# MBA 3.33

## MASTERS OF BUSINESS ADMINISTRATION

Logistic and Supply Chain management

**UP Rajarshi Tandon Open University**

**Allahabad**

# BLOCK 1-6

**Block 5: SUPPLY CHAIN MANAGEMENT**: BENCHMARKING

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# MBA : LOGISTICS AND SUPPLY CHAIN MANAGEMENT

## BLOCK 1: INTRODUCTION AND EVOLUTION

In **Block 1** you will learn about basics of supply chain management (SCM); evolution and key drivers of supply chain management; typology of SCM; cycle view of SCM; problems and suggested solutions in SCM.

**Unit 1** discusses supply chains; supply chain management (SCM); SCM vs supply chains; examples and definition of SCM.

**Unit 2** explains supply chain management with focus on its evolution and its key drivers.

**Unit 3** deals with models/types of SCM; cycle view of SCM; problems and challenges in SCM; suggested solutions to handle those challenges.

## UNIT 1: BASICS OF SUPPLY CHAIN MANAGEMENT

**UNIT FRAMEWORK**

## 1.1 OBJECTIVES

After completing this unit, you will be able to understand the following topics:

- Supply chain and supply chain management
- Objectives of supply chain management
- Importance of supply chain management
- Activities of supply chain management
- Examples of supply chain management
- Definitions of supply chain management

## 1.2 INTRODUCTION

The global market faces a fierce competition today. The introduction of products with shorter life cycles and the heightened expectations of customers have forced business enterprises to invest in, and focus attention on, their supply chains. This, together with continuing advances in communications and transportation technologies (e.g., mobile communication, internet, and overnight delivery), has motivated the continuous evolution of the supply chain and of the techniques to manage it effectively. Recently, the pressure of the competitive market and new information technologies has affected the structures of the production systems, calling for:

• reduction of time to market

• higher flexibility of the systems

• drastic reduction of costs

• extended quality concept

### 1.3 SUPPLY CHAIN

A supply chain is a system of organisations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. A supply chain is a network of retailers, distributors, transporters, storage facilities, and suppliers that participate in the production, delivery and sale of a product to the consumer. These activities are associated with the flow and transformation of goods from the raw materials stage to the end user, as well as the associated information and funds flows.

Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. In simple terms, a supply chain is the link between a firm or business and its suppliers and customers.


Fig. 1.1 A conceptual model of a basic supply chain

The supply chain, which is also referred to as the logistics network, consists of suppliers, manufacturing centres, warehouses, distribution centres, and retail outlets, as well as raw materials, work-in-process inventory, and finished products that flow between the facilities.

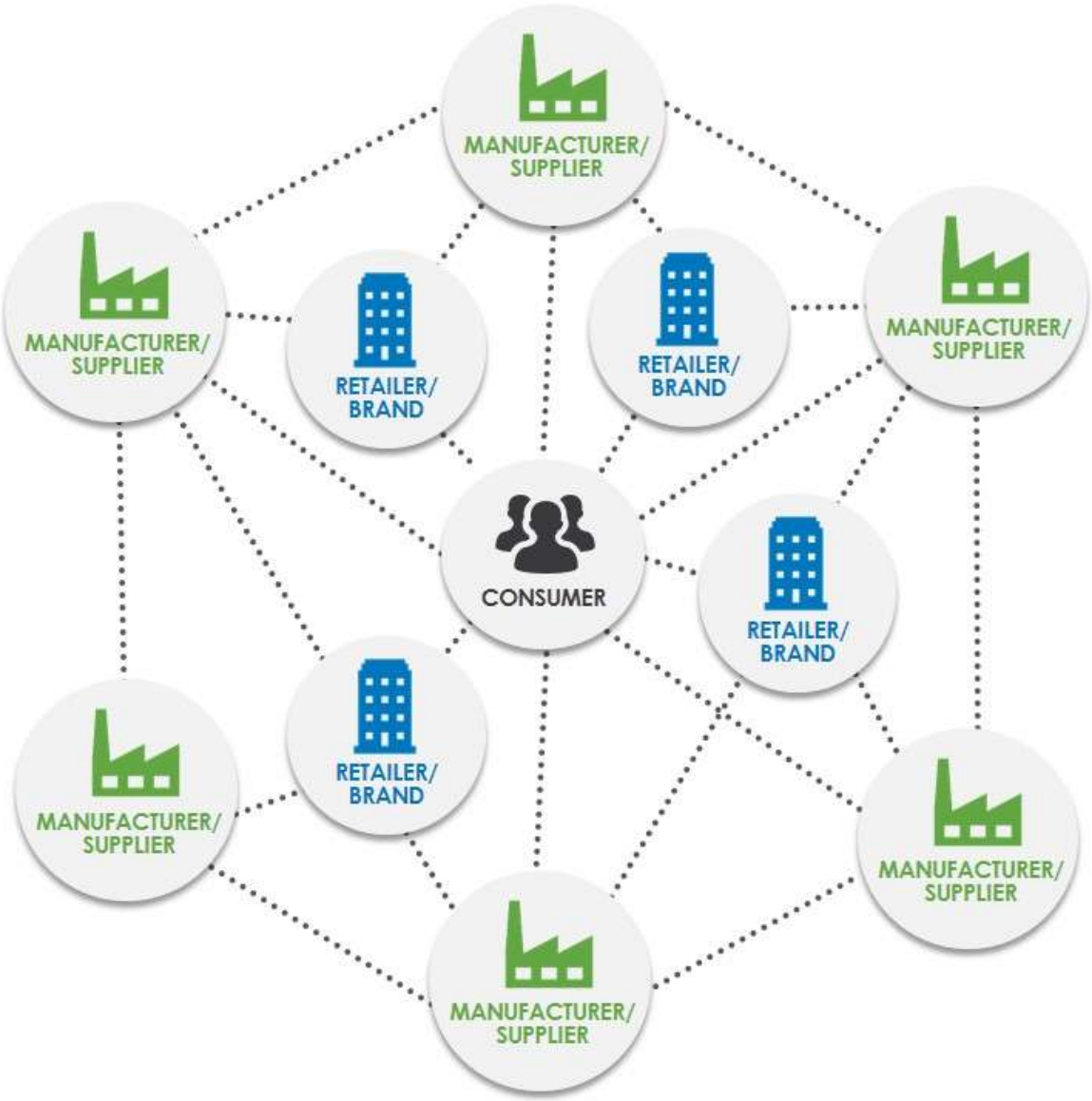


Fig. 1.2 A supply chain network

A supply chain encompasses all activities in fulfilling customer demands and requests. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable. A supply chain strategy refers to how the supply chain should operate in order to compete in the market. The strategy evaluates the benefits and costs relating

to the operation. The supply chain strategy focuses on the actual operations of the organisation and the supply chain that will be used to meet a specific goal.

The supply chain integrates, coordinates and monitors the flow of materials, information, and funds.

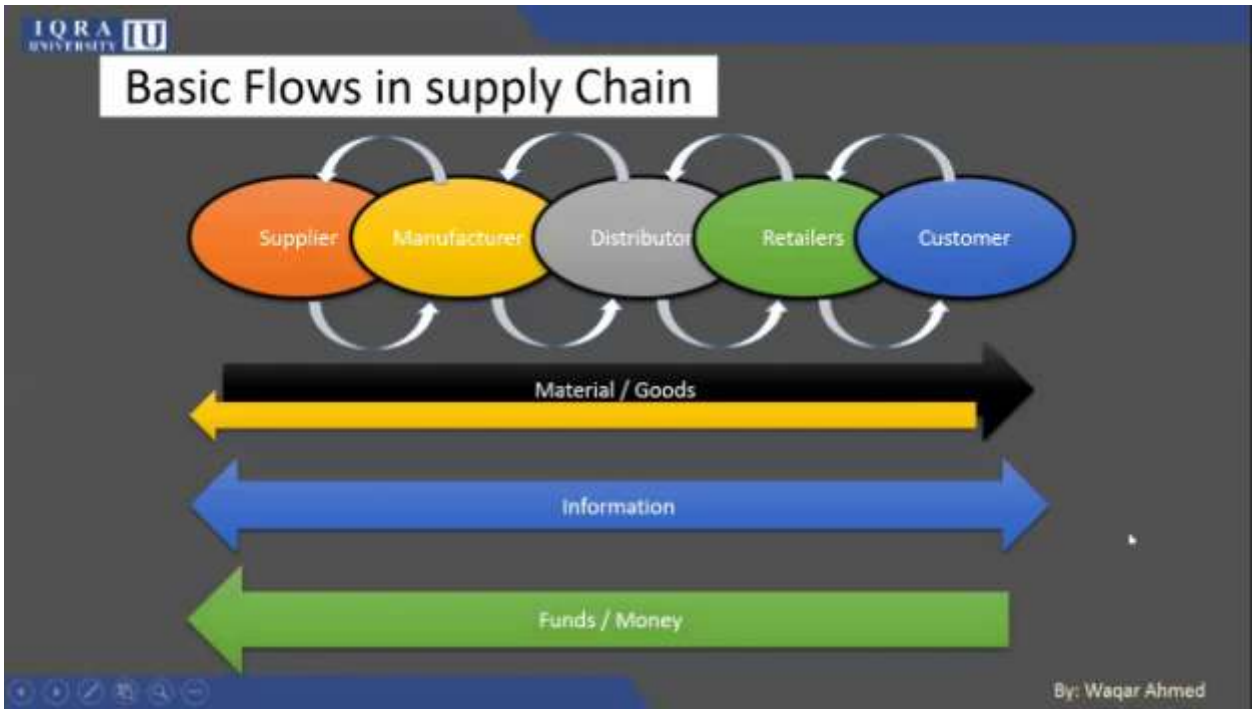


Fig. 1.3 Flows in a supply chain

**1.4 SUPPLY CHAIN MANAGEMENT**

Supply chain management is the management of the flow of goods and services and includes all processes that transform raw materials into final products. It involves the active streamlining of a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace.

Supply chain management (SCM) is the discipline that manages the flow of supplies through all of the stages of a production cycle. SCM applies to any organization that executes projects,

produces goods or provides services, as those activities require a supply chain to maintain a steady flow of resources. That's where supply chain management comes in.

Supply chain management is very important in the business administration field because it affects other key business areas such as operations management, inventory control and quality management. But what really makes SCM so important is that it can also become an important competitive advantage for businesses.

The main goal of supply chain management is to make the most of the resources involved in a supply chain and be as productive as possible. People are managed and supplies require management as well. Whether those supplies are goods or services, they must be accounted for and carried through from start to finish with deliberate control.

## 1.5 OBJECTIVES OF SUPPLY CHAIN MANAGEMENT

A supply chain is a global network of organisations that cooperate to improve the flows of material and information between suppliers and customers at the lowest cost and the highest speed. The final objective of a supply chain is customer satisfaction. The supply chain management takes into consideration every facility that has an impact on cost and plays a role in making the product match to customer requirements: from supplier and manufacturing facilities through warehouses and distribution centres to retailers and stores.

The main purpose of the supply chain is to maximise overall value generated. Value is the difference between what the cost supply chain incurs and the worth end product has to the customer. Value of the commercial supply chain is correlated with its profitability generally known as supply chain surplus. For example, A customer purchase a personal computer from IBM at $2,000, which indicates the revenue supply chain achieved. All the stages incur costs to make sure the efficient transfer of funds, information, storage of the product, transportation to the final consumer etc. The difference between the supply chain cost and revenue generated from personal computer represent the supply chain surplus or profitability.

Supply chain surplus can be defined as the total profit shared by all the stages and intermediaries of a supply chain. The greater the supply chain surplus the more successful is supply chain. But,

Supply chain success is measured by its overall surplus not by the profit at each stage. The supply chain management has to be efficient and cost-effective across the entire system; from transportation and distribution to inventories of raw materials, work in process, and finished goods, are to be minimized. The emphasis is not on simply to minimise transportation cost or reducing inventories but, rather, on taking a systems approach to supply chain management.

The objectives of supply chain management can be listed below: ,

- enhancing customer service ,
- expanding sales revenue ,
- reducing inventory cost ,
- improving on-time delivery ,
- reducing order to delivery cycle time ,
- reducing lead time ,
- reducing transportation cost ,
- reducing warehouse cost ,
- reducing supplier base ,
- expanding depth of distribution

## 1.6 IMPORTANCE OF SUPPLY CHAIN MANAGEMENT

The importance of supply chain management comes into picture if there is sharp focus on the loss due to the absence of an effective supply chain strategy and / or the benefit due to an effective supply chain for any firm. Basically, it refers that how good is the integration of supply chain that matters for any firm. The importance of having a robust supply chain management can be depicted from the following example: ,

Suppose, ABC is any company that manufactures the cycle chains for a cycle manufacturing company XYZ. Another company PQR manufactures bits used in the cycle chain manufactured by ABC. Now, in coming days, as per the market forecast, XYZ shall need 50,000 units of cycle chain, information that is not available with ABC. Accordingly, PQR also does not know how many bits to produce in order to meet ABC’s requirement. The result would be either both ABC

and PQR hold high safety stock inventory or lose business respectively with XYZ and ABC. Now, if in this example showing only three supply chain partners, absence of a critical information among the partners, that is of production forecast at XYZ firm results into either a higher inventory level or loss of future business.

The importance of supply chain management is to: Supply Chain Management 6/JNU OLE , reduce inventories along the chain , share better information among the partners , plan in consultation rather than in isolation

## 1.7 ACTIVITIES OF SUPPLY CHAIN MANAGEMENT

There are three levels of activities of supply chain management that different parts of the company will focus on: ,

**Strategic:** At this level, strategic decisions concerning the whole organisation, such as the size and location of manufacturing sites, partnerships with suppliers, products to be manufactured and sales markets are taken. Such decisions have a long-lasting effect on the firm. This includes decisions regarding product design, what to make internally and what to outsource, supplier selection, and strategic partnering and the flow of material through the logistics network. ,

**Tactical:** Tactical decisions focus on adopting measures that will produce cost benefits such as using industry best practices, developing a purchasing strategy with favoured suppliers, working with logistics companies to develop cost effect transportation and developing warehouse strategies to reduce the cost of storing inventory. Such decisions are typically updated anywhere between once every quarter and once every year. These include purchasing and production decisions, inventory policies, and transportation strategies, including the frequency with which customers are visited. ,

**Operational:** Decisions at this level affect how the products move along the supply chain. Operational decisions involve making schedule changes to production, purchasing agreements with suppliers, taking orders from customers and moving products in the warehouse. Such decisions refer to day-to-day decisions such as scheduling, lead time quotations, routing, and truck loading.

