer demand planning. It increased the decision maker’s insights into supply chain connectivity. The various types of deterministic models and their uses and limitations are shown in Table 5.2.1.1 below:

Sr. No.	Researcher	Advantages of the Model	Disadvantages of the model
1.	Glover et al. (1979); PDI Model	Network bases model helps to integrate supply, storage/location and customer demand planning.	The model is confined to single period and single objective problems.
2.	Cohen and Lee (1989), Mixed integer, non-liner, value added model	Helps to coordinate the supply chain processes of sourcing, centralized production planning, and intrer-plant transshipment.	Failed to capture risk factors inherent in a global setting.
3.	Arntzen et al. (1995), Global Supply chain Model (GSCM)	It took into account the inter-dependence of production, inventory and delivery processes to minimize activity days and costs associated.	Failed to asses the risk factors in global distribution.
4.	Ashayeri and	Helps to formulate the DC	The model is confined to

	Rongen (1997), Multi-criteria solution method (ELECTRE)	repositioning strategy based on the analysis of material flows, DC locations, and throughput times.	single-period and un-capacitated problems.
5.	Melachrinoudis and Min (2000) base on physical planning.	It solves multi-objective, multi-period problems for optimal relocation site and phase-out schedule of combined manufacturing and distribution facility from supply chain perspective.	The sight selection is a typical problem as threats faced by Reliance Fresh in UP, so it could not cove all dynamic environment variables.
6.	Nozick and Turnquist (2001) an approximate inventory cost function was embedded into a fixed-charge facility location model.	The model help to solve multiple objectives (service-cost tradeoff) issues associated with location of automobile DCs.	It is confined to single period, single echelon problems with no capacity constraint.
7.	Huang and Hsu (2007) EOQ model under retailer partial trade credit policy in SC	The model helps retailers to determine optimal order policy.	The model did not incorporate more realistic assumptions, such as probabilistic demand, allowable shortages, deteriorating items, or finite replenishment rate.

Table 5.2.1.1 deterministic models

5.2.2 Stochastic Models

These models take into consideration uncertain and random elements. Midler (1969) developed a dynamic programming model based on optimal control theory for selecting an optimum combination of transportation modes, commodity flows, and re-routing of carriers from customers to suppliers over a multi-period planning horizon. Later on various models were developed and these are as shown in Table 5.2.2.1 below:-

Sr.	Researcher	Advantages of the Model	Disadvantages of the
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No.			model
1.	Midler (1969), dynamic programming model	Helps to understand optimal combination of transportation modes, commodity flows, and re-routing of carriers over a multiple-period time horizon.	It is difficult to understand and solve.
2.	Tapiero and Soliman (1972), optimal control theory.	Utilized optimal control theory to solve multi-commodity transportation, multi-regional production and inventory planning problems over time with uncertain demand.	The linear and parametric programmes are difficult to solve.
3.	Lee and Billington (1993), stochastic programme.	It helps to solve material ordering policy, the customer service level for each product, and postponement strategies.	It was difficult to solve vanilla box problems and bullwhip effect.

Table 5.2.2.1 Stochastic Models

5.2.3 Hybrid Models

Hybrid models are the combination of deterministic and stochastic models. As the inventory costs are the major component of supply chain cost, these models help to minimize the inventory costs. Baumol and Vinod (1970) introduced the most classical inventory theoretical models but that could not find the impact of under and over capacity load carrying. Their models allowed a decision maker to make tradeoff among direct shipping cost, in-transit carrying cost, ordering cost, and consignee's carrying cost. The various models and their analysis is as shown in Table 5.2.3.1 below:-

Sr. No.	Researcher	Advantages of the Model	Disadvantages of the model
1.	Das (1974)	Model can be applied to inter-model situations, can estimate the demand variability.	Only few products can be entertained
2.	Karmakar and	The model helps to solve a	Multi product problems

	Patel (1977), Decomposition approach.	single product, single period, multiple location inventory problems with stochastic demands and transshipment between locations.	could not be entertained.
3.	Herron (1983), Inventory theoretic model.	Model helps to relate the levels of customer service, frequency of expedite shipment in case of stock- outs.	Severe computational complexity prohibits its use to the real-life problems.
4.	Bookbinder et al. (1989), spread-sheet based simulation and Linear programming model.	Model helps to evaluate inventory/production alternatives and select best alternative, while making tradeoff between transportation cost and inventory investment.	Could not estimate the impact of backhauls on transportation cost.
5.	Petrovic (2001), fuzzy model framework.	Model incorporate the element of uncertain lead times during the replenishment process into fuzzy model framework, the model is useful in understanding supply chain dynamics under uncertainty.	Model is limited to periodic review of inventory systems.

Table 5.2.3.1 Hybrid Models

5.2.4 IT driven models

IT driven models are most critical drivers of supply chain success because they enhance visibility through information sharing by linking supply chain partners.

The various IT driven models are discussed as Table 5.2.4.1 below:-

Sr. No.	Researcher	Advantages of the Model	Disadvantages of the model
1.	Camm et al. (1997), combined integer programming model, GIS and DSS.	Model help to solve location and sourcing of multiple products.	DSS did not include capacity constraints.

2.	Johnston et al. (1999), stand alone GIS model	Model helps in managing and integrating multi-facility warehousing and production systems and to find near optimal storage location for stock items in multi-facility warehousing environment.	Could not help warehouse restructuring.
3.	Al-Mashari and Zairi (2000) SAP R/3 based ERP architecture	Model enables high integration and communication based on graphical user interface (GUI), application and database.	Model needs high IT skill to use

Table 5.2.4.1 IT driven Models

In addition to above classifications models can also be classified as:-

1. Descriptive Models
2. Optimization models

Descriptive models are used to better understand the functional relationships in the company and external environment. The decisions of descriptive models are input to the optimization models that analyze the decision problems to find out the optimal solution to the supply chain problems. To better understand these models are shown in the fig.5.2. below

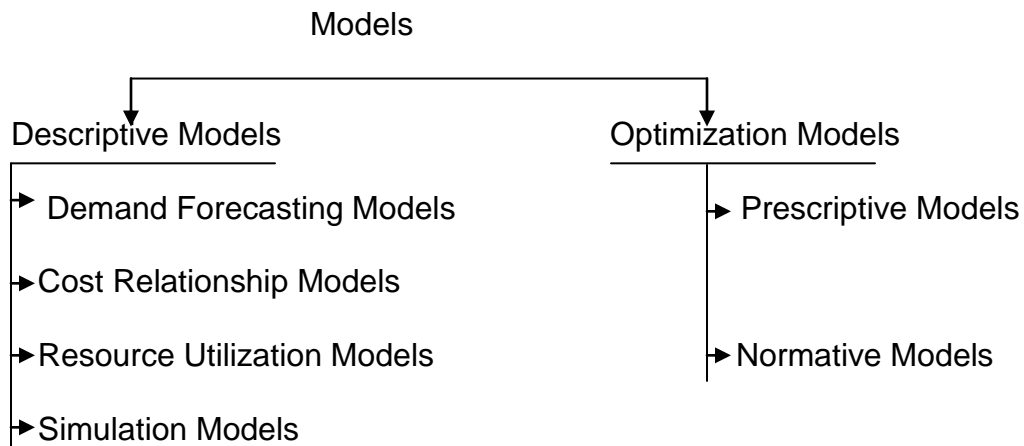


Fig 5.2 Models Classification

- Forecasting models are used to predict the demand for raw material, finished products, and other factors based on historical method. These models include; Time series models, Casual models; Judgment models and New Product models etc.
- Cost relationship models are used to predict the relationships among cost drivers, direct and indirect costs e.g. Activity–Based Costing.
- Resource utilization models are used to know the resource consumption of activities e.g. Linear Programming Models.
- Simulation models describe how all or parts of the supply chain operate over a period of time as a function of parameters and policies e.g. Determination Simulation models, Monte Carlo Simulation
- Prescriptive models are authoritative in nature and are used to prescribe the decisions.
- Normative models are used to identify norms that the company should set (Shapiro, 2007).