## 1.8 SCM VS. SUPPLY CHAINS

A supply chain is the network of individuals, companies, resources, activities, and technologies used to make and sell a product or service. A supply chain starts with the delivery of raw materials from a supplier to a manufacturer and ends with the delivery of the finished product or service to the end consumer.

SCM oversees each touchpoint of a company's product or service, from initial creation to the final sale. With so many places along the supply chain that can add value through efficiencies or lose value through increased expenses, proper SCM can increase revenues, decrease costs, and impact a company's bottom line.

## 1.9 EXAMPLES OF SCM

Understanding the importance of SCM to its business, Walgreens Boots Alliance Inc. decided to transform its supply chain by investing in technology to streamline the entire process. For several years the company has been investing and revamping its supply chain management process. Walgreens was able to use big data to help improve its forecasting capabilities and better manage the sales and inventory management processes.

This includes the 2019 addition of its first-ever Chief Supply Chain Officer, Colin Nelson. His role is to boost customer satisfaction as the company increases its digital presence. Beyond that, in 2021, it announced it would be offering free two-hour, same-day delivery for 24,000 products in its stores

Other examples of supply chain management are:

- Dell
- Toyota/ Volkswagen
- McMaster Carr / W.W. Grainger, sell auto parts
- Amazon

- Frozen food industry/Fast food industry/5 star restaurants
- Internet shopping

## 1.10 DEFINITION OF SUPPLY CHAIN MANAGEMENT

In commerce, supply chain management (SCM) deals with a system of procurement (purchasing raw materials/components), operations management (ensuring the production of high-quality products at high speed with good flexibility and low production cost), logistics and marketing channels, so that the raw materials can be converted into a finished product and delivered to the end customer.

A more narrow definition of the supply chain management is the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronising supply with demand and measuring performance globally".

Supply Chain Management can be defined as the management of flow of products and services, which begins from the origin of products and ends at the product's consumption. It also comprises movement and storage of raw materials that are involved in work in progress, inventory and fully furnished goods.

The Council of Supply Chain Management Professionals defines supply chain management as follows: "Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities". Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

Some other important definitions of supply chain management are:

1. Supply Chain Management (SCM) is the management and oversight of a product from its origin until it is consumed. SCM involves the flow of materials, finances and information. This

includes product design, planning, execution, monitoring and control. The goal of this process is to reduce inventory, increase transaction speed and improve work flow with profit in mind.

2. APICS, the global association for supply chain management professionals, defines supply chain management as: “the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally.”

3. SCM is the management of a network of all business processes and activities involving procurement of raw materials, manufacturing and distribution management of Finished Goods. SCM is also called the art of management of providing the Right Product, At the Right Time, Right Place and at the Right Cost to the Customer.

4. Supply chain management is the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally.

5. Supply Chain Management is the management of upstream and downstream value-added flows of materials, final goods, and related information among suppliers, company, resellers, and final consumers.

6. CSCMP’s definition is: Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities.

Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

7. SCMA defines supply chain management (SCM) as: The process of strategically managing flows of goods, services, finance and knowledge, along with relationships within and among

organizations, to realize greater economic value through: Supporting enterprise strategic objectives, Contributing to the achievement of strategic competitiveness of the enterprise, Contributing to the enhancement of the competitive advantage of the enterprise and Enhancing customer satisfaction.

8. Supply chain management (SCM) is the broad range of activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most streamlined and cost-effective way possible.

SCM encompasses the integrated planning and execution of processes required to optimize the flow of materials, information and financial capital in the areas that broadly include demand planning, sourcing, production, inventory management and storage, transportation — or logistics — and return for excess or defective products. Both business strategy and specialized software are used in these endeavors to create a competitive advantage.

9. Supply chain management is the management of the flow of goods and services and includes all processes that transform raw materials into final products. It involves the active streamlining of a business's supply-side activities to maximize customer value and gain a competitive advantage in the marketplace.

SCM represents an effort by suppliers to develop and implement supply chains that are as efficient and economical as possible. Supply chains cover everything from production to product development to the information systems needed to direct these undertakings.

10. A supply chain is a global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution, and cash. A supply chain, in view of the above supply chain management definition, comprises a network of both entities and processes (the engineered flow). A supply chain doesn't have to be global, but the massive chains that interest us in this course -the ones that run through corporations, are decidedly global in scope.

11. Management of material and information flow in a supply chain to provide the highest degree of customer satisfaction at the lowest possible cost. Supply chain management requires the

commitment of supply chain partners to work closely to coordinate order generation, order taking, and order fulfillment. They thereby create an extended enterprise spreading far beyond the producer's location.

On the basis of these definitions, the features of supply chain management are:

- **Improved Efficiency**

Efficiency is one of the most important goals of supply chain management. A crucial aspect of supply chain management is minimizing waste. Waste can take many forms, including waste of resources, money, labor hours, delivery times, etc.

For instance, if your business uses ERP software to update inventory data in real-time and share it with a supplier, it may quickly restock its stock to satisfy customer demand. While it might be challenging to learn but can be quite helpful for the success of your company as a whole.

- **Optimization of Transportation and Logistics**

The improvement of logistics and transportation is yet another crucial objective of supply chain management. Each firm is in charge of its own responsibilities with regard to placing orders, sending packages, and transporting items in a free-standing business setting.

With any vendors or customers you do business with, SCM gives you the ability to optimize your transportation and logistics operations. Orders are automatically inputted into a system, which alerts nearby facilities that more resources are needed to fulfill this request. Because of this, the procedure is fairly frictionless.

- **Lower Cost Expenses**

Reduced operational cost is the main goal of supply chain management. The cost of all business expenses, including those related to purchasing, producing, and transporting goods, is reduced by creating an effective supply chain.

The holding period for both raw materials and completed items may be decreased by enabling a seamless flow of raw materials between a supplier and a business and the movement of finished goods between a company and its clients. Losses are thereby minimized, and total organizational costs are maintained to a minimum.

- **Provides Customer Satisfaction**

Customer happiness is another aspect of SCM, as the supply chain is the best channel for providing customer care. Pricing and delivery are the two most important factors, and SCM directly affects them.

You may surpass your rivals in terms of retail price and profitability by having an effective supply chain. You may meet or surpass your customer's expectations for product delivery with the help of high-performing operations.

SCM always gives clients what they want, when they want it, and at a low price since these things raise the likelihood that they will continue to be satisfied.

- **Better Distribution System**

The organization in charge of running the firm benefits from supply chain management since it streamlines the distribution process. To ensure the quicker circulation of products, it is essential to create adequate coordination between the various transportation channels and warehouses.

SCM helps businesses to cut costs while providing products more quickly. This leads to an improvement in the overall distribution system, which immediately helps in the timely and accurate delivery of goods.

- **Cloud-Based Accessibility**

Authorized users may access and use cloud-based supply chain management tools from any location, at any time, and on any connected device. The biggest benefit of this feature is that cloud-based solutions may be set up more affordably, more quickly, and with less risk than on-premise ERP systems.

- **Keeping Improved Coordination**

Supply Chain Management focuses on improved coordination between the business stakeholder. A communication channel is created that allows employees, customers, and suppliers to communicate with the company efficiently. In an emergency, employees may contact their managers through the established route, and managers can promptly lead their workforce.

- **Self Service Portals**

In a supply chain network, many partners working from various places are included. Due to their inability to constantly communicate, communication problems arise.

Business partners may exchange plans and information depending on their actions and preferences via password-protected self-service portals, enabling continual contact whenever necessary in the field of supply chain management.

- **Performance Measurement**

The measurement of performance measures by looking more closely at the operations is one of the key components of supply chain management. The most important technique to promote responsiveness and creativity in a business is by using metrics analysis based on the processes to gain insightful data.

An efficient SCM guarantees a clear picture of the business operations and helps in determining the KPIs that need to be developed. In order to increase overall business performance, a measuring system must be established for a standard process architecture.

- **Security**

Another crucial component of supply chain management software is security. Be sure the cloud-based system you choose for supply chain management has security features like Data encryption, network monitoring, virus scanning, multi-factor authentication, and role-based authorization.

## 1.11 SUMMARY

At the most fundamental level, supply chain management (SCM) is management of the flow of goods, data, and finances related to a product or service, from the procurement of raw materials to the delivery of the product at its final destination.

Although many people equate the supply chain with logistics, logistics is actually just one component of the supply chain. Today's digitally based SCM systems include material handling and software for all parties involved in product or service creation, order fulfillment, and information tracking—such as suppliers, manufacturers, wholesalers, transportation and logistics providers, and retailers.

Supply chain activities span procurement, product lifecycle management, supply chain planning (including inventory planning and the maintenance of enterprise assets and production lines), logistics (including transportation and fleet management), and order management. SCM can also extend to the activities around global trade, such as the management of global suppliers and multinational production processes.

## 1.12 SELF-ASSESSMENT QUESTIONS

**Q1.** What is meant by supply chain?

**Q2.** Define supply chain management.

**Q3.** What are the objectives of supply chain management?

**Q4.** Explain supply chain vs supply chain management.

**Q5.** Discuss the features of supply chain management.

**Q6.** Give examples of supply chain management.

## 1.13 TEXT AND REFERENCES

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# UNIT 2: SCM: EVOLUTION AND KEY DRIVERS

## UNIT FRAMEWORK



## 2.1 OBJECTIVE

The objective of the unit is

- To discuss the stages in evolution of the concept of supply chain management.
- To understand the key drivers of supply chain management.
- To elicit the different types of supply chain management drivers.

## 2.2 INRODUCTION

Improving one's own business is no guarantee of success in today's competitive markets. The individual success of a company depends not alone on their in-house skills and expertise. Without the right companies up and down the supply chain to work with a company will never achieve true competitive advantage. This unit will discuss six major movements can be observed in the evolution of supply-chain management studies: creation, integration, globalization, specialization phases one and two, and SCM 2.0. The five drivers of supply chain management to be discussed in this unit provide a useful framework for thinking

about supply chain capabilities. Decisions made about how each driver operates will determine the blend of responsiveness and efficiency a supply chain is capable of achieving.

## 2.3 EVOLUTION OF THE CONCEPT OF SUPPLY CHAIN MANAGEMENT

The evolution of supply chain management has been a gradual process that has been shaped by a range of factors, including technological advancements, changes in consumer behavior, and globalization. Supply chain management has evolved significantly over the years, as businesses have realized the importance of efficient and effective supply chain management. The evolution of supply chain management has been driven by several factors, including advancements in technology, changes in customer expectations, and the need to compete in an increasingly global marketplace. The following are some of the key stages in the evolution of supply chain management.

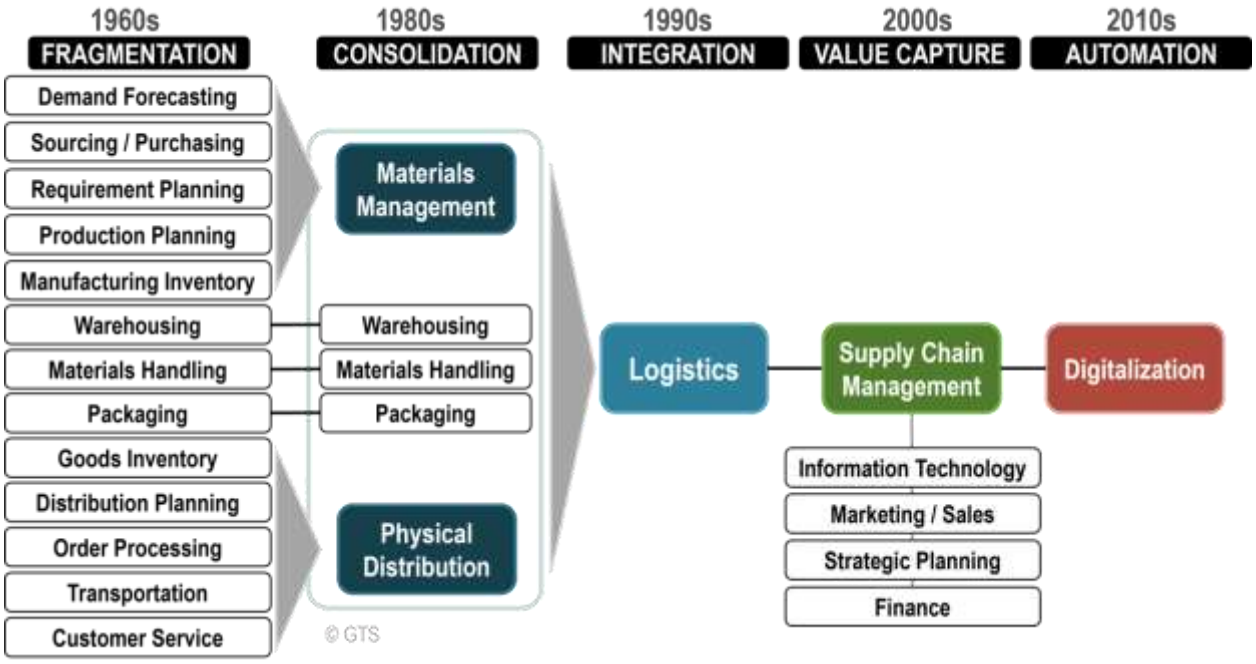


Fig. 2.1 Evolution of supply chain management

First, the early days of supply chain management were focused primarily on logistics and transportation. The primary goal was to move products from point A to point B as efficiently as

possible, with little emphasis on the management of inventory or the coordination of suppliers and manufacturers.

However, as businesses began to expand and globalize, supply chain management became more complex. This led to the development of new technologies and software that could help manage the flow of goods and information across multiple suppliers, manufacturers, and distributors.

Early Stages (1900s-1960s): In the early stages of supply chain management, companies focused on optimizing their internal processes, such as production and inventory management. The focus was on increasing efficiency and reducing costs.

Expansion of Transportation Infrastructure (1960s-1980s): In the 1960s and 1970s, the expansion of transportation infrastructure, such as highways and air travel, facilitated the growth of global trade. This led to the emergence of international supply chains, which required new approaches to managing logistics and inventory. Although logistics tasks have remained relatively similar, they initially consolidated into two distinct functions related to materials management and physical distribution during the 1970s and 1980s.

Emergence of Technology (1980s-2000s): The emergence of technology, such as barcode scanners, electronic data interchange (EDI), and enterprise resource planning (ERP) systems, allowed companies to more effectively manage their supply chains. This led to the rise of just-in-time (JIT) and lean manufacturing practices.

The introduction of enterprise resource planning (ERP) systems in the 1990s was a significant turning point in the evolution of supply chain management. These systems allowed companies to integrate all of their business functions, including supply chain management, into a single platform. This made it easier to manage inventory, track shipments, and coordinate with suppliers and manufacturers.

Globalization (2000s-2010s): The growth of global trade and the emergence of new markets in Asia and other regions created new opportunities for companies to source materials and sell their products. However, it also increased the complexity of supply chain management, requiring companies to manage logistics across multiple countries and regions.

As the internet became more prevalent, businesses began to explore the potential of e-commerce and online marketplaces. This led to the development of new supply chain models, such as dropshipping and direct-to-consumer shipping, which relied on real-time data and analytics to manage inventory and logistics.

Focus on Sustainability (2010s-Present): In recent years, there has been a growing focus on sustainability in supply chain management. This has led to increased attention on issues such as reducing carbon emissions, promoting ethical labor practices, and minimizing waste.

Today, supply chain management continues to evolve, with new technologies and approaches emerging to meet the changing needs of businesses and consumers. For example, the rise of e-commerce has led to the development of new logistics models, such as drop-shipping and last-mile delivery, while the use of artificial intelligence and blockchain technology is transforming supply chain management processes. As supply chains continue to grow in complexity and importance, it is likely that we will see continued innovation and evolution in the field of supply chain management.

Supply chain management has evolved to become a strategic function within many organizations. Supply chain professionals are responsible for managing supplier relationships, optimizing inventory levels, reducing costs, and ensuring that products are delivered to customers on time and in good condition.

Advancements in technology, such as the Internet of Things (IoT) and blockchain, are also driving the evolution of supply chain management. These technologies enable real-time tracking and visibility across the entire supply chain, from raw materials to finished products.

Table 2.1: Evolution of Supply Chain Management

| | | |
|---|---|---|
| 1. | Creation Era | The term supply chain management was first coined by an<br><br>American industry consultant in the early1980s. However the concept of supply chain in management, was of great importance |

| | | |
|---|---|---|
| | | long before in the early 20th century |
| 2. | Integration Era | This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems in the 1960s and developed through the 1990s by the introduction of Enterprise Resource Planning (ERP) systems |
| 3. | Globalisation Era | This era is characterized by the globalization of supply chain management in organizations with the goal of increasing competitive advantage, creating more value added, and reducing costs through global sourcing. |
| 4. | Specialization Era Phase-One Outsourced Manufacturing and Distribution | In the 1990s industries began to focus on "core competencies" and adopted a specialization model. Companies abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. |
| 5. | Specialization Era Phase Two – Supply Chain Management as a Service | Specialization within the supply chain began in the1980s with the inception of transportation brokerages, ware house management, and non asset based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution and performance management. |
| 6. | Supply Chain Management 2.0 (SCM 2. 0) | Web 2. 0 is defined as a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. |

Source: Jinesh Jain, G. S. Dangayach, G. Agarwal, Soumya Banerjee, "Supply Chain Management: Literature Review and Some Issues, Journal of Studies on Manufacturing (Vol.1-2010/Iss.Jain et al. / Supply Chain Management: Literature Review and Some Issues / pp. 11-25.

The eras are explained as under:

- **Creation era** The term "supply chain management" was first coined by Keith Oliver in 1982. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply-chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to Japanese management practices. However, the term became widely adopted after the publication of the seminal book Introduction to Supply Chain Management in 1999 by Robert B. Hand field and Ernest L. Nichols, Jr., which published over 25,000 copies and was translated into Japanese, Korean, Chinese, and Russian.
- **Integration era** This era of supply-chain-management studies was highlighted with the development of electronic data interchange (EDI) systems in the 1960s, and developed through the 1990s by the introduction of enterprise resource planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of Internet-based collaborative systems. This era of supply-chain evolution is characterized by both increasing value added and reducing costs through integration. A supply chain can be classified as a stage 1, 2 or 3 networks. In a stage 1–type supply chain, systems such as production, storage, distribution, and material control are not linked and are independent of each other. In a stage 2 supply chain, these are integrated under one plan and enterprise resource planning (ERP) is enabled. A stage 3 supply chain is one that achieves vertical integration with upstream suppliers and downstream customers. An example of this kind of supply chain is Tesco.
- **Globalization era** It is the third movement of supply-chain-management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains beyond national boundaries and into other continents. Although the use of global sources in organizations supply chains can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply-chain management in organizations with the goal of increasing their competitive advantage, adding value, and reducing costs through global sourcing.

- **Specialization era (phase I): outsourced manufacturing and distribution** In the 1990s, companies began to focus on "core competencies" and specialization. They abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements, as the supply chain extended beyond the company walls and management was distributed across specialized supply-chain partnerships. This transition also refocused the fundamental perspectives of each organization. Original equipment manufacturers (OEMs) became brand owners that required visibility deep into their supply base. They had to control the entire supply chain from above, instead of from within.

  Contract manufacturers had to manage bills of material with different part-numbering schemes from multiple OEMs and support customer requests for work-in-process visibility and vendor managed inventory (VMI). The specialization model creates manufacturing and distribution networks composed of several individual supply chains specific to producers, suppliers, and customers that work together to design, manufacture, distribute, market, sell, and service a product. This set of partners may change according to a given market, region, or channel, resulting in a proliferation of trading partner environments, each with its own unique characteristics and demands.
- **Specialization era (phase II): supply-chain management as a service** Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management (storage and inventory), and non-asset-based carriers, and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution, and performance management.

  Market forces sometimes demand rapid changes from suppliers, logistics providers, locations, or customers in their role as components of supply-chain networks. This variability has significant effects on supply-chain infrastructure, from the foundation layers of establishing and managing electronic communication between trading partners, to more complex requirements such as the configuration of processes and work flows that are essential to the management of the network itself. Supply-chain specialization enables companies to improve their overall competencies in the same way that outsourced manufacturing and distribution has done; it allows them to focus on their core competencies and assemble networks of specific, best-in-class partners to contribute to

the overall value chain itself, thereby increasing overall performance and efficiency. The ability to quickly obtain and deploy this domain-specific supply-chain expertise without developing and maintaining an entirely unique and complex competency in house is a leading reason why supply-chain specialization is gaining popularity.

Outsourced technology hosting for supply-chain solutions debuted in the late 1990s and has taken root primarily in transportation and collaboration categories. This has progressed from the application service provider (ASP) model from roughly 1998 through 2003, to the on-demand model from approximately 2003 through 2006, to the software as a service (SaaS) model currently in focus today.

- **Supply-chain management 2.0 (SCM 2.0)** Building on globalization and specialization, the term "SCM 2.0" has been coined to describe both changes within supply chains themselves as well as the evolution of processes, methods, and tools to manage them in this new "era". The growing popularity of collaborative platforms is highlighted by the rise of Trade Card's supply-chain-collaboration platform, which connects 8 multiple buyers and suppliers with financial institutions, enabling them to conduct automated supply-chain finance transactions.

  Web 2.0 is a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. At its core, the common attribute of Web 2.0 is to help navigate the vast information available on the Web in order to find what is being bought. It is the notion of a usable pathway. SCM 2.0 replicates this notion in supply chain operations. It is the pathway to SCM results, a combination of processes, methodologies, tools, and delivery options to guide companies to their results quickly as the complexity and speed of the supply-chain increase due to global competition; rapid price fluctuations; changing oil prices; short product life cycles; expanded specialization; near-, far-, and off-shoring; and talent scarcity.

## 2.4 KEY DRIVERS OF SUPPLY CHAIN MANAGEMENT

Five supply chain drivers, Production, Inventory, Location, Transportation, and Information, influence the performance of the supply chain. Companies can develop and manage these drivers to emphasize the ideal balance between responsiveness and efficiency, depending on your business and financial requirements.

Responsiveness to customer demands and expectations drives continuous innovation in products and how customers are served. Prioritizing responsiveness enables companies to accommodate unexpected fluctuations in the market and changes in customer preferences successfully.

On the other hand, the push for efficiency increases productivity and lowers products' prices, making them available to a broad population segment. Yet efficiency requires predictability and stability, which has been hard to come by since March of 2020.

Optimizing responsiveness and efficiency is a continuous battle for most companies. This article looks at each of the five drivers in closer detail to see how your organization can more effectively balance these drivers and the pros and cons you can expect to consider.

The first and foremost driver of supply chain management is:

**PRODUCTION**

This driver can be made very responsive by building factories that have a lot of excess capacity and use flexible manufacturing techniques to produce a wide range of items. To be even more responsive, a company could do their production in many smaller plants that are close to major groups of customers so delivery times would be shorter. If efficiency is desirable, then a company can build factories with very little excess capacity and have those factories optimized for producing a limited range of items. Further efficiency can also be gained by centralizing production in large central plants to get better economies of scale, even though delivery times might be longer.

The supply chain drivers are grouped under two main drivers:

a. Logistics drivers
b. Cross functional drivers

The following are the important drivers of the supply chain.

**a. LOGISTICS DRIVERS:**

- Facilities — warehouse or storage locations or factory location.

- Inventory — stock of raw materials or finished goods
- Transportation— moving of goods from one place to another.

**b. CROSS FUNCTIONAL DRIVERS:**

- Pricing – cost of goods
- Information — information is nothing but the customer needs and wants
- Sourcing — procuring raw materials for production activities.

**1. LOCATION/FACILITIES**

Facility is the physical place where the purchased product is kept in the first physical facility in the supply chain network. This location can be either the first (production site) or second (storage location) type. The performance of the supply chain is thought to be significantly influenced by decisions regarding location, as well as that location's capacity and capabilities, which can have both positive and negative effects.A location decision that emphasizes responsiveness would be one where a company establishes many locations that are close to its customer base. For example, fast-food chains use location to be very responsive to their customers by opening up lots of stores in high volume markets. Efficiency can be achieved by operating from only a few locations and centralizing activities in common locations. An example of this is the way e-commerce retailers serve large geographical markets from only a few central locations that perform a wide range of activities.

**2. INVENTORY**

Responsiveness can be had by stocking high levels of inventory for a wide range of products. Additional responsiveness can be gained by stocking products at many locations so as to have the inventory close to customers and available to them immediately. Efficiency in inventory management would call for reducing inventory levels of all items and especially of items that do not sell as frequently. Also, economies of scale and cost savings can be gotten by stocking inventory in only a few central locations such as regional distribution centers (DCs).

**3. TRANSPORTATION**

Responsiveness can be achieved by a transportation mode that is fast and flexible such as trucks and airplanes. Many companies that sell products through catalogs or on the Internet are able to provide high levels of responsiveness by using transportation to deliver their products often within 48 hours or less. FedEx and UPS are two companies that can provide very responsive transportation services. And now Amazon is expanding and operating its own transportation services in high volume markets to be more responsive to customer desires. Efficiency can be emphasized by transporting products in larger batches and doing it less often. The use of transportation modes such as ship, railroad, and pipelines can be very efficient. Transportation can also be made more efficient if it is originated out of a central hub facility or distribution center (DC) instead of from many separate branch locations.

**4. PRICING**

Pricing as a driver identifies the price that a company should or will charge for the products and services it offers along the supply chain. Pricing has an impact on consumer behavior, which has an impact on demand and supply chain efficiency. For example, if a transportation company charges differently depending on the lead time supplied by clients, price-sensitive consumers will likely place orders fast and customers who are patient will be prepared to order just before. Customers who value accountability are provided with it through pricing, while customers who do not value accountability as highly can benefit from cheaper expenses.

**5. INFORMATION**

The power of this driver grows stronger every year as the technology for collecting and sharing information becomes more wide spread, easier to use, and less expensive. Information, much like money, is a very useful commodity because it can be applied directly to enhance the performance of the other four supply chain drivers. High levels of responsiveness can be achieved when companies collect and share accurate and timely data generated by the operations of the other four drivers. An example of this is the supply chains that serve the electronics market; they are some of the most responsive in the world. Companies in these supply chains, the manufacturers, distributors, and the big retailers all collect and share data about customer demand, production schedules, and inventory levels. This enables companies in these supply

chains to respond quickly to situations and new market demands in the high-change and unpredictable world of electronic devices (smartphones, sensors, home entertainment and video game equipment, etc.).

## 6. SOURCING

Without effective sourcing, any organization won't carry out any specific supply chain management tasks like production, storage, or shipping. Strategic level sourcing decisions affect the supply chain's accountability and efficiency by determining what a company does, what it wants to do, and what its sources do. The business should work to keep its facilities efficient while making its manufacturing facilities extremely sensitive in high-cost locales. You should be aware that the cost of goods sold accounts for sourcing costs. Additionally, the funds paid to vendors are listed under accounts payable. Sourcing is the entire set of business processes required to purchase goods and services.