5.2.5 Balance Scorecard

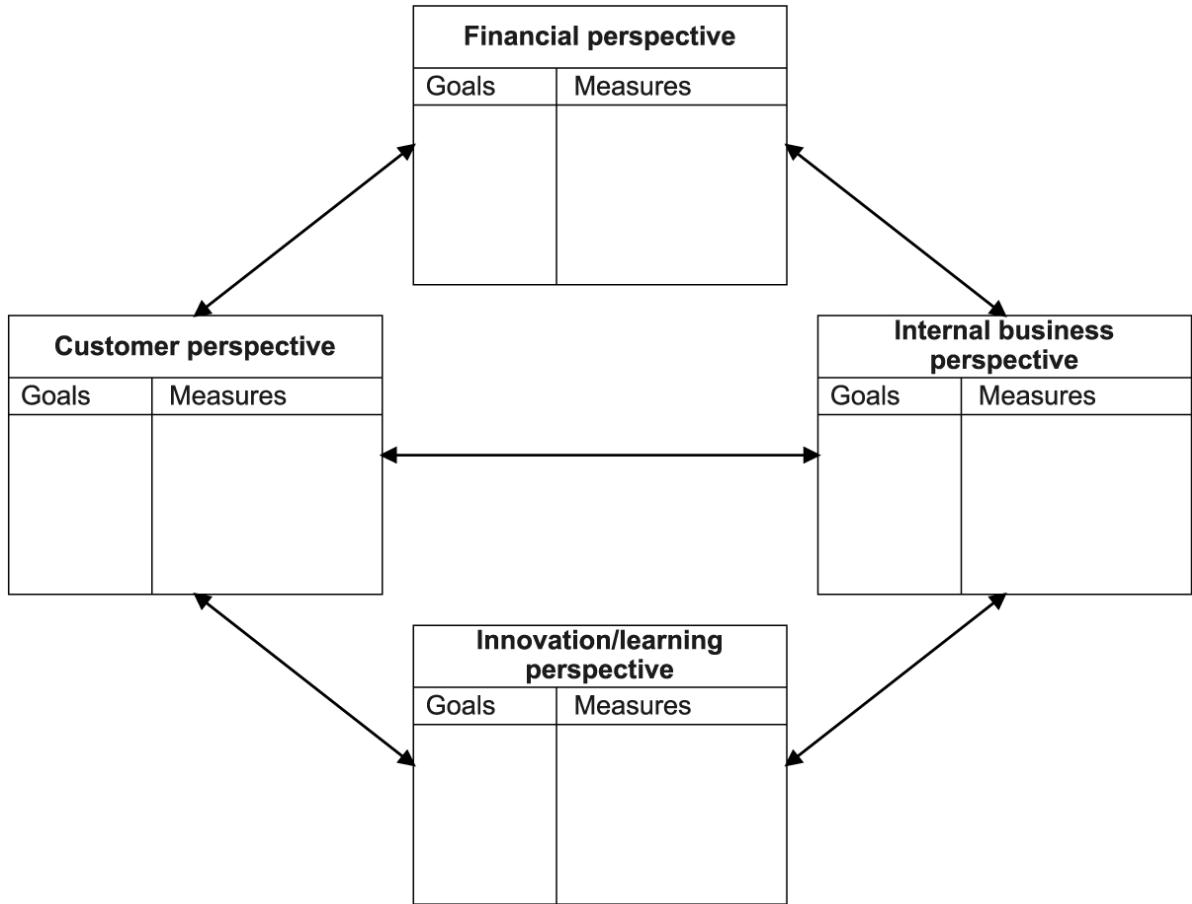
Kaplan and Norton (1992) developed the most well known PMS is the balanced scorecard system. The balanced scorecard proposes that a company should use a balanced set of measures for quick and comprehensive view of the business from four important perspectives (Figure5. 3). In turn, these perspectives provide answers to four fundamental questions:

- (1) How do we see our shareholders (financial perspective)?
- (2) What should we excel at (internal business perspective)?
- (3) How do our customers see our business (the customer perspective)?
- (4) How can we continue to improve and create value (innovation and learning perspective)?

The balanced scorecard includes financial performance measures giving the outcome of actions already taken. It also complements the financial performance measures with more operational non-financial performance measures, which are important future driver of financial performance. Kaplan and Norton (1992) argue that, four perspectives information is very important.

The balanced scorecard minimizes information overload by limiting the number of measures used. It also helps managers to focus on the handful of measures that are most important. According to Ghalayini et al. (1997), the main weakness of this approach is that it is just designed to provide senior managers with an overall view of performance. Thus, it is not intended for (nor is it applicable to) the factory operations level. Further, they also added that the BSC is constructed as a monitoring and controlling tool rather than an improvement tool.

Neely et al. (2000) argue that although the BSC is a valuable framework that suggests important areas in which performance measures might be useful. It provides little guidance on how to identify the best measures to be introduced and ultimately used to manage the business. They further conclude that the balanced scorecard does not consider the competitor perspective at all.



Source: Kaplan and Norton (1992)

Fig 5.3 Balance Scorecard

Summary: Supply chain models play very important role to simplify the understanding of various metrics for successful performance. These measurements are important to position the business comparative to competitors.

Practical Questions:

1. Define supply chain modeling and classify various supply chain models.
2. Select any service organization and suggest suitable supply chain performance model for the same.

3. What caused the supply chain and logistical issues to arise during COVID-19 pandemic? How did pandemic have compelled companies to model their logistics management ?
4. Are there any additional issues that consumers may face that they may not be aware of? How will the shortage of goods to retailers affect consumers shopping during the holidays? Is there anything individual consumers can do to help solve the problem?
5. What are the financial ramifications to the India and to the rest of world for supply chain issue after COVID-19?

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Product Life Cycle**Structure:****6.1 Product life cycle****6.2 Stages of product life cycle****6.3. Logistic and product life cycle****6.4 Summary****References**

Objective: This chapter shall help the students to understand product life cycle and its relationship with logistics.

6.1 Product Life Cycle

The product life cycle is defined as the stages through which product passes during its life span starting from initiation to decline. It involves all professional disciplines, and requires multifold skills, tools and processes for its successful life completion. Product life cycle (PLC) has to do with the life of a product in the market with respect to business/commercial costs and sales measures. The product life cycle asserts four things:

- 1) Limited product life.
- 2) Product passes through distinct sale stages and each stage has different challenges, opportunities, and problems to the seller.
- 3) Product profits rise and fall at different stages of product life cycle.
- 4) Each product needs different purchasing, financial, manufacturing, marketing,

and human resource strategies in each life cycle stage.