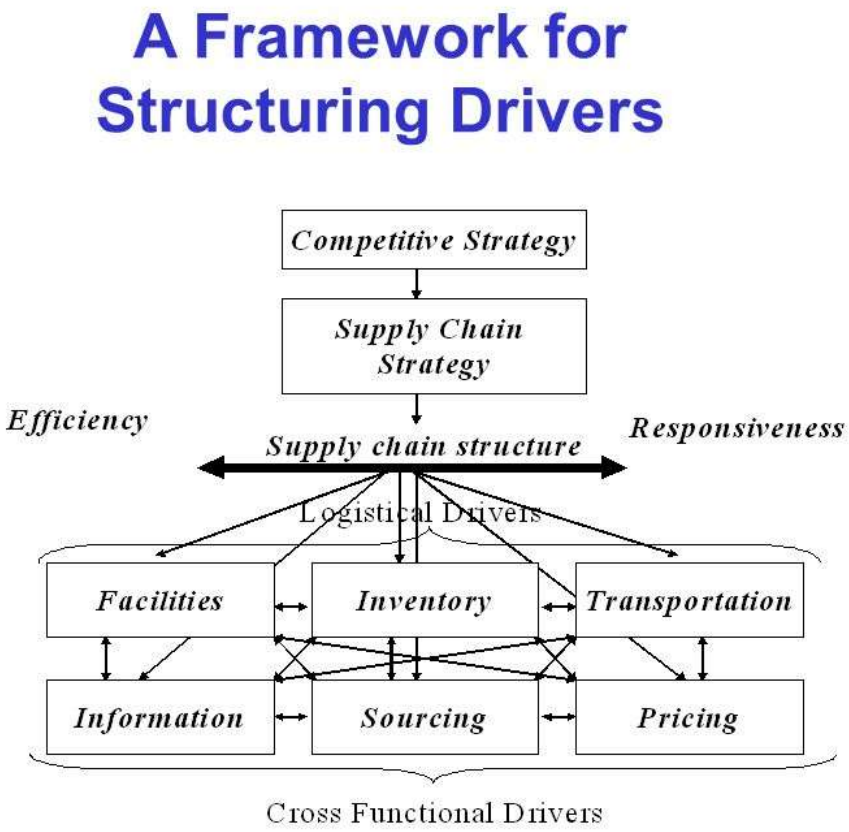

Fig. 2.2 Key drivers of supply chain management

| Supply Chain Drivers | Responsiveness | Efficiency |
|---|---|---|
| 1. Production | - Excess capacity<br>- Flexible manufacturing<br>- Many smaller plants | - Little excess capacity<br>- Narrow focus<br>- Few central plants |
| 2. Inventory | - High inventory levels<br>- Wide range of items | - Low inventory levels<br>- Fewer items |
| 3. Location | - Many locations close to customers | - Few central locations serve wide areas |
| 4. Transportation | - Frequent shipments<br>- Fast & Flexible modes | - Few large shipments<br>- Slower and cheaper modes |
| 5. Information | - Collect & share timely and accurate data | - Cost of information drops while other costs rise |

Fig. 2.3 Responsiveness and efficiency of supply chain drivers

**2.5 SUMMARY**

The evolution of supply chain management has been driven by a combination of factors, including advancements in technology, changes in customer expectations, and the need to compete in an increasingly global marketplace. As supply chain management continues to evolve, businesses will need to adapt to new technologies and processes to remain competitive and meet the changing needs of their customers.

The evolution of supply chain might now more than ever be a little more predictable than in the past, however supply chain professionals must always be looking for ways to adapt. Though our

railroads, highways, sea ports, and even airlines are more refined than ever, companies are always seeking ways to improve on value added activities and finding ways to minimize costs as much as possible. Days of looking for modes of transportation are slowly coming to an end as we have more ways than ever from logistics and transportation companies to ship products and services and low costs. Since 1960, companies are now more focused on value added processes like inventory control, proper demand planning, operations, and transportation.

To determine the performance of the supply chain, factors such as facility inventory, transportation, sourcing information, and pricing interact. Depending on your company and financial objectives, companies can design and manage these drivers to highlight the optimal balance between responsiveness and efficiency. Therefore, to maintain this balance, a company must assess the performance of the supply chain's drivers because doing so will also enable it to determine how and when it has achieved the strategic fit.

## 2.6 SELF-ASSESSMENT QUESTIONS

**Q1.** Explain creation era in supply chain management.

**Q2.** Discuss the evolution of the concept of supply chain management.

**Q3.** What do you meant by key drivers of supply chain management?

**Q4.** Enlist logistics and cross-functional drivers of supply chain management.

**Q5.** Throw light on early and later stages in the evolution of supply chain management.

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# UNIT 3: SUPPLY CHAINS: TYPOLOGY AND CYCLE VIEW; SCM: PROBLEMS AND SUGGESTED SOLUTIONS

**UNIT FRAMEWORK**



## 3.1 OBJECTIVE

The objective of the unit is

- To explain various models or types of SCM
- To discuss cycle view of SCM
- To explore various problems in SCM and their solutions

## 3.2 INTRODUCTION

Corporations have turned increasingly to global sources for their supplies. This globalization of supply management has forced companies to look for more effective ways to coordinate the flow of materials into and out of the company.

Companies and distribution channels compete more today on the basis of time and quality. Having a defect-free product to the customer faster and more reliably than the competition is no longer seen as competitive advantage but simply a requirement to be in the market. Customers demand products consistently delivered faster, exactly on time, and with no damage. Each of these necessitates closer coordination with supplier and distributors.

The global orientation and increased performance based competition combined with rapidly changing technology and economic conditions all contribute to market place uncertainty. This uncertainty requires great flexibility on the part of individual companies and distribution channels, which in turn demand more flexibility in channel relationship.

## 3.3 TYPOLOGY OF SUPPLY CHAINS

Supply chain management does not look the same for all companies. Each business has its own goals, constraints, and strengths that shape what its SCM process looks like. In general, there are often six different primary models a company can adopt to guide its supply chain management processes.

**Continuous Flow Model:** One of the more traditional supply chain methods, this model is often best for mature industries. The continuous flow model relies on a manufacturer producing the same good over and over and expecting customer demand will little variation.

The continuous model is a type of supply chain in which materials flow continuously and constantly through the production process. This type of supply chain is often used in manufacturing industries with a high demand for products and a need for consistent output.

One advantage of the continuous model is that it allows for just-in-time production, which can save on inventory costs. This type of production also eliminates waste, as materials are only produced when needed. A disadvantage of this model is that it can be challenging to change or adapt the production process if there is a sudden change in demand.

If you are considering using the continuous model for your business, it is essential to weigh the advantages and disadvantages to see if this type of supply chain is right for you.

**Agile Model:** This model is best for companies with unpredictable demand or customer-order products. This model prioritizes flexibility, as a company may have a specific need at any given moment and must be prepared to pivot accordingly.

**Fast Model:** The Fast Model is a supply chain model designed to help businesses make decisions quickly. This model is based on the principle that the faster a business can make decisions, the better off it will be. The Fast Model is designed to help companies to make decisions about inventory, production, and other aspects of their operations.

This model emphasizes the quick turnover of a product with a short life cycle. Using a fast chain model, a company strives to capitalize on a trend, quickly produce goods, and ensure the product is fully sold before the trend ends.

**Flexible Model:** The flexible model works best for companies impacted by seasonality. Some companies may have much higher demand requirements during peak season and low volume requirements in others. A flexible model of supply chain management makes sure production can easily be ramped up or wound down.

Many businesses use the Flexible Model as their primary supply chain model. The Flexible Model allows businesses to keep inventory levels low, which can reduce costs and increase profits. This model is especially popular in industries where demand can change rapidly, such as the fashion industry.

The biggest advantage of the Flexible Model is its ability to adapt to changing conditions. This flexibility can help businesses avoid stockouts and disruptions in the supply chain. The Flexible Model can also help companies to save money by reducing the need for safety stock.

There are some challenges associated with using the Flexible Model as your primary supply chain model:

This model requires close coordination between all supply chain members. This can be difficult to achieve, especially if your suppliers are worldwide.

This model can be expensive to implement since it requires more resources and infrastructure than other models.

The Flexible Model may not be suitable for all types of products or businesses; for example, it may not work well for products with long lead times or high levels of customization.

**Efficient Model:** For companies competing in industries with very tight profit margins, a company may strive to get an advantage by making their supply chain management process the most efficient. This includes utilizing equipment and machinery in the most ideal ways in addition to managing inventory and processing orders most efficiently.

**Custom Model/Custom configured model:** If any model above doesn't suit a company's needs, it can always turn towards a custom model. This is often the case for highly specialized industries with high technical requirements such as an automobile manufacturer.

A custom-configured supply chain model is designed specifically for a company's individual needs. This type of model takes into account the specific products, services, and materials that a company uses, as well as the unique way in which its supply chain operates. Custom-configured models are often used by companies with very complex or unique supply chains, such as the automotive or aerospace industries.

There are several benefits to using a custom-configured supply chain model:

1. It ensures that a company's supply chain is optimized specifically for its products and processes.
2. It allows a company to take into account changes in its business environment, such as new legislation or market conditions.
3. Custom-configured models can be adapted over time to reflect changes in a company's business model or operations.

The downside of custom-configured models is that they can be very expensive and time-consuming to develop. In addition, they require close collaboration between the modeling team and the company's decision-makers to succeed.

**The Inventory Model:** In business, the term "supply chain" is about transforming raw materials into finished goods and then getting those finished goods into the hands of the customer. The supply chain encompasses everything from the sourcing of raw materials to the manufacturing of products to the distribution and delivery of those products.

There are various inventory supply chain models that businesses can use, depending on their specific needs and goals. The three most common types of supply chain models are make-to-stock (MTS), make-to-order (MTO), and assemble-to-order (ATO).

The make-to-stock (MTS) model is the most common type of supply chain. In this model, finished goods are manufactured and stocked in anticipation of customer demand. When a customer orders, the finished product is simply pulled off the shelf and shipped out. This type of model is often used for fast-moving consumer goods (FMCG) like food and beverages, where customer demand is relatively easy to predict.

The make-to-order (MTO) model is similar to MTS, but businesses only stock raw materials or components instead of finished stocking goods. When a customer places an order, the necessary components are pulled from inventory and assembled into a finished product before being shipped out. This type of model is often used for customized products or products with a long lead time, like furniture or big-ticket items.

There is no right or wrong supply chain model, but some models are better suited than others to achieve a particular business's aims.

When it comes to supply chain modeling, businesses need first to develop a comprehensive understanding of the market they operate in, their customers' needs, and the business's operational objectives.

They can then evaluate the pros and cons of various supply chains and decide which approach best suits their specific aims. By combining different elements from various models, businesses may adopt a more bespoke supply chain strategy.

### 3.4 CYCLE VIEW OF SUPPLY CHAINS

A supply chain is a sequence of processes and flows that take place within and between different stages and combine to fill a customer need for a product. The supply chain process occurs in two ways, Cycle View and Push/Pull view. We will discuss cycle view in detail.

Not only manufacturers and suppliers, but additionally conveyors, retailers, warehouses and customers themselves are incorporated in the supply chain. A typical Supply Chain includes a variety of stages including customers, retailers, distributors, manufacturers, and component suppliers. The cycle View of the Supply Chain is subsidiary to making operational decisions as the role of each member of the Supply Chain is defined. Its goal is to convert customer advent into customer order.

Each cycle consists of six sub processes as shown in Figure 3.3-3.6. Each cycle starts with the supplier marketing the product to customers. A buyer then places an order that is received by the supplier. The supplier supplies the order, which is received by the buyer. The buyer may return some of the product or other recycled material to the supplier or a third party. The cycle of activities then begins all over again.

Depending on the transaction in question, the sub processes can be applied to the appropriate cycle. When customers shop online at Amazon, they are part of the customer order cycle—with the customer as the buyer and Amazon as the supplier. In contrast, when Amazon orders books from a distributor to replenish its inventory, it is part of the replenishment cycle— with Amazon as the buyer and the distributor as the supplier.

Within each cycle, the goal of the buyer is to ensure product availability and to achieve economies of scale in ordering. The supplier attempts to forecast customer orders and reduce the cost of receiving the order. The supplier then works to fill the order on time and improve efficiency and accuracy of the order fulfillment process. The buyer then works to reduce the cost

of the receiving process. Reverse flows are managed to reduce cost and meet environmental objectives.

Even though each cycle has the same basic subprocesses, there are a few important differences among the cycles. In the customer order cycle, demand is external to the supply chain and thus uncertain. In all other cycles, order placement is uncertain but can be projected based on policies followed by the particular supply chain stage. For example, in the procurement cycle, a tire supplier to an automotive manufacturer can predict tire demand precisely once the production schedule at the manufacturer is known. The second difference across cycles relates to the scale of an order. Whereas a customer buys a single car, the dealer orders multiple cars at a time from the manufacturer, and the manufacturer, in turn, orders an even larger quantity of tires from the supplier. As we move from the customer to the supplier, the number of individual orders declines and the size of each order increases. Thus, sharing of information and operating policies across supply chain stages becomes more important as we move further from the end customer.

A cycle view of the supply chain is useful when considering operational decisions because it clearly specifies the roles of each member of the supply chain. The detailed process description of a supply chain in the cycle view forces a supply chain designer to consider the infrastructure required to support these processes. The cycle view is useful, for example, when setting up information systems to support supply chain operations

The processes in a supply chain are divided into a series of cycle, each performed at the interface between two successive stages of a supply chain. A cycle view of the supply chain is very useful when considering operational decisions. It clearly specifies the roles and responsibilities of each member of the supply chain. It helps the designer to consider the infrastructure required to support the processes. Cycle view of Supply chain process includes,

- Customer order cycle (customer-retailer)
- Replenishment cycle (retailer-distributor)
- Manufacturing cycle (distributor-manufacturer)
- Procurement cycle (manufacturer-supplier)

Cycle view clearly defines processes involved and the owners of each process. It specifies the roles and responsibilities of each member and the desired outcome of each process.

A **customer order cycle** takes place when orders are processed, prepared, and shipped. For retail, the customer is often picking orders from the store inventory (shelves), which represents the point of final demand. In a pull logistics system, customer order cycles are particularly important since they are the driver of further cycles upstream of the supply chain.

The **replenishment cycle** concerns the steps involved to re-supply outlets from distribution centers and wholesalers. Each outlet places orders to distributors based on its own fluctuation of demand. It involves inventory that has already been manufactured and stored in different locations and parts of the supply chain.

The **manufacturing cycle** concerns the scheduling of production in light of the demand from distributors.

The **procurement cycle** involves the scheduling of the components required in the manufacturing of a good.

The frequency of the cycles varies, which is reflected in their respective inventory levels. Usually, retailers have significant fluctuations in their inventory levels since stores only carry a limited amount of inventory (on shelves and in the limited back store area). Once the inventory reaches a critical level, a new inventory is ordered from the distributor, which triggers a replenishment cycle. Since distributors have a higher level of inventory, the replenishment cycle tends to fluctuate less. This is even more so for manufacturers since they tend to have a relatively stable output due to the fixed capabilities of their equipment, labor, and tools. Still, flexible manufacturing systems are able to accommodate higher fluctuations.

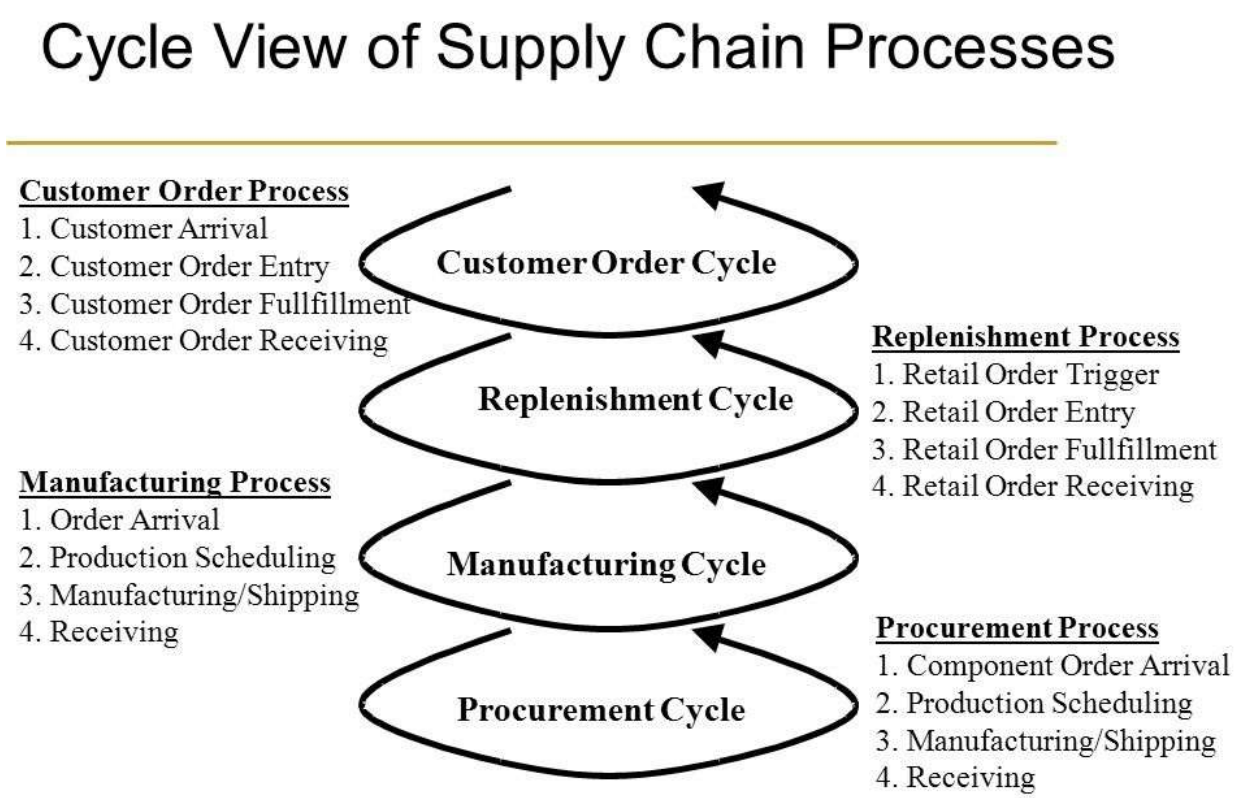


Fig. 3.1: Cycle view of supply chains

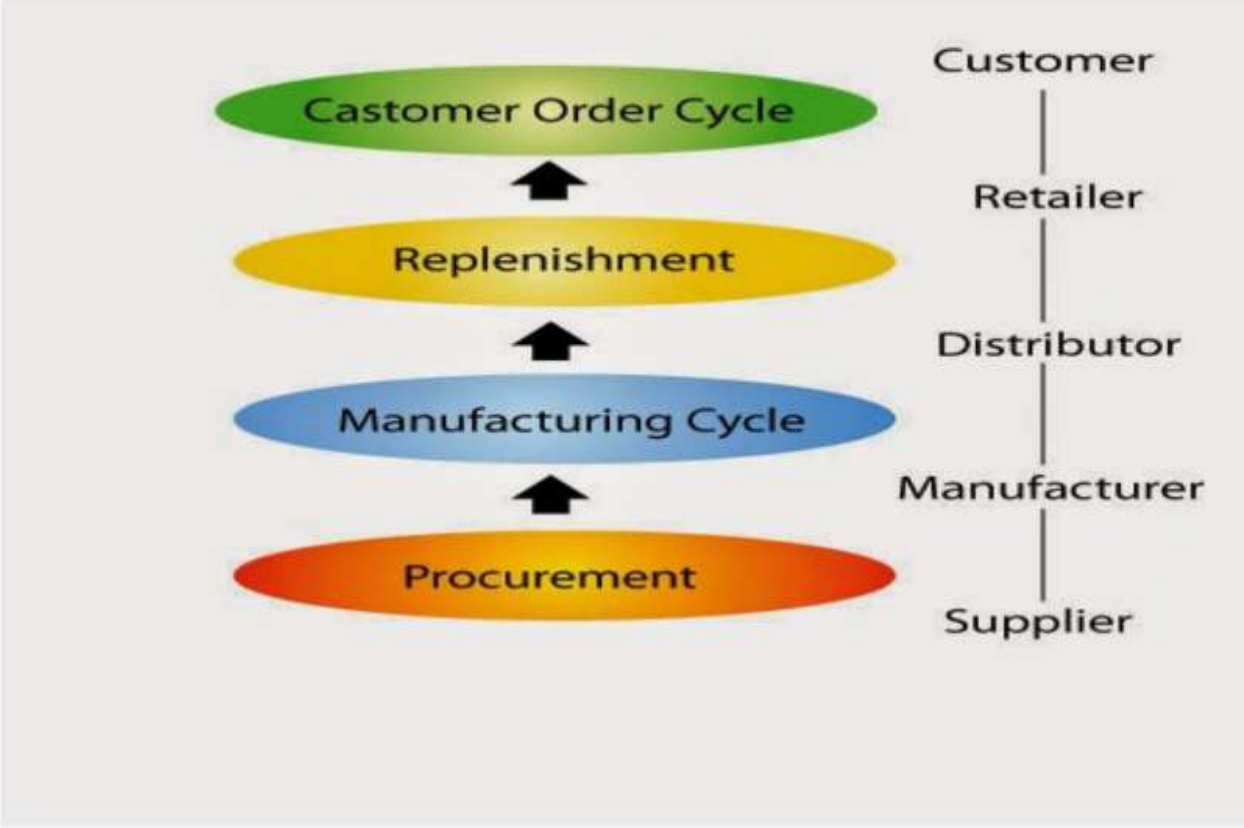


Fig. 3.2: Order of flow in supply chain

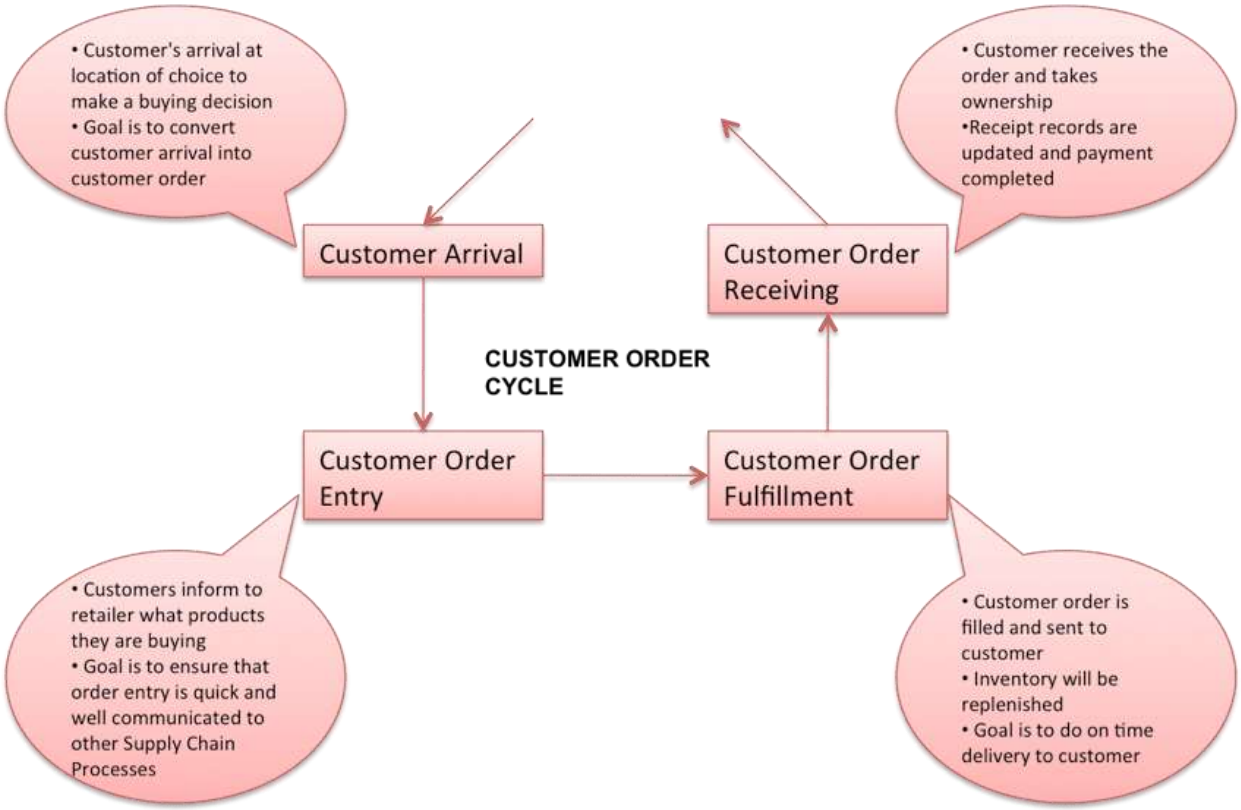


Fig. 3.3 Customer order cycle

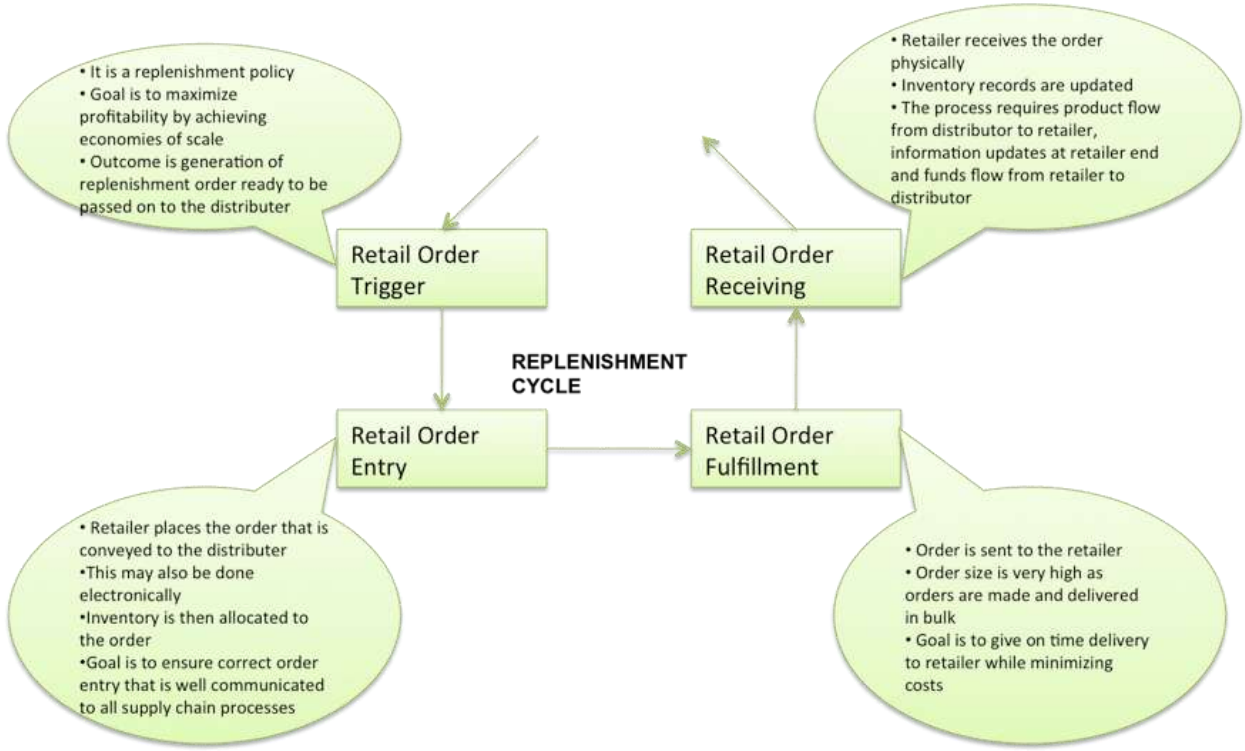

Fig. 3.4: Replenishment cycle

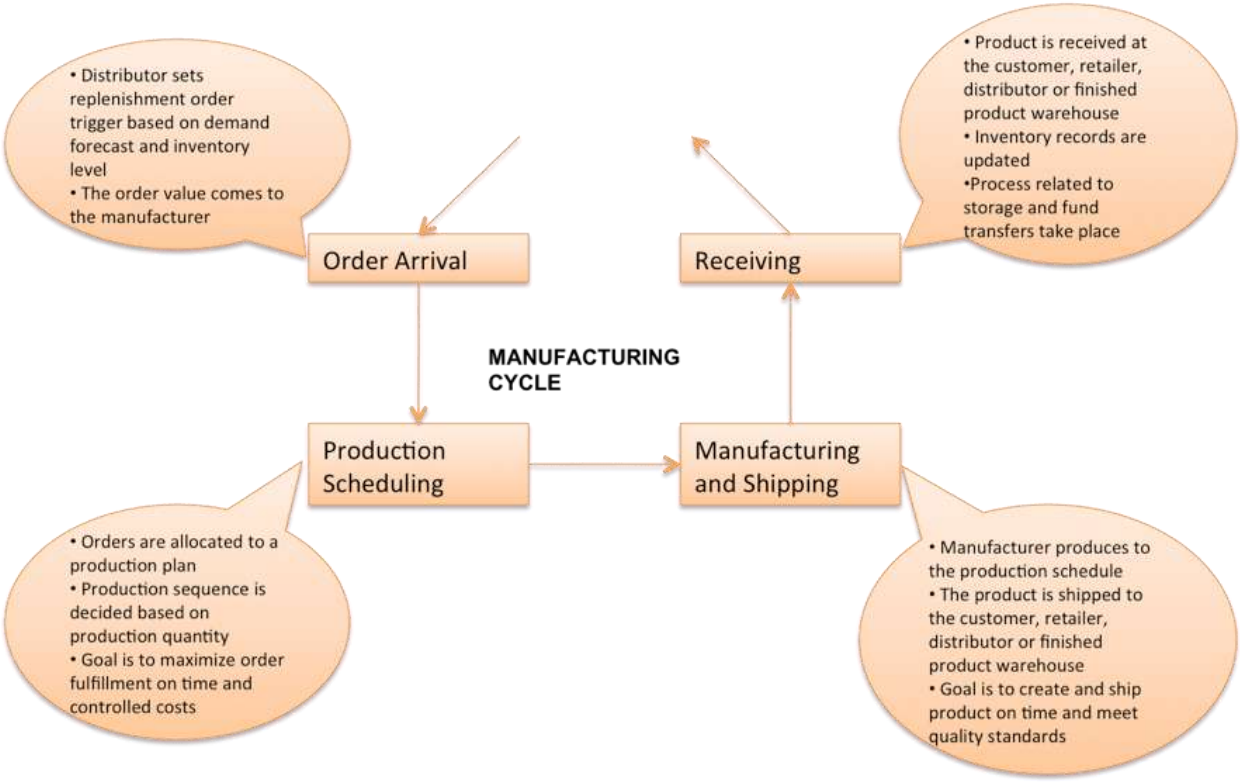


Fig. 3.5: Manufacturing cycle

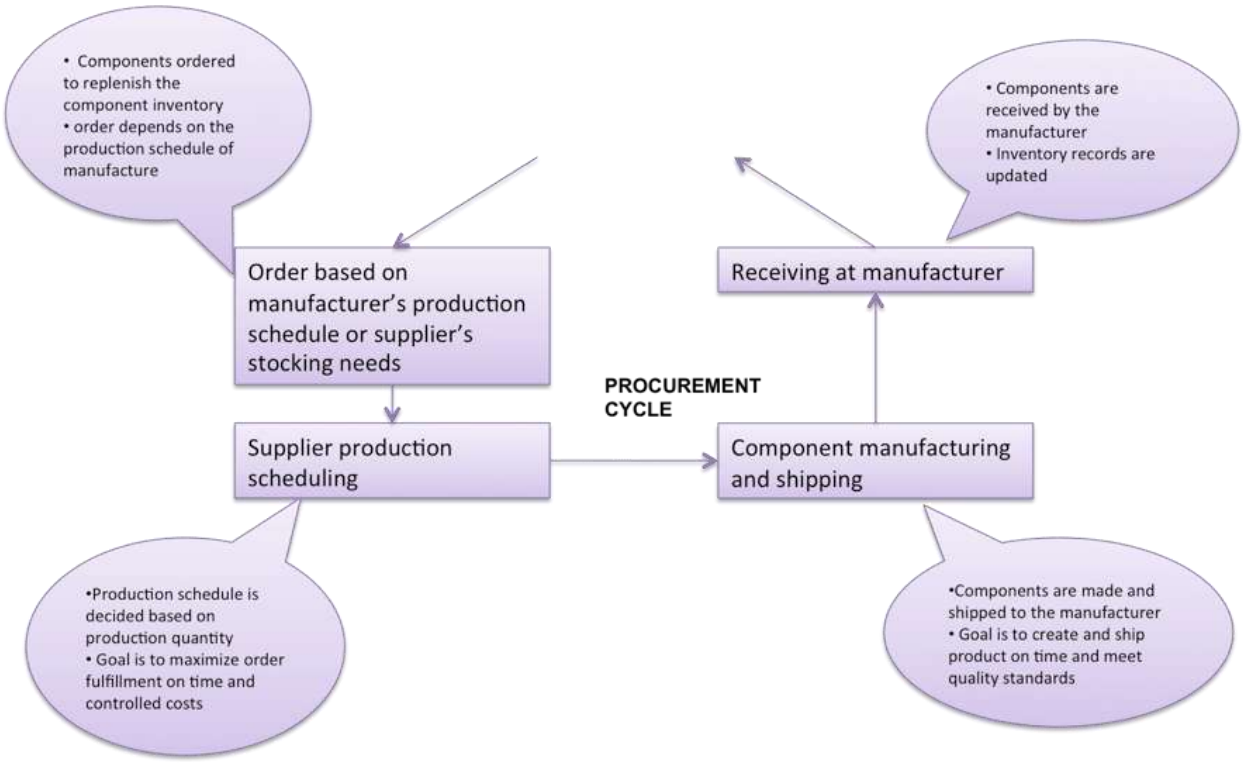


Fig. 3.6: Procurement cycle

### 3.5 SUPPLY CHAIN MANAGEMENT: PROBLEMS AND SUGGESTED SOLUTIONS

Supply chain management is a varied process that involves many stakeholders. Supply chain management is important for an organisation as it keeps track of the movement of raw materials required to assemble the finished product and to maintain optimal inventory levels to meet fluctuating customer demand.

Organisations must also maintain visibility to avert production hiccups by identifying areas that depend on a single supplier. There is a need for the modern supply chain to evolve to meet emerging demands and supply chain challenges, as this will allow organisations to retain competitive and business advantages. Supply chain management issues can involve various complexities. Supply chains are central to successful business operations, so any glitches affect brand value and revenue. A supply chain operations certification will help professionals gain key competencies for optimal performance

Many different factors cause issues in supply chain management, but here are the 10 most common ones, along with corresponding integrated supply chain solutions.

**1. Difficulty predicting consumer demand**

Consumer demand changed significantly during the pandemic and may continue to change going forward. These shifts lead to a significant supply chain concern for your business: difficulty accurately predicting consumer demand.

Accurately predicting how high consumer demand will be is essential to your supply chain management. Correctly forecasting consumer demand is one way to maximize your order fulfillment strategy, for example. Your demand predictions inform your company's raw materials purchases, resource allocation, manufacturing and more.

If consumer demand is lower than you predicted, your company will be left holding too much inventory. If you predict weak consumer demand but real demand is high, your inventory will be out of stock. Either of these two scenarios will cost your business.

Challenges with predicting consumer demand will also hurt your ability to budget and offer the best possible customer service.

**Solution:** The solution to demand-forecasting issues is to adjust your methods and rely on artificial intelligence (AI) to make those forecasts more accurate. Businesses that use AI as part of their supply chain management will be in good company. Oracle, Blue Yonder and Manhattan Associates are just some of the companies increasing their investments in AI for supply chain execution.

Your business may also want to consider the price elasticity of demand for your products or services. If your customers respond strongly to changes in price, you can use price adjustments to nudge customer demand to be more in line with your predictions.

**2. Shipping cost increases**

Shipping and logistics cost increases make moving your materials and finished products more and more expensive. As a business, you're left with two choices for dealing with these cost increases. You can either pass them along to your consumers or absorb them yourself and suffer a hit to your bottom line. Neither is an appealing option.

When demand for shipping is high relative to shipping capacity, you get higher shipping costs. Until demand decreases or capacity increases, shipping costs will remain high.

**Solution:** One solution companies use to deal with rising shipping costs is to consider alternative transportation methods. If ocean freight is too expensive, for example, ground transportation may be the better option for your business.

Ultimately, though, many companies end up raising their prices on customers to bring down their losses. That's why increasing shipping costs are one of the factors that predict rising inflation. Take steps to optimize your shipping costs to keep costs as low as possible for your customers.

**3. Long lead times**

Lead time is the amount of time that passes between the initiation and completion of a production process. If, for example, you place a purchase order on Jan. 1 and don't receive the delivery until Jan. 15, the lead time on that order is 14 days.

Every part of your supply chain will have a different lead time. Together, the separate lead times in your supply chain make up your total lead time for delivering products or services.

Long lead times in your supply chain can cause a longer total lead time. Because customers expect prompt deliveries, these long lead times can cost your business sales.

**Solution:** If you have unreliable suppliers in your supply chain, remove them. Choosing suppliers closer to your distribution centers and warehouses will also bring down lead times.

**4. Keeping up with technology**

In some ways, technologies like the Internet of Things (IoT) are blessings for supply chain management. Different technologies like AI and electric vehicles can make it easier than ever to get your products or services to customers.

Technology is helpful, however, only if your company can successfully implement it within your existing supply chain. That's where many businesses struggle. Your company needs to keep up with technology to stay ahead of your competition, but doing so requires a significant investment of time and money.