6.2 Stages of a Product Life Cycle

The important and most common product life stages are as hereunder:

1. Market introduction stage: This is a costs are high stage and faces slow sales volumes to start, little or no competition and competitive manufacturers watch for acceptance/segment growth losses. For product survival demand has to be created and customers have to be prompted to try the product. In many of the cases it makes no money at this stage.

2. Growth stage: In this stage costs reduced due to economies of scale, sales volume increases significantly, profitability begins to rise, public awareness increases and the competition begins to increase with a few new players in establishing market. This increased competition leads to price decreases.

3. Maturity stage: Here the costs are lowered as a result of production volumes increasing and experience curve effects and the sales volume peaks and market saturation is reached. The increase in competitors entering the market tends to drop price due to the proliferation of competing products. Also brand differentiation and feature diversification is emphasized to maintain or increase market share and industrial profits go down.

4. Saturation and decline stage: Here the costs become counter-optimal; sales volume decline or stabilize, prices, profitability diminish. Also profit becomes more a challenge of production/distribution efficiency than increased sales request for deviation.

6.3 Logistic and Product Life Cycle

Customer retention necessitate that everyone in the firm have the customer firmly in mind when exercising their functional duties. At the same time, functional duties are interdependent in creating value for customers. The logistic must work

together with production and marketing to plan, coordinate, control and integrate their activities. In the modern setup logistics must satisfy both the internal and external customers of the firm (Langley, C.J. Jr and Holcomb, M.C., 1992). Quite often, a company's internal functions operate like functional "silos" rather than serving each other for the customer's benefit. Logistics with production, marketing, and new product development must work together as unified processes for customer satisfaction and firm success (Zacharia & Mentzer, 2007; Morash et al, 1996; Hammer, 1990; Lynagh & Poist, 1984).

Resource dependence theory suggests that managerial decisions are influenced by those who control critical resources, both internal and external to the firm (Pfeffer and Salancik 1978) and the success of a company can derive power from the control of these important resources (Tremblay, Cote, and Balkin 2003). Logistics play an important role in many contexts, such as customer service (Langley and Holcomb 1992), product availability, time advantages, low cost distribution (Stalk, Evans, and Shulman 1992), and global manufacturing (Fawcett and Cross 1993).

Logistics, as a function, is increasingly viewed as strategically important to the firm (Zacharia and Mentzer 2004, Bienstock, Mentzer, and Bird 1997; Mentzer, Flint, and Hutt 2001). Inbound logistics, internal logistics, and outbound logistics are important processes within the firm (Srivastava, Sbervani, and Fabey 1999). Logistics within the firm base an important role in managing international suppliers and international customers (Fawcett and Closs 1993). An empirical study by Ellinger, Daugherty, and Keller (2000) found logistics is of strategic importance to the firm and affects corporate performance (customer satisfaction and overall profitability).

Logistics has become more salient in companies where logistics excellence has an impact on the company's profitability. The examples include; Dell, Nabisco, and FedEx (Mentzer and Williams 2001) and companies have used logistics as a tool to create a competitive advantage (Bowersox, Mentzer, and Speh 1995;

Morasb, Droge, and Vickery 1996). Srivastava, Sbervani, and Fahey (1999) identified three core business processes: supply chain management, customer relationship management, and new product development.

New product development researchers (Meyers and Tucker 1989; Morasb, Droge, and Vickery 1996) have identified that logistics involvement in NPD improves the performance of new projects. Also when the product life cycle times are short, as in fashion goods or electronic products like cell phones, logistics processes can make critical contributions to the time to market a new product (LaLonde and Powers 1993). Electronic durable companies like Dell, Intel, and Sony use a modular product design and automotive companies like Tata, Maruti, Toyota, Ford, and General Motors use JIT manufacturing to benefit in part from early involvement of logistics in NPD. Logistics feedback helps new product design and parts configuration, based on reliability, serviceability, shipping, handling, and installation requirements (Meyers and Tucker 1989).

NPD logistics performance is typically associated with distribution and handling of the product, such as the order fill rate, on-time delivery, and damage free delivery (Chow, Heaver, and Henriksson 1994). Logistics, by being involved in the NPD process, could help to reduce the cost and damage associated with delivering the new product. Logistics performance improves order fill rate or damage free delivery to the customers. Increasing customer satisfaction will likely lead to improvements in NPD project performance areas such as profit and speed to market product.

6.4 Summary: Product life cycle (PLC) has to do with the life of a product in the market. Successful products perform well in the market for a longer period. This success is also associated with the on time delivery of the product to the right location and to the right person. Here the logistics fills this gap for product success in the market.

Practical Question:

1. Explain product life cycle and its correlation with logistics.
2. Select any durable product and study its life cycle in the market.
3. What is product life cycle management? Explain with the help of suitable examples.
4. Discuss various product life cycle management softwares. Why business need such softwares?

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Retailing

Structure:**7.1 Introduction****7.2 Retail Players in India****7.3 Summary****References**

Objectives: This chapter shall help the students to know:

- 1. Retailing business.**
- 2. Retail business players in India.**

7.1 Introduction

Retailing is the set of activities that markets products or services to the final consumers for their own personal or household use. It may also be defined as the sale of goods and services in small quantities. Retailing industry has been present since the felt of human inability to arrange all the goods and services for their personal or non-business use. In India this industry is identified as karyana stores. These karyana stores have been in use since ages. The concept of organized retailing gained momentum in 1980 when Mother's Dairy introduced vegetables and milk at the retail outlets in New Delhi. Later on Verka, Amul, Markfed have followed the concept and created co-operative societies for seeds, pulses, milk and milk products (Neetu, 2007). The boom in organized retailing came after liberalization in 1991. According to CMIE report the retail growth

doubled from 1990 to 1999. In India there are 15 million retailers, operating in the form of 'mom pop' outlets spread over 100 million square feet area, generating sales of Rs. 50,000crore in 2007-08 (India Retail Report, 2007). The organized retailing which constitutes 2% of the retailing has come up with new formats of retailing like supermarkets, hypermarkets, malls, department stores, discount stores, specialty stores, convenience stores, kiosks and food court counters.

7.2 Retail Players in India

The organized retail accommodated many major players after 1990. There were just three shopping malls in 1990 i.e. Spencer Plaza in Chennai, Ansal Plaza in New Delhi and Cross Roads in Mumbai (Neetu, 2007). The number of retail formats has risen to many thousands by the end of 2007. The major retail players in this industry are:

7.2.1 Reliance Retail

The reliance retail is India's largest has set the target of Rs. 100,000cr (USD 22 bn) from its retail venture by 2010-11. Reliance Fresh provides fresh fruits and vegetables, staples, groceries, fresh juice bars and dairy products. The company has 17 stores in Hyderabad, 5 in Jaipur.

7.2.2 RPG Retail

The RPG was the first to enter into the business of organised retailing in India. It has added Foodworld which is a division of Spencer & Co in 1996. Later on in 1999 Foodworld was hived off as a separate company. In 1997 RPG launched Health and Glow in pharmacy and health care business. In 2003 RPG launched Music World. The group has 7 Spencer's Hyper, 90 stores across Spencer's

Super/Daily/Fresh/Express formats and 265 Music World outlets, covering about 8lac sqft retail space in March, 2007. The total retail space under Spencer's umbrella is likely to increase to 5mn sqft in the next 2-3 years.