**Solution:** Look for places in your supply chain operations where technology would make the biggest impact. Start budgeting time and money to put that technology into action. Never stop looking for ways in which technology can help your supply chain management evolve.

**5. Sourcing from a reliable carrier**

Working with suppliers and business partners who are 100% reliable is always the goal for business owners. Finding reliable carriers isn't always easy, though.

When you hand off your materials or finished products to a carrier for transport, you have to trust that the items will be safe and sound while arriving on time at their intended destination. If your carriers aren't reliable, they may damage or delay your packages — a potentially costly supply chain problem.

**Solution:** Thoroughly vet all potential carriers your business may hire. Start with online research to find out whether the carriers have the resources to transport your goods and whether they specialize in a certain kind of shipping. If you see red flags, like a poor safety record in the Federal Motor Carrier Safety Administration (FMCSA) database, stay away from those carriers.

Doing your due diligence at the procurement stage will help protect your business from unreliable carriers.

**6. Risk management**

There’s a lot of inherent risk in your supply chain. While it isn’t possible to eliminate all of that risk, you can mitigate it with proper risk management.

Some of the internal and external risks you should address through supply chain risk management include:

Supplier bankruptcies

Theft

New government regulations

Natural disasters

Cybersecurity vulnerabilities

Any of these risk factors could severely disrupt your supply chain and impact your bottom line. Both known and unknown risks will always be in play, which is why supply chain risk management is so difficult.

**Solution:** Invest time and money in identifying, assessing and mitigating risks to your supply chain. Use software tools as part of a comprehensive supply chain risk management program. Your risk management should be ongoing — don’t “set it and forget it.”

**7. Labor shortages**

All along the supply chain, your business relies on workers. Labor shortages will hurt your business's ability to get your product or service to customers on time and without problems.

Consider how many different workers you need to deliver your finished product to consumers. You need workers to staff warehouses and distribution centers, dockworkers and longshoremen to operate ports, truck drivers to move your goods across land and more. Shortages of workers in even just one of those positions will interfere with your supply chain.

Several different factors can cause a labor shortage, including:

**Interindustry competition:** When there are more open jobs than available workers, different sectors have to compete for workers. Inevitably, some industries will not get enough workers and will suffer a labor shortage.

**Shifting priorities:** Recently, many workers have shifted their priorities toward flexibility or more time at home. This has left in-person jobs with fewer workers and applicants.

**Lower labor force participation:** Whenever fewer people participate in the labor force, a labor shortage can happen. For example, if a big chunk of the workforce retires and there aren't enough incoming workers to replace the retirees, the labor force participation will go down.

**Skills shortages:** Sometimes, the professionals in the workforce don't have the right skills to fit the industries looking for workers, leading to labor shortages in those particular industries.

Regardless of the cause of the labor shortage, it can result in a supply chain disruption.

**Solution:** To make sure you can get your products or services to customers, you have to either combat labor shortages or reduce your business's reliance on labor.

Your business can apply strategies like offering higher salaries and more perks to your employees to help with recruiting top candidates. You may also be able to train and cross-train your existing employees so they can fill in the gaps created by labor shortages.

Automation and product re-engineering are tools you can use to reduce your reliance on labor over the long term.

**8. Delayed port operations**

The pandemic caused heavy port congestion, which is still a problem today. When ships can't load or unload freight because the port stations are already at full capacity, port operations experience costly delays. Many important global docks are still suffering from supply chain bottlenecks.

Major ports aren’t able to move freight along at their usual speeds due to social-distancing requirements and labor shortages. Even once these issues go away, it will take some time for ports to operate at full speed again.

**Solution:** For the time being, your business should plan for delays while loading and unloading freight at ports. Adjust your delivery commitments accordingly.

**9. Poor logistics management**

Logistics management entails transportation, storage and delivery. Sometimes, logistics disruptions are unavoidable. Many of them arise from poor logistics management, though.

If your logistics management is poor, your business will have to deal with delivery delays and decreased customer satisfaction. That’s why logistics are critical.

**Solution:** Think of logistics as a series of interlocking parts and consider how each aspect affects the others. Automate logistics processes like delivery tracking when possible. When in doubt, turn to ecommerce analytics and other digital solutions for logistics management.

**10. Quality control**

Every business practices some form of quality control to ensure its products or services meet set standards. Quality control shouldn't start on your own production lines, though — it applies to all of the steps in the supply chain.

If your business has unaddressed quality control problems anywhere along the supply chain, your customers and brand reputation will suffer. Better quality control means a lower chance of returns and product failures.

**Solution:** Implement a strong production parts approval process (PPAP) to ensure that all of the components from suppliers meet your quality standards. Make your suppliers a part of your quality control process by connecting them to your quality management system (QMS).

## 3.6 SUMMARY

In this unit, we have discussed top six different supply chain models for enterprises, and they all come with their own pros and cons. It is essential for businesses to identify a suitable model for their supply chains that will meet their specific needs while helping them to avoid any additional costs.

Having the right supply chain model in place is as important as having the right people, processes and technology to manage the supply chain. It enables an enterprise to improve efficiency and can help it build resilience to disruptions and mitigate exposure to various risks. With the right model, companies can turn their supply chains into a competitive advantage.

A cycle view of a supply chain is very useful when considering operational decisions because the roles of each member of the supply chain are clearly outlined in the cycle view of the supply chain.

An agile and resilient supply chain is the need of the hour. However, resilience and agility cannot be built into a supply chain without carefully considering its design, implementation, and operation. This requires a change in mindset, the adoption of advanced technology and tools, and the inclusion of risk and agility KPIs along with the traditional KPIs of cost, quality, and service levels.

## 3.7 SELF-ASSESSMENT QUESTIONS

**Q1.** Discuss the various types of SCM.

**Q2.** What is meant by cycle view of SCM?

**Q3.** What do you understand by Agile and Continuous flow model.

**Q4.** What are the challenges being faced in SCM?

**Q5.** Discuss the remedies for overcoming the problems in SCM.

**Q6.** Describe customer order cycle.

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## CASE STUDY

McDonald's Food Chain McDonald's is a fast food chain with restaurants all over the world. It serves burgers and other fast food. It remains consistent in terms of cost and quality of burgers. To meet such high standards, it was essential to have an excellent supply chain management system. McDonald's was started as a drive-in restaurant by two brothers, Richard and Maurice McDonald in California, US in the year 1937. The business, which was generating $200,000 per annum in the 1940s, got a further boost with the emergence of a revolutionary concept called 'self-service.' Prices were kept low. Speed, service and cleanliness became the critical success factors of the business. By mid-1950s, the restaurant's revenues had reached $350,000. As a result, franchisees started showing interest. However, the franchising system failed because the

McDonald brothers observed very transparent business practices. As a consequence, imitators copied their business practices and emerged as competitors. In 1996, when McDonald's entered India, Mumbai-based Radhakrishna Foodland Private Limited (RFPL) was chosen as a distribution agent who would act as a hub for all its vendors. RFPL stored the products in controlled conditions in Mumbai and New Delhi and supplied them to McDonald's outlets on a daily basis. By transporting the semi-finished products at a particular temperature, the cold chain ensured freshness and adequate moisture content of the food. The specially designed trucks maintained the temperature in the storage chamber throughout the journey. From its experience in other countries, McDonald's was aware that supply chain management was undoubtedly the most important factor for running its restaurants successfully. In India as in other parts of the world, McDonald's had a very well orchestrated supply chain, called the 'cold chain'. Around the world (including India), approx. 85% of McDonald's restaurants were owned and operated by independent franchisees. Yet, McDonald's was able to run by outsourcing nine different ingredients used in making a burger from over 35 suppliers spread all over India through a massive value chain. McDonald's sourced its ingredients from all parts of India. For example, the iceberg lettuce was specially developed for India using a new culture farming technique. Thus, US-based fast food giant, McDonald's success in India had been built on four pillars: limited menu, fresh food, fast service and affordable price. Intense competition and demands for a wider menu drive-through and sitdown meals - encouraged the fast food giant to customize product variety without hampering the efficacy of its supply chain.

Questions

1. What business strategies were used in McDonald's food supply chain?

2. What was the role of outsourcing in SCM?

3. How McDonald's continues to be the fast food giant?

# BLOCK 2

# PLANNING AND ERP

## MBA : LOGISTICS AND SUPPLY CHAIN MANAGEMENT

## BLOCK 2: PLANNING AND ERP

In **Block 2** you will learn about Planning Demand and Supply; Supply Management; Concept of ERP in SCM; Evolution of ERP; Quick and Accurate Response System in SCM; Use of Other Planning Strategies.

**Unit 4** discusses Demand Planning; Supply Planning and Supply Management.

**Unit 5** explains the Concept of ERP in SCM; ERP Evolution; Quick Response System and Accurate Response System in SCM.

**Unit 6** deals with the Use of Other Planning Strategies.

## UNIT 4: PLANNING DEMAND AND SUPPLY; SUPPLY MANAGEMENT

**UNIT FRAMEWORK**

**4.1 OBJECTIVE**

The objective of the lesson is

To explain the Demand Planning

To explore the concept of Supply Planning and

To understand Supply Management.

**4.2 INTRODUCTION**

Businesses seeking to get the most value from their supply chain have a lot to deal with these days. To be competitive in today's environment, your company must employ the best sales and operation planning process possible. To be successful, it's key to understand all of the functions of your operations and the tools at your disposal. This unit will discuss demand planning and

supply planning by defining both terms and how they differentiate from one another. Supply management will also be discussed in this unit.

Often, demand planning and supply planning get confused with one another. While both are closely related, each is quite different. Demand and supply planners must work together closely, but most businesses have separate departments for demand and supply planning.

It can be challenging for these individual departments with contrasting functions to collaborate efficiently, but the dawn of integrated business planning has aided many businesses in this area.

## 4.3 PLANNING DEMAND AND SUPPLY

### 4.3.1 Demand Planning

In general, demand planning is the process of forecasting customer demand. Demand planners combine data sets from historical sales, market influences, retailer or distributor actions, and other conditions that may affect demand, such as social influences, school schedules or weather impacts. They use this data to forecast customer demand.

There are two types of demand planning: unconstrained and constrained. In unconstrained demand forecasting, the planner focuses solely on raw demand potential. This means they won't factor in possible constraints such as capacity and cash flow. Essentially, how much could you sell if supply wasn't an issue? Constrained forecasting, however, does take these factors into account, creating a more realistic approach.

Businesses should employ both unconstrained and constrained demand planning to give their customers the most value and keep supply costs down. When your business improves its demand forecasting, you also reduce the amount of inventory you hold to meet service targets, reducing costs. Bringing both together is essential in supporting executive Sales and Operations Planning as current, and future resources as considered in relation to demand.

There are four elements of demand planning that businesses should take into account:

**Appropriate Product History:** What you've sold in the past may indicate what you will sell in the future. This element involves choosing the best historical period and the right conditions but can be helpful in forecasting.

**Internal Trends:** Also using historical data, businesses determine trends based on another sales pattern in the product or group of products.

**External Trends:** Some factors that may influence a business's ability to meet its goals include competition, socio-cultural factors, legal, technological changes, economy, and political environment.

**Events and Promotions:** When businesses run events or promotions, there will often be an increase in sales. Demand planning must account for this as well.

Demand planning solutions enabled by Blue Ridge Global will help you effectively forecast and allow you to take a proactive approach to your supply chain.

The demand planning process estimates future demand for a company's products or services. It aims to align a company's supply with customer demand to minimize the associated risks. As a result, it helps companies to manage their inventory better, reduce costs, improve customer satisfaction, and increase profitability.


Fig. 4.1 Demand Planning

Some of the essential considerations in it include:

**Accuracy:** Forecasting demand accurately is difficult due to the unpredictable nature of consumer behavior and the impact of external factors such as economic conditions and market trends.

**Data quality:** The data used in the process is critical to forecasting accuracy. Quality data can lead to correct demand predictions, resulting in overstocking or stock shortages.

**Collaboration:** Effective planning requires cooperation and communication among different departments within a company. The lack of coordination between departments can lead to conflicting demand forecasts and inefficient supply chain management.

**Adaptability:** The process must be flexible and adaptable to changes in demand in real-time.

#### 4.3.1.1 Methods of Demand Planning

There are several methods used for such planning, including:

**Statistical forecasting:** This method uses statistical techniques such as time-series analysis, regression analysis, and exponential smoothing to forecast future demand based on historical data. Statistical forecasting is appropriate for products or services with a stable demand pattern and significant historical data.

**Judgmental forecasting:** This method uses expert judgment and intuition to forecast demand. Critical forecasting is often used when there is limited historical data or an uncertain demand pattern.

**Combined forecasting:** This method combines statistical and judgmental results to generate a more accurate demand forecast. This method is proper when the demand pattern is complex, and a combination of statistical and critical methods is required to create a precise prediction.

**Delphi method:** It involves a structured process where a panel of experts provides their forecasts, which are then consolidated and refined through a series of iterations. The goal of the Delphi method is to arrive at a consensus forecast that considers the views of multiple experts.

**Simulation modeling**: This method involves creating a mathematical model representing the demand for a product or service and simulating different scenarios to forecast the market. Simulation modeling is appropriate for products or services with complex demand patterns or situations where multiple factors impact demand.

**Promotional forecasting:** This method involves forecasting demand for a product or service during a promotion or advertising campaign. Promotional forecasting considers the impact of promotions and advertising on the market and helps companies plan for increased demand during these periods.

#### 4.3.1.2 Elements of Demand Planning

Its elements can be broadly categorized into three main components:

**Data collection and analysis:** This involves gathering and analyzing historical sales data, market trends, customer demographics, and other relevant information to develop a baseline for

forecasting future demand. The data collected and analyzed in this stage forms the basis for the demand forecast.

**Forecasting:** It involves the use of statistical models, judgmental methods, or a combination of both to estimate future demand for a company's products or services. The demand forecast considers the impact of various factors, such as seasonality, promotions, and market trends, on future demand.

**Demand planning in the supply chain:** It involves the development of a plan to ensure that the necessary products or materials are available in the right quantities at the right time to meet customer demand. It may include adjusting production schedules, inventory levels, and transportation plans.

In addition to these three main components, it also includes:

**Performance monitoring:** This involves continuously monitoring actual demand against the forecast to promptly identify and respond to changes in direction. Performance monitoring helps companies improve their demand forecasts' accuracy over time.

**Consensus building:** This involves reviewing and validating the demand forecast with relevant organizational stakeholders to ensure that all relevant departments understand the demand forecast and its underlying assumptions.

**Collaboration:** It requires cooperation and communication among departments within a company, including sales, marketing, finance, and production teams. The lack of coordination between departments can lead to conflicting demand forecasts and inefficient supply chain management.

**Adaptability:** Its process must be flexible and adaptable to changes in demand in real-time.

#### 4.3.1.3 Examples of Demand Planning

Let us understand it in the following ways.

**Example #1**

Suppose a clothing retailer, Amacon Ltd., wants to improve its process. The company has different departments, such as sales, marketing, finance, and production, generating its forecast of expected demand for other products. The process aims to align these forecasts into a single, unified demand plan that can inform decision-making and guide the development of supply chain strategies.

The first step in its process is to collect data on historical demand and relevant market trends, as well as forecasts and projections generated by different departments.

The next step is reconciling the different forecasts and projections to develop a consensus view of expected demand. This may involve adjusting individual forecasts to account for any discrepancies or outliers.

Once a consensus view of expected demand has been developed, all relevant stakeholders must agree on the demand plan, and any necessary adjustments must be made. The consensus demand plan is then communicated to all relevant departments and stakeholders, and the company works together to ensure that the project is implemented effectively.

**Example #2**

As per recent reports, with a spike in demand for luxury goods like sports vehicles and models with many features, Hyundai Motor India is trying to capitalize on growth prospects in rural areas. With more retail locations and initiatives like mobile service vans, the second-largest automaker in the nation hopes to increase its footprint in small towns and rural areas. The carmaker has over 5,000 employees working in rural areas, and its sales locations have already surpassed 600. Last year, Hyundai sales in rural areas reached one lakh.

**4.3.1.4 Importance of Demand Planning**

It is essential for several reasons:

**Improved customer satisfaction:** By accurately forecasting demand, companies can ensure sufficient quantities of products or services to meet customer demand. It helps to minimize stock shortages and reduces the risk of disappointing customers.

**Increased efficiency:** It enables companies to optimize their supply chain processes, reducing waste and maximizing the use of resources. It helps to reduce costs and improve overall efficiency.

**Better inventory management:** By continuously monitoring actual demand against the demand forecast, companies can adjust their inventory levels to minimize the risks associated with overstocking or stock shortages. It helps to ensure that the right products are available at the right time, improving customer satisfaction and reducing costs.

**Improved decision-making:** It provides companies with valuable information about future demand for their products or services. This information can inform strategic decision-making, such as product development and marketing initiatives.

**Better resource allocation:** By forecasting demand, companies can make informed decisions about resource allocation, such as raw materials and production capacity.

**Enhanced collaboration:** It involves collaboration between different departments within a company, such as sales, marketing, finance, and production. It helps ensure that all relevant departments understand the demand forecast and its underlying assumptions, improving communication and collaboration.

**Increased competitiveness:** It helps companies stay ahead of the competition by ensuring they have the right products or services available at the right time. It helps to increase market share and improve overall competitiveness.

#### 4.3.1.5 Demand Planning Functions

Demand planners must consider data from several sources when coming up with their forecasts. These sources may include past sales data, the effects of advertising and marketing, the behavior

of distributors and retailers, and even socio-political climate. Both types of demand forecasts make use of these sources.

The two types of demand projections include constrained demand forecasting and unconstrained demand forecasting. Constrained demand forecasting considers the business' limitations in meeting the demand for their products or services. By preempting and planning for these constraints, a company will better meet customer service targets while lowering costs.

On the other hand, unconstrained demand forecasting is somewhat like a thought experiment where planners imagine the maximum demand potential without limitations, like the company's production capacity and capital-output.

Unconstrained demand forecasting can help give the company a target to aim for, however unattainable it may be. Many businesses utilize both types of demand forecasting, as both can prove advantageous.

Some businesses only make use of constrained demand forecasting, though companies that make use of integrated business planning utilize both unconstrained and constrained demand forecasting. Employing both types will significantly aid a business in operating more efficiently in the short term while also scaling its operations in the long run.

### 4.3.2 Supply Planning

While demand planning involves forecasting customer demand, supply planning determines how a business will fulfill that demand while still meeting its financial and service goals. Therefore, supply planning should factor in various aspects related to inventory production and logistics. These factors may include on-hand quantities, open and planned customer orders, minimum order quantities, lead times, production leveling, safety stocks, and demand.