7.2.3 Pantaloon Retail

Pantaloon Retail (India) Limited, is India's leading retailer that operates multiple retail formats in both the value and lifestyle segment of the Indian consumer market. The company operates in, over 7 million square feet of retail space, has over 1000 stores, and has felt its presence across 51 cities in India and employs over 24,000 people.

The company's leading formats include Pantaloons, a chain of fashion outlets, Big Bazaar, a uniquely Indian hypermarket chain, Food Bazaar, a supermarket chain, blends the look, touch and feel of Indian *bazaars* with aspects of modern retail like choice, convenience and quality and Central, a chain of seamless destination malls. It has also introduced the formats like, Depot, Shoe Factory, Brand Factory, Blue Sky, Fashion Station, aLL, Top 10, mBazaar and Star and Sitara. A subsidiary company of , Home Solutions Retail (India) Limited, operates Home Town, a large-format home solutions store, Collection i, selling home furniture products and E-Zone focused on catering to the consumer electronics segment.

7.2.4 The Tata Group

The Tata group established retail arm, Trent in 1989. The company also signed a JV with Woolworths for its subsidiary Infiniti Retail that launched Croma, a multi brand outlet for consumer durable in Mumbai. The company also signed JV with Westside and Star India Bazaar.

Trent acquired 76% stake in book and music retailer Landmark. Trent also entered into agreement Delhi based DLF Universal (India's largest real estate developers). During 05-06 Trent achieved a turnover of Rs.346cr from its JV with Westside and Star India Bazaar. The Landmark contributed Rs.57cr during 05-06. Titan Watches Limited (JV between Tata Group and Tamil Nadu Industrial Development Corporation) diversified into Jewellery business under the brand Tanishq. Titan operates more than 200 World of Titan showrooms spread across 109 cities and reported sales of Rs.665cr in FY 05-06.

7.2.5 Raheja Group

The Mumbai based K Raheja Corp Group launched Shoppers' Stop (Departmental Store), Crossword (Book & Music Retail), Hypercity (Hypermarket), and Pantaloon (Ready-made garments) retail formats in India. The Shoppers' Stop tied up with Mothercare, the global brand for infants and children and also tied up with MAC for high end beauty and cosmetic products. The company has also beverage outlets such as Café Brio and Desi Café within its outlets.

7.2.6 Piramyd Retail

Piramyd launched Crossroads (Mall), Piramyd Megastore (Lifestyle Department Store), Jammin (Family entertainment centre), and Piramyd Supermarket. The company has 4 lakh sqft of retail space and is planning to spread over 2mn sqft space in the next 5 years.

7.2.7 Nilgiris'

Mr. Chenniappan established Nilgiris as a modest store carrying Nilgiris' own products, mostly dairy and bakery. This chain has now blossomed to cover a vast region in South India with 26 outlets and annual sales of about Rs.2300mn in 2007. The company is planning to

open an additional 30 outlets in their next phase of expansion.

7.2.8 Trinethra

Trinethra is a supermarket chain has started its business in 1986. Now it has predominant presence in the southern state of Andhra Pradesh with 66 stores spread over 8 districts of the state. Their turnover was Rs. 78.8cr for the year 2002-03. They plan to saturate their presence through out the state of Andhra Pradesh before venturing into two more southern states of the country. The group plans to venture into the lower level regions like smaller towns and mandals by using the franchisee-model.

7.2.9 Vishal Group

The Vishal Mega Mart, a Delhi based company operates more than 55 large stores in 45 cities dealing with ready-made garments, grocery and liquor. The company has sales over Rs 2.88bn in 2007. The company has strong presence in North India.

7.2.10 PCL

The Bharat Petroleum Corporation Ltd has 6,600 retail outlets across the country, and 580 convenience stores (In & Out). The company provides the services of ATMs, Western Union Money Transfer, beverages (Pepsi, Coffee), and snacks through a web of alliance with ITC, Pepsi, Cadbury's, Gillette, Pedigree, Himalaya.

7.3 Summary: Retailing is the process of selling the products in small quantities for non-business or personal use. This industry in India has felt its presence since ages but the organized retailing gained momentum in 1980s. Now a days there are many retail players in India and these players are performing their business successfully.

Practical Questions:

1. What is retailing? Mention the retail players in India.
2. Select any city and compare the sales performance of organized retailers.
3. What are major problems faced by organized retailers in India?
4. Compare traditional and organized retailing.

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Retail Challenges and Prospects

Structure:

8.1 Literature survey on retail challenges

8.2 Future retail prospects

8.2.1 Retail trade growth

8.2.2 Income growth

8.2.3 Consumer trends

8.2.4 Increase in number of working women

8.2.5 Physical infrastructure

8.2.6 Services

8.3 Retail challenges for organized agriculture retailing

8.4 Summary

References

Objectives: This chapter shall help the students to understand:

- 1. Retail challenges**
- 2. Future retail prospects**

8.1 Literature Survey on Retail Challenges

Organized retail in India is little decade old industry, suffering from many challenges. The challenges have set aside many business organizations because of their inability to cope with the dynamic environment. The recent example is the Reliance Retail rollout in Uttar Pradesh. Many of the business houses fail to get collaboration with the foreign partners due to these challenges in the India. These challenges are quoted by many researchers as shown in the table 8.1 below:

Table 8.1 Retail Challenges

Sr. No.	Author	Retail Challenges
1.	Pradhan (2007,pp, 45-46)	<ol style="list-style-type: none"> 1. Retail is not recognized as an industry 2. High Cost of Real Estate 3. High Stamp Duty 4. Inadequate Infrastructure 5. Multiple and Complex Taxation System 6. Competitive forces
2.	Newman and Cullen (2002,p 384)	<p>Retail Crimes</p> <ol style="list-style-type: none"> 1. Arson 2. Criminal Damage 3. Sabotage 4. Robbery
3.	Sinha and Uniyal (2007, pp, 45-49)	<ol style="list-style-type: none"> 1. Karyana Stores 2. High Operational Costs 3. Requirement of Specialization 4. Correct Marketing Mix 5. Strong IT Support 6. Unclear Industry Status
4.	http://www.thus.net/retail/challenges.html	<ol style="list-style-type: none"> 1. Customer Loyalty 2. Customer Help 3. Better Supply Chain 4. Better Sales Performance 5. Greater Productivity
5.	http://www.infisoft.com/novatime/nt_retail.html	<ol style="list-style-type: none"> 1. Manual collection of labor and job cost related data 2. Effectively managing the controllable labor cost, including overtime 3. Support multiple job / pay rates for employees 4. Managing employee schedules and staffing requirements 5. Providing a self-service portal to boost staff morale
6.	http://www.stonesoft.com/en/products_and_solutions/solutions/industry_solutions/retail/challenges	<ol style="list-style-type: none"> 1. Higher Demand for Connectivity 2. Increased Security Risks 3. Payment Card Security
7.	Jack (2004)	<ol style="list-style-type: none"> 1. Effectiveness of marketing and Advertisement 2. Product Sourcing 3. Technological Changes 4. Higher Service Levels 5. Transparency 6. Management Skills and Capabilities
8.	Gunender Kapoor (2007)	<ol style="list-style-type: none"> 1. FDI in Retail 2. Lack of recognition as an Industry 3. Difficulty in procurement and movement of goods 4. Mismatch in demand and supply 5. Numerous intermediates 6. Inefficient supply chains 7. Poor infrastructure

		8. Availability and cost of real estate 9. Urban land ceiling 10. Availability of parking
9.	Bhatia & Sharma (2008)	1. High operational costs 2. Insufficient investment in strengthening back-end operations 3. High rate of attrition and retaining a talented workforce

8.2 Future Retail Prospects

As per the statistical evidences available from various studies, it seems that the organised retail will gradually grow in future. These prospects are as follow:

8.2.1 Retail trade growth

As it is evident from the table 2, the retail trade growth is expected to be more than GDP growth. The growth of organised retail is identified as 34.8% for 2004-06, and growth of retail trade is identified as; 13.6% in 05, 10.4% in 07, 7.7% in 08, and is expected to touch 10.6% in the next year. It is a good sign of future development in this sector.

Table 8.2. Retail Trade Growth

Retail Trade	2005	2006	2007	2008	2009	2010
Retail Sales (Rs Bn)	15,409	17,360	19,465	21,715	24,215	27,107
Retail sales (Us \$bn)	349.4	385.8	421.3	467.0	516.3	564.7
Retail Sales volume growth (%)	6.0	7.5	7.7	6.9	6.8	7.3
Retail sales US\$ Value growth (%)	13.6	10.4	9.2	10.8	10.6	9.4

Source: EIU, 2007

Table 8.3 The Growth of Organized Retail 2004-2007

Retail Segment	Value in Crores			Y.oY Growth % 2004-06
	2004	2005	2006	
Health & Beauty care services	150	220	350	52.9
Pharmaceuticals	550	730	950	31.3
Entertainment	650	950	1350	44.1
Books, Music & Gifts	800	1150	1450	34.9
Mobile Handsets and Accessories & Services	840	1100	1500	33.7
Jewellery	850	1100	1450	30.6
Clothing, Textiles and Fashion Accessories	10900	14000	18500	30.3
Watches	1110	1350	1550	18.2
Catering Services	2000	2400	3400	30.8
Furnishings, Utensils, Furniture-Home & Office	2200	2600	3200	20.6
Consumer Durables, Home Appliances/Equipments	2500	3200	4300	31.2
Footwear	2500	3300	4500	34.2
Food & Grocery	2950	3500	5000	30.8
Total	28000	35600	47500	34.8

(Source: India Retail Report, 2007)

8.2.2 Income growth

The developing economy of India has witnessed an increase in disposable income of consumers. This is a favorable state for the growth of organised retailing which demands more buying power to the consumers. The improvement in the economy is shown in table 4.

Table 8. 4 The Changing Indian Market Structure

Socio-Economic classification of Annual Household income	Households Millions (% of Population)			
	2001-02		2006-07	
Very Rich (>INR 360001)	2.6	1.5%	5.2	2.7%
Consuming Class (INR 80001-60000)	46.4	25.9%	75.5	39.5%
Climbers (INR 40001-80000)	74.4	41.9%	81.7	43.1%
Aspirants (INR 28001-40000)	33.1	18.8%	20.2	10.7%
Destitute (< 28000)	24.1	13.7	16.5	8.7%

Source: NCAER, Projections on Structures of Market released in 2001.

8.2.3 Consumer Trends

According to India's *Marketing Whitebook* (2006) by Businessworld, India have 192 million households, 6 million population has family income more than INR215, 000, and 75 million population has the family income between INR45, 000 and INR215, 00. This country has 54% population below the age of 25 years and 85% population is below the age of 45 years. According to AC Nielson's Retail and Shopper Trends 2004 report, Indian's spend an average of INR2500 on food, grocery and personal care items per month and 48% consumers are interested to try new things. This is a positive sign for organised retailing to grow in this area based on the interest of the consumers.

8.2.4 Increase in the number of working women

According to India Retail Report 2007, more and more women are taking the job, has added to the family income. Women with more disposable income like to go for more purchasing, and ultimately it will boost the retail sale.

8.2.5 Physical Infrastructure

India's spending on power, construction, transportation, telecommunications and real estate, at \$31 billion or 6% of GDP in 2002 This had prompted the government to partially open up infrastructure to the private sector allowing foreign investment which has helped in a sustained growth rate of close to 9% for the past six quarters. India holds second position in the world in roadways'

construction, more than twice that of China. As of 2005 the electricity production was at 661.6 billion kWh with oil production standing at 785,000 bbl/day. India's prime import partners are: China 8.7%, US 6%, Germany 4.6%, Singapore 4.6%, Australia 4% as of 2006 CIA FactBook As of January 15, 2007, there were 2.10 million broadband lines in India. Over 76% of the broadband lines were via DSL and the rest via cable modems. This promotion in the physical infrastructure is a positive sign for organised retail growth.

8.2.6. Services

India ranks fifteenth in services output. It provides employment to 23% of work force, and it has maintained a speed of 4.5% in 1951-1980 and shoot upto 7.5% in 1991–2000. It had the 15% share in the GDP in 1950, and rose upto 55% in 2007. Business services like; Business process outsourcing, IT and IT enabled services are among the fastest growing sectors contributing to one third of the total output of services in 2000. The growth in the IT sector is attributed to increased specialisation, availability of a large pool of low cost, but highly skilled, educated and fluent English-speaking workers. On the supply side and on the demand side, increased demand from foreign consumers interested in India's service exports or those looking to outsource their operations.

8.3 Classification of Retail Challenges for Organized Agricultural Retailing

The retail challenges for organized retailing are classified as:

8.3.1 Inventory management challenges: It includes better supply chain performance, higher demand for connectivity, security risks, product sourcing, higher service levels, difficulty in procurement and movement of goods, and mismatch in demand and supply. It is also a challenge for this

industry as retail outlets are offering multiple products of different nature, wide product variety, different costs and product life.

8.3.2 Customer attractiveness: It includes customer loyalty, transparency management skills and capabilities. This component is also a big challenge for this industry as maintenance of customer loyalty is a challenging job in this competitive environment. It is also very difficult to acquire transparency management skills and capabilities due to involvement multiple intermediates and multiple taxation system.

8.3.3 Manpower management: Like any other service organisation manpower management is a challenge for organised retailing. The basic tasks in organised retailing are sales forecasting, managing supplies and merchandise, selling, employee training, advertising, billing merchandise, store cleaning and inventory management, hiring and firing the employees, store security, cash handling, customer research and supervision. To handle these operations the organisations have to select right person for the right job and at the right time. This requirement has led the HR managers to focus on manpower planning, recruitment, motivation, retention and building reward systems to ensure performance measurement orientation.

8.3.4 Numerous intermediates: There are many intermediates to send the product to the retail outlets. These intermediates take away their share and reduce the retail profits of the organisations. The organisations have to cope with the every day's low price to remain competitive in the market.

8.3.5 Karyana store: Karyana stores are the major threats to the organised retailing as they have low operating cost and are placed at the convenient locations in the form of mom and pop shops. They take away major share of retailing.

8.3.6 Effectiveness of marketing and advertisement: Marketing and advertisement effectiveness helps the organisation to increase visits to the stores and convert browsers into buyers. To convince the customers to purchase is a big challenge for the organisations as the diversity in the demographic setup is quite complex in India. This led the organisation to think of multiple strategies for the same.

8.3.7 Retail is not recognized as industry: In spite of major tax return from the organised retailing as compared to karyana stores, it is not recognized as an industry like manufacturing and other service industries. This has led to insufficient attention of the Indian government towards this sector and ultimately is a big challenge for this industry.

8.3.8 FDI in retail: Government has restricted FDI in retailing leading to poor functioning of this industry. This is also a big challenge for this industry.

8.3.9 Estate and Infrastructure factors: It includes high cost of real estate, and inadequate infrastructure. The sky high costs of land and insufficient infrastructure are the main hindrance for this industry. Due to this organisations find it difficult to select suitable store location and maintain the basic operations for retailing.

8.4 Summary: The organized retailing in India is a few decades old and has not achieved the status of industry in India. In spite of many challenges there are good future prospects to grow this trade.

Practical Questions:

1. What are retail challenges and prospects in India?
2. Identify retail challenges for fashion retailing in India.
3. Compare financial performance of top five organized retailers in India.

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SUPPY CHAIN PRACTICES**Structure:****9.1 Introduction****9.2 Literature survey on supply chain practices****9.3 Summary****References**

Objectives: The objective of this chapter is to understand the supply chain practices used in retailing industry.

9.1 Introduction

Organized retailing in the last decade has emerged as one of the sunrise industry in India. The boom in the sector started after 1991 after liberalization. The retailing in India has received global recognition and attention. The global players like Wal-Mart, Tesco and Metro group are eyeing to capture the Indian market but the domestic players like Reliance, Aditya Birla, KK Modi, Tata Trent and Bharti group are at the good stage to develop organized retailing. While the need for increased efficiency in enterprise operations persists, modern management thinking advocates the collaboration among business partners and the responsiveness to client needs as additional thrusts towards a successful competitive strategy based on key performance indicators.

It is within this context that Supply Chain Management (SCM) has become part of the senior management agenda in western countries since the 1990s, particularly in the manufacturing and retailing industries. More recently, interest in SCM has also been growing in the agriculture retailing industry, both in developed and developing countries. Just as their counterparts in manufacturing

and retailing, executives of agrifood enterprises are becoming aware that successful coordination, integration and management of key business processes across members of their supply chains will ultimately determine their competitive success. Moreover, agri-retailing businesses increasingly realize that they no longer compete as solely autonomous entities. Instead, competition occurs more and more among entire supply chains. The increased interest in SCM has also been spurred by developments in Information and Communication Technology (ICT) that enable frequent exchange of huge amounts of information among chain participants, for purposes of coordination. Consequently, there is a need and an opportunity for a joint approach of business partners towards the establishment of more effective and efficient supply chains.

This is especially true in agri-retailing supply chains, because of shelf-life constraints of food and agricultural products and increased consumer attention to safe and environment/animal-friendly production methods. Agri-retailing chains and networks play an important role in providing access to markets for producers from developing countries, as well as for local, regional and export markets. Changes in agrifood systems impact the ability of agro-industrial enterprises to compete; small and large alike will have to innovate and reduce costs, while being more responsive to consumer needs. The SCM practice is a set of activities exercised by organizations to promote the business. The role of supply chain management changed considerably over the last three decades. During 1970 it focused on the integration of warehousing and transportation within the firm. In 1980 the focus of SCM shifted to re-engineering of cost structure and in the end of 80s the focus drifted to reducing cost to improve customer service (Gattorna, 1998). The supply chain practices are seen as tangible activities or technologies that play an important role in the collaboration of a focal firm with its suppliers and /or customers (Taco van, 2007).

9.2 Literature survey on supply chain Practices

Prahalad and Hamel (1990) quoted that SC practices include internal competencies require greater reliance on external suppliers to support non-core requirements, particularly in design and engineering support. Monckza et.al (1994) and Burt and Soukup(1985) emphasized that SC practices include earlier Supplier participation in the in the product design process to render more cost – effective design choice, develop alternative conceptual solutions, select the best components and technologies, and help in design assessment.

Tully (1995) quoted that in the practice of a competitive global market, organizations have downsized, focused on core competencies and attempted to achieve competitive advantage by more effectively managing all internal and external value added activities. Many firms have reduced their supply base so they can more effectively manage relationships with strategic suppliers. Mason (1996) and Copacino (1996) indicate that buying firms are developing cooperative, mutually beneficial relationships with suppliers and viewing suppliers as virtual extension of their firms.

Donlon, JP et al. (1996) quoted that SCM practices include supplier partnership, outsourcing, cycle time compression, continuous process flow and information technology sharing. Ragatz et al. (1997) stated that Superior supplier capability can lead to exceptional quality or rapid integration of latest technological breakthroughs into the buying firm's own products through early supplier involvement. Narasimhan (1997) quoted that SCM practices implemented to achieve superior supply chain performance require internal cross-functional integration within a firm and external integration with suppliers or customers to be successful. Tan, KC et al. (1998) SCM practices include purchasing, quality and customers relations

Holmstro:m(1997),Zairi(1998) SCM practices: Location, pricing and mark-up, assortment, performance metric, forward-buying, delivery destination, replenishment frequency, order batch sizes. Pagh and cooper (1998), Van Hoek

(1998) Classified SCM practices as: Logistics postponement, Manufacturing postponement, standardization, customization.

Beamon (1999) quoted that SCM practices include: Inventory turn, gross margin and profit, average –in –stock inventory, ability to measure inventory. According to Banfield (1999) and Laming (1993) purchasing and supply chain management perspective's is synonymous with integration of supply base that evolved from traditional purchasing and materials function.

Alvarado and Kotzab (2001) concentrate on core competencies, use of inter-organizational systems such as EDI, and elimination of excess inventory levels by postponing customization towards the end of supply chain as supply chain practices. Fernie (1995), Ketzenberg et al. (2000) identified SCM practices as Gross margin return on inventory (GMROI), Obsolete inventory, markdowns, lost sales. Tan, KC et al. (2002) Identify six aspects of SC practices through factor analysis: supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and JIT capability.

Ka:kka:inen et.al.(2003) identified the supply chain practices as: Direct Delivery, cross-docking and merge-in transit. Golocic et al. (2003) SCM practices: Arms-length, cooperative/partnership, collaboration and integration. McKenney and Clark(1995)Lee and Whang(1998), Vergin and Bari(1999) Holmstro:m(2002), Ka:kka:inen M.,(2003) SCM practices: Electronic Data Interchange or point of sales (EDI/POS),Continuous replenishment planning(CRP),Efficient consumer response (ECR),Collaborative planning forecasting and replenishment(CPFR), Vendor managed inventory (VMI),Radio frequency identification(RFID).

El-Beheiry et al. (2004) SCM practices are: Demand variability, Induced Seasonality. De Toni (1999), Frolich (2001), Kulp et al. (2004) SC practices include Electronic data interchange (EDI), Integrated production planning,

packaging congruence, vendor managed inventory (VMI) and delivery synchronization. Fisher (1997), Li and O'Brien(2001), Wong et.al.(2004) Identify SCM practices for functional, intermediate and innovative products as :Physically efficient (MTO), physically responsive(MTS) and Market responsive(ATO). Chen &Paulraj,A (2004) SC practices use supplier base reduction, long-term relationships, communication, cross-functional teams and supplier involvement to measure buyer-supplier relationships.

Min,&Mentzer(2004) SC practices include greed vision and goals, information sharing, risk and award sharing, cooperation, process integration, long-term relationships and agreed supply chain leadership. Suri (1999) and Christopher et al. (2004) SCM practices are classified as Time-to-market, Time-to-serve, Time-to-react. Lapide L., (2005) Classified SCM practices in five areas: SC Integration, Complexity Management, Aligning Strategy and SC.IT with process improvement and Operational Innovation. Jack, GA et al. (2007) Classified SCM agrifood practical experiences as: Collaborative demand planning and replenishment, Collaborative production, Collaborative logistics planning. These practices are defined by different researchers in the Table 9.1 given below:

Table 9.1 Supply Chain Practices

SN	Author	Description	Dimensions
1.	Prahalad and Hamel(1990)	Emphasize internal competencies require greater reliance on external suppliers to support non-core requirements, particularly in design and engineering support.	Strategic supplier Partnership Design and Engineering
2.	Monckza et.al(1994) Burt and Soukup(1985)	Supplier may also participate earlier in the product design process to render more cost –effective design choice, develop alternative conceptual solutions, select the best components and technologies, and help in design assessment.	Strategic supplier Partnership Design and Engineering
3.	Tully (1995)	In the practice of a competitive global market, organizations have downsized,focused on core competencies and attempted to achieve competitive advantage by more effectively managing all internal and external value added activities.Many firms have reduced their supply base so they can more effectively manage relationships with strategic suppliers.	Core competencies Competitive advantage Value added activities
4.	Mason(1996) Copacino(1996)	Indicate that buying firms are developing cooperative, mutually beneficial relationships with suppliers and viewing suppliers as virtual extension of their firms.	Strategic supplier Partnership Virtual extension of the firm
5.	Donlon,JP	SCM practices include supplier partnership, outsourcing,	Strategic supplier

	et.al.(1996)	cycle time compression, continuous process flow and information technology sharing.	Partnership Outsourcing ,Information sharing,compressed cycle time and continuous process flow.
6.	Ragatz et.al (1997)	Superior supplier capability can lead to exceptional quality or rapid integration of latest technological breakthroughs into the buying firm's own products through early supplier involvement.	Strategic supplier Partnership,Exceptional quality,Technological integration.
7.	Narasimhan (1997)	SCM practices implemented to achieve superior supply chain performance require internal cross-functional integration within a firm and external integration with suppliers or customers to be successful.	Strategic supplier Partnership,internal cross-functional integration with firm,External integration with supplier and customers.
8.	Tan, KC et.al.(1998)	SCM practices include purchasing, quality and customers relations	Strategic purchasing,prouct/service quality, Customer relationship
9.	Holmstro:m (1997), Zairi(1998)	SCM practices: Location, pricing and mark-up, assortment, performance metric, forward-buying, delivery destination, replenishment frequency, order batch sizes.	Strategic location,pricing and mark-up,forward buying,prompt delivery,Replenishment frequency,order batch size.
10.	Pagh and cooper (1998), Van Hoek (1998)	Classified SCM practices as : Logistics postponement, Manufacturing postponement, standardization, customization.	Logistic postponement,Manufacturing postponement,standardization, customization,
11.	Beamon(1999)	SCM practices include: Inventory turnover, gross margin and profit,average –in –stock inventory,ability to measure inventory.	Inventory turnover,gross margin and profit,average-in-stock inventory,ability to measure inventory.
12.	Banfield. (1999) and Laming(1993)	According to purchasing and supply chain management perspective's is synonymous with integration of supply base that evolved from traditional purchasing and materials function.	Supply chain integration.
13.	Alvarado and Kotzab(2001)	SCM practices concentrate on core competencies, use of inter-organizational systems such as EDI ,and elimination of excess inventory levels by postponing customization towards the end of supply chain.	Core competencies,EDI,elimination of excess inventory,postponement.
14.	Fernie(1995),K etzenberg et.al.(2000)	Identified SCM practices : Gross margin return on inventory (GMROI),Obsolete inventory, markdowns ,lost sales.	GMROI,Obsolete inventory,mark downs,lost sales.
15.	Tan, KC et.al.(2002)	Identify six aspects of SC practices through factor analysis: supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and JIT capability.	SC integration,Information sharing,SC characteristics,Customer service management,geographical proximity,JIT.
16.	Ka:kka:inen et.al.(2003)	SCM practices: Direct Delivery, cross-docking and merge-in- transit.	Direct delivery,cross-docking,merge- in -transit
17.	Golovic et.al.(2003)	SCM practices :Arms-length, cooperative/partnership, collaboration and integration.	Arms length,Strategic supplier Partnership,collaboration,int

			egration.
18.	McKenney and Clark(1995) Lee and Whang(1998), Vergin and Bari(1999) Holmstrom (2002), Kakkalainen M..(2003)	SCM practices: Electronic Data Interchange or point of sales (EDI/POS),Continuous replenishment planning(CRP),Efficient consumer response (ECR),Collaborative planning forecasting and replenishment(CPFR), Vendor managed inventory (VMI),Radio frequency identification(RFID)	EDI/POS,CRP,ECR,CPFR, VMI, RFID
19.	El-Beheiry et.al.(2004)	SCM practices are: Demand variability, Induced Seasonality	Demand variability,induced seasonality
20.	De toni(1999), Frolich(2001), Kulp et.L.(2004)	SC practices include Electronic data interchange (EDI), Integrated production planning, packaging congruence, vendor managed inventory (VMI) and delivery synchronization.	EDI,Integrated production planning ,packaging congruence,VMI,delivery synchronization.
21.	Fisher(1997), Li and O'Brien(2001), Wong et.al.(2004)	Identify SCM practices for functional, intermediate and innovative products as :Physically efficient(MTO),physically responsive(MTS) and Market responsive(ATO) .	Physically efficient(MTO),physically responsive(MTS) and Market responsive(ATO)
22.	Chen,& Paulraj,A (2004)	SC practices use supplier base reduction, long-term relationships, communication, cross-functional teams and supplier involvement to measure buyer-supplier relationships.	Supplier base reduction, Strategic supplier Partnership, communication, supplier relationship
23.	Min,& Mentzer (2004)	SC practices include greed vision and goals, information sharing, risk and award sharing, cooperation, process integration, long-term relationships and agreed supply chain leadership.	Vision and goal,information sharing,risk and award sharing,cooperation,integration,Strategic supplier Partnership,supply chain leadership.
24.	Suri (1999) and Christopher et.al.(2004)	SCM practices are classified as Time-to-market, Time-to-serve, Time-to-react.	Time-to-market,time-to-serve,time to react.
25.	Lapide.L , (2005)	Classified SCM practices in five areas: SC Integration, Complexity Management, Aligning Strategy and SC.IT with process improvement and Operational Innovation.	Integration,complexity management,aligning strategy and SC
26.	Jack,G.A.et.al. (2007)	Classified SCM agrifood practical experiences as: Collaborative demand planning and replenishment, Collaborative production, Collaborative logistics planning.	CPFR, collaborative production, collaborative logistic planning.

Table 9.2 Classification of supply chain practices and Underlying Factors

SN	Factors	Scale items
1.	Supply chain Integration	Outsourcing , internal integration, External integration with supplier and customers, Supply chain integration, Integrated production planning

2.	Strategic purchasing	Strategic purchasing, forward buying, mark downs,
3.	SC characteristics	Communication, Vision and goal,
4.	Risk and award sharing	risk and award sharing,
5.	Customer-Supplier relationship	Supplier relationship management, customer-supplier relationship management
6.	Supply chain collaboration	Collaborative production, Collaborative logistic planning,
7.	complexity management	complexity management, outsourcing ,VMI
8.	Supply chain coordination	Continuous process flow, Manufacturing postponement, Logistic postponement, merge- in –transit, aligning strategy and SC
9.	Information Sharing	Information sharing ,
10.	Strategic Location	Strategic location,
11.	Customer Service Management	compressed cycle time , Customer relationship, , Replenishment frequency, order batch size, customization, Direct delivery, cross-docking, ECR, Delivery synchronization,
12.	Flexibility	Demand variability, induced seasonality, Market responsive(ATO), prompt delivery, Time-to-market, Postponement,

9.3 Summary: Retailing in India has vast potential. The retailers exercise various practices to survive in this competitive market. The selection of right practice for a particular industry plays very important role as each practice has its own advantages and disadvantages.

Practical Questions:

1. What are supply chain practice and their role for business promotion?
2. Select FMCG retailing and identify the supply chain practices exercised in this industry.
3. Compare supply chain practices exercised by apparel retailers in India.

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Information Systems in Retail

Structure:

10.1 Information shared in supply chains

10.2 Information sharing metrics

10.3 Effective transportation system

10.4 Transportation coordination

10.5 Summary

References

Objectives: This chapter shall help the students to understand information sharing in the supply chains and its metrics and effective transportation coordination.

Information Shared in Supply Chains

Sharing information in a supply chain is important not only to reduce the Bullwhip Effect but also to reduce the cost of entire supply chain. Information sharing in the supply chain into six components: product, process, planning, inventory, order, and resource. Product information includes the characteristics of manufactured products and associated production process. A bill-of-materials (BOM) is used to indicate component cost data. However, product information is not sufficient category in information sharing in a supply chain. Process information concentrates on the business processes in a supply chain that actually add value to fulfill the customer demand. General processes in a supply chain are ordering, production, and delivery. Process information may contain the information regarding; lead-time, set-up time, costs, policies, and the quality of the process. The real-time quality information sharing is better than no information sharing as well as one-way and two-way information sharing.

Planning information in a supply chain includes demand forecasts and order scheduling. The effective technique of forecasting and sharing the data obtained plays very important. The order schedule indicates the order quantity, which includes production order and purchase order. The products spend most of the time in the supply chain stages rather than in actual manufacturing of the product so it is desirable to focus on reducing inventory in a supply chain. Inventory information includes on-hand inventory, backlogs, and work-in-process inventories, unit cost. Order information includes demand information from the end customer to suppliers and the size and date of the order. Some supply chain collaboration such as Third-Party Logistics (3PL), Vendor Managed Inventory (VMI), and Two-tier Collaborative Planning, Forecasting, and Replenishment (CPFR) rely more on inventory information than other information. Many retailer's plan their safety stock based on not only its current order and inventory level, but also its prior orders, prior inventory, and inventory levels of upstream members of the, so as to reduce the Bullwhip Effect.

The inventory decisions in most of the cases are based on pull or push situations. The pull inventory decisions involve the identification of customers needs and based on their needs providing products and services. On the other hand push decisions are based on the core competencies of the company. Based on the core competencies the companies provide products to the organizations and customers purchase them. For example based on the customers need for medicine the companies like Ranbaxy, Cipla etc. develop medicines. On the other hand the high-tech companies like Nokia, Sony, etc. provide high technology electronics products and customers purchase them based on the comparative analysis of product features.

10.2 Information Sharing Metrics

Information sharing is now a day is a strategic decision for most of the production and service organizations as 'you can't improve what you can't measure'. The

traditional measure; cost, quality, delivery, and delivery performance are not sufficient nowadays. The information sharing among various supply chain echelons has added to the strategic components. Many research studies proved that information sharing with suppliers also play an important role. The information can be shared at the three levels as hereunder:

1. Pre-transaction information sharing
2. Transaction information sharing
3. Post-transaction information sharing.

The information sharing at these three levels shall help the organizations to develop and design competitive supply chain strategy.

10.3 Effective Transportation System

In freight transport, the principle of JIT acts as a driving force for prompt deliveries. JIT influences the increasing utilization of light goods vehicles. However, it may be argued that to some extent, the current tendency is contra productive; in their efforts to eliminate waste in their internal processes, actors contribute to increased transport intensity and congestion, negatively affecting the performance of the transport system as a whole. The European Logistics Association quoted that members of an integrated supply chain should collaborate to maximize vehicle load factors, minimize empty running, achieve an optimal allocation of freight between modes, and standardize on handling systems that make effective use of vehicle and warehouse capacity.

There is a wide range of possibilities to define the efficiency of transport and its effective utilization. The utilization of vehicle capacity does not only depend on the load rate, measured at a single point of the route; load rate variation during the route and empty-running should also be regarded. In general, a combination of indicators may be required. In general the most basic transportation systems are (Tseng, et al., 2005):

1. Road-ways
2. Sea-ways

3. Air-ways

4. Rail-ways

The suppliers' can select the suitable mode of transportation depending upon availability, cost, time and geographical conditions for strategic advantage. Operations Research has provided very important techniques to vehicle routing and scheduling problems. (For detailed discussion see any book of Operations Research)

10.4 Transportation coordination

The transport coordination is very essential to minimize the cost of material flows. Coordination of transport operations may be implemented along two lines (Mihyeon & Amekudzi, 2005):

1. Back-hauling and
2. Combined loading

Back-hauling refers to the utilization of vehicle on empty trips for movement of one product in each direction. Sometimes, a detour is required to collect goods during return trips. Combined loading refers to the utilization of vehicle for goods movement in one/same direction. Combined loading could be organized by means of goods terminals and/or collection/distribution routes. The organizations always try to combine the concepts of back-hauling and combined loading. Many optimization techniques and software can be used for strategic and operative planning of coordinated transport operations. For back-hauling as well as combined loading, the coordination could be constrained by laws and regulations for goods handling.

Environmental issues affect numerous logistical decisions throughout the value chain. This research identifies strategies that are most and least popular for managing and responding to such issues, and provides evidence of relationships between select company characteristics and the particular types of strategies employed in managing logistics-related environmental impacts. Data sources included companies in the United States, Canada, and the European Union.

Study results suggest that the green logistics strategies of recycling materials, reducing consumption, and reusing materials are universally popular among western industrialized nations. Firms that exhibit more intense commitment to environmentalism than their peers augment use of these universal strategies with various specialized thrusts, such as environmental audits.

10.5 Summary: Sharing information in a supply chain is important not only to reduce the Bullwhip Effect but also to reduce the cost of entire supply chain. Information sharing in the supply chain into six components: product, process, planning, inventory, order, and resource. This information sharing results in effective coordination of transportation and hence helps to select the suitable mode of transportation and minimize the time and cost of transportation.

Practical Question:

- 1. Explain the role of information sharing in coordinating transportation.**
- 2. Select FMCG retailing and study its transportation system in detail.**
- 3. Compare various modes of transportation.**

References

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