There are five functions of supply planning:

**Acquisition:** This step involves purchasing raw materials needed for the final product. Purchasing supplies is essential for manufacturing to take place and should include having visibility to your suppliers and their suppliers.

**Business Operations:** This is where demand forecasting comes in. At this step, you need to know how much product must be produced, to calculate the demand and decide how much inventory you will need.

**Transportation and Logistics:** This component organizes the parts of planning, buying, manufacturing, storage, and transportation to ensure items reach the end customer.

**Management of Resources:** Here, businesses ensure that enough resources are available and optimally distributed.

**Workflow of Information:** Exchanging information keeps supply chain management on track. This process ensures a standardized system is in place across all departments.

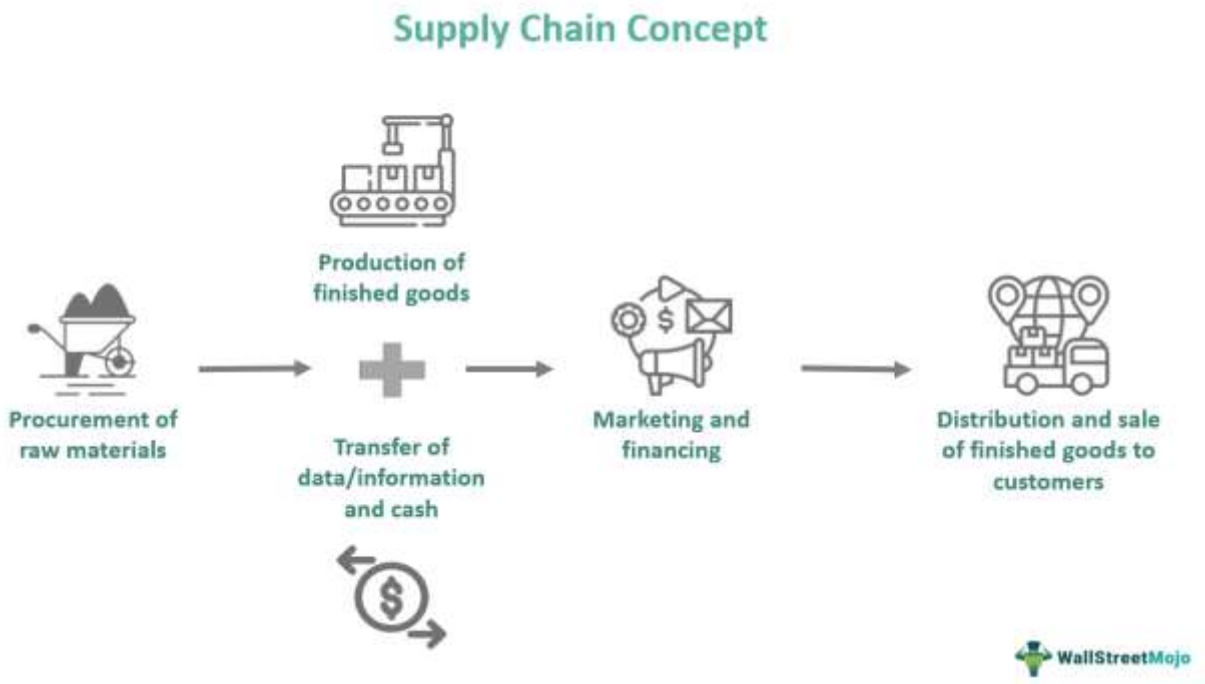


Fig. 4.2 Supply Planning

Many businesses will use supply planning software to automate inputting a demand plan and all its data into generating a master production schedule. Then, once the supply plan is created, they will review its capacity and impact on resources and revise it as needed.

Supply planning is the entire planning process which includes distribution, manufacturing, and procurement operations according to demand forecasts, considering capacity constraints and material availability. The goal of the process is planning supply that would satisfy the demand for the product/service offered in the best way possible.

Best practices for supply planning forms a supply structure that satisfies the demand effectively and efficiently by considering maintenance and stock policies, production and sourcing parameters (lead time, minimum order quantities, lot sizes, etc.). Vendor-managed inventory, strategic partnerships with suppliers and third-party manufacturers, inventory visibility, and flexible manufacturing to minimize the effects of demand volatility are some common components of these best practices.

A firm can vary supply of product by controlling a combination of the following two factors:

1. Production capacity

2. Inventory

The objective is to maximize profit, which, for our discussion, is the difference between revenue generated from sales and the total cost associated with material, capacity, and inventory. In general, companies use a combination of varying capacity and inventory to manage supply. In the following sections, we list some specific approaches to managing capacity and inventory with the goal of maximizing profits.

#### 4.3.2.1 Managing Capacity

In managing capacity to meet predictable variability, firms use a combination of the following approaches:

• **Time flexibility from workforce:** In this approach, a firm uses flexible work hours by the workforce to manage capacity to better meet demand. In many instances, plants do not operate continually and are left idle during portions of the day or week. Therefore, spare plant capacity exists in the form of hours when the plant is not operational. For example, many plants do not run three shifts, so the existing workforce could work overtime during peak periods to produce

more to meet demand. The overtime is varied to match the fluctuation in demand. This system allows production from the plant to match demand from customers more closely. If demand fluctuates by day of the week or week of the month and the workforce is willing to be flexible, a firm can schedule the workforce so that the available capacity matches demand better. In such settings, use of a part-time workforce can further increase capacity flexibility by enabling the firm to put more people to work during peak periods. Telemarketing centers and banks use part-time workers extensively to match supply and demand better.

• **Use of seasonal workforce:** In this approach, a firm uses a temporary workforce during the peak season to increase capacity to match demand. The tourism industry often uses seasonal workers. A base of full-time employees exists, and more are hired only for the peak season. Toyota regularly uses a seasonal workforce in Japan to match supply and demand better. This approach, however, may be hard to sustain if the labor market is tight.

• **Use of subcontracting:** In this approach, a firm subcontracts peak production so that internal production remains level and can be done cheaply. With the subcontractor handling the peaks, the company is able to build a relatively inflexible but low-cost facility in which production rates are kept relatively constant (other than variations from the use of overtime). Peaks are subcontracted out to facilities that are more flexible. A key here is the availability of relatively flexible subcontractor capacity. The subcontractor can often provide flexibility at a lower cost by pooling the fluctuations in demand across different manufacturers. Thus, the flexible subcontractor capacity must have both volume (fluctuating demand from a manufacturer) as well as variety flexibility (demand from several manufacturers) to be sustainable. For example, most power companies do not have the capacity to supply their customers with all the electricity demanded on peak days. They instead rely on being able to purchase power from suppliers and subcontractors who have excess electricity. This allows the power companies to maintain a level supply and, consequently, a lower cost.

• **Use of dual facilities—specialized and flexible:** In this approach, a firm builds both specialized and flexible facilities. Specialized facilities produce a relatively stable output of products over time in an efficient manner. Flexible facilities produce a widely varying volume and variety of products but at a higher unit cost. For instance, a PC components manufacturer

might have specialized facilities for each type of circuit board as well as a flexible facility that can manufacture all types of circuit boards. Each specialized facility can produce at a relatively steady rate, with fluctuations being absorbed by the flexible facility.

• **Designing product flexibility into the production processes:** In this approach, a firm has flexible production lines whose production rate can easily be varied. Production is then changed to match demand. Hino Trucks in Japan has several production lines for different product families. The production lines are designed so that changing the number of workers on a line can vary the production rate. As long as variation of demand across different product lines is complementary (i.e., when one goes up, the other tends to go down), the capacity on each line can be varied by moving the workforce from one line to another. Of course, this requires that the workforce be multiskilled and able to adapt easily to being moved from line to line. Production flexibility can also be achieved if the production machinery is flexible and can be changed easily from producing one product to producing another. This approach is effective only if the overall demand across all the products is relatively constant. Several firms that produce products with seasonal demand try to exploit this approach by carrying a portfolio of products that have peak demand seasons distributed over the year. A classic example is that of a lawn mower manufacturer that also manufactures snowblowers to maintain a steady demand on its factory throughout the year. In the services field, an example comes from strategy consulting firms, which often offer a balanced product portfolio, with growth strategies emphasized when economic times are good and cost-cutting projects emphasized when times are bad. Managing Inventory When managing inventory to meet predictable variability, firms use a combination of the following approaches:

• **Using common components across multiple products:** In this approach, a firm designs common components to be used in multiple products. The total demand of these components is relatively stable, even though each product displays predictable variability. The use of a common engine for both lawn mowers and snowblowers allows for engine demand to be relatively stable even though lawn mower and snowblower demand fluctuates over the year. Therefore, the part of the supply chain that produces components can easily synchronize supply with demand, and a relatively low inventory of parts has to be built up. Similarly, in a consulting firm, many of the

same consultants produce growth strategies when they are in demand and cost-reduction strategies when these are in demand.

• **Build inventory of high-demand or predictable-demand products:** When most of the products a firm produces have the same peak demand season, the previous approach is not feasible. In such an environment, it is best for the firm to build products that have more predictable demand during the off-season, because there is less to be learned about their demand by waiting. Production of more uncertain items should take place closer to the selling season, when demand is more predictable. Consider a manufacturer of winter jackets that produces jackets both for retail sale and for the Boston Police and Fire Departments. Demand for the Boston Police and Fire jackets is more predictable, and these jackets can be made in the off-season and stocked up until winter. The retail jacket's demand, however, will likely be better known closer to the time when it is sold, because fashion trends can change quickly. Therefore, the manufacturer should produce the retail jackets close to the peak season, when demand is easier to predict. This strategy helps the supply chain synchronize supply and demand better.

#### 4.3.2.2 The Functions of Supply Planning

Supply planning is about meeting demand forecasts as swiftly and accurately as possible, compelling you to oversee all the inventory production and logistics factors. These factors may include planned and received orders, existing inventory, setting expectations for lead times in manufacturing products, setting minimum order quantities, chasing demand, leveling production, and overseeing safety stocks.

#### 4.3.2.3 Integrated Business Planning For Collaboration

Having the supply planning and the demand planning departments collaborate seamlessly can be a challenge. However, overcoming these problems has never been easier than now, with the help of integrated business planning.

Integrated business planning utilizes data and input from both demand and supply planning departments to arrive at a single plan that they will follow, allowing both teams of planners to be consistent in both their long-term and short-term objectives.

## 4.4 SUPPLY MANAGEMENT

Every organization needs suppliers. No organization can exist without suppliers. Therefore, the organization's approach to suppliers, its acquisition processes and policies, and its relationships with suppliers will impact not only the performance of the suppliers, but also the organization's own performance. No organization can be successful without the support of its supplier base, operationally and strategically, short- and long-term.

Supply management is focused on the acquisition process recognizing the supply chain and organizational contexts. Special emphasis is on decision making that aligns the supplier network and the acquisition process with organizational goals and strategies and ensures short- and long-term value for funds spent.

There is no one best way of organizing the supply function, conducting its activities, and integrating suppliers effectively. This is both interesting and challenging. It is interesting because the acquisition of organizational requirements covers a very wide and complex set of approaches with different needs and different suppliers. It is challenging because of the complexity and because the process is dynamic, not static. Moreover, some of the brightest minds in this world have been hired as marketing and sales experts to persuade supply managers to choose their companies as suppliers. It is also challenging because every supply decision depends on a large variety of factors, the combination of which may well be unique to a particular organization.

For more than 75 years, this text and its predecessors have presented the supply function and suppliers as critical to an organization's success, competitive advantage, and customer satisfaction. Whereas in the 1930s this was a novel idea, over the past few decades there has been growing interest at the executive level in the supply chain management and its impact on strategic goals and objectives.

To increase long-term shareholder value, the company must increase revenue, decrease costs, or both. Supply's contribution should not be perceived as only focused on cost. Supply can and should also be concerned with revenue enhancement. What can supply and suppliers do to help the organization increase revenues or decrease costs? should be a standard question for any supply manager.

The supply function continues to evolve as technology and the worldwide competitive environment require innovative approaches. The traditionally held view that multiple sourcing increases supply security has been challenged by a trend toward single sourcing. Results from closer supplier relations and cooperation with suppliers question the wisdom of the traditional arm's-length dealings between purchaser and supplier. Negotiation is receiving increasing emphasis as opposed to competitive bidding, and longer-term contracts are replacing short-term buying techniques. E-commerce tools permit faster and lower-cost solutions, not only on the transaction side of supply but also in management decision support. Organizations are continually evaluating the risks and opportunities of global sourcing. All of these trends are a logical outcome of increased managerial concern with value and increasing procurement aggressiveness in developing suppliers to meet specific supply objectives of quality, quantity, delivery, price, service, and continuous improvement.

Effective purchasing and supply management contributes significantly to organizational success. This text explores the nature of this contribution and the management requirements for effective and efficient performance. The acquisition of materials, services, and equipment—of the right qualities, in the right quantities, at the right prices, at the right time, with the right quality, and on a continuing basis—long has occupied the attention of managers in both the public and private sectors.

Today, the emphasis is on the total supply management process in the context of organizational goals and management of supply chains. The rapidly changing supply scene, with cycles of abundance and shortages, varying prices, lead times, and availability, provides a continuing challenge to those organizations wishing to obtain a maximum contribution from this area. Furthermore, environmental, security, and financial regulatory requirements have added considerable complexity to the task of ensuring that supply and suppliers provide competitive advantage.

### 4.4.1 Supply Management Terminology

Some academics and practitioners limit the term purchasing to the process of buying: learning of the need, locating and selecting a supplier, negotiating price and other pertinent terms, and

following up to ensure delivery and payment. This is not the perspective taken in this text. Purchasing, supply management, and procurement are used interchangeably to refer to the integration of related functions to provide effective and efficient materials and services to the organization. Thus, purchasing or supply management is not only concerned with the standard steps in the procurement process: (1) the recognition of need, (2) the translation of that need into a commercially equivalent description, (3) the search for potential suppliers, (4) the selection of a suitable source, (5) the agreement on order or contract details, (6) the delivery of the products or services, and (7) the payment of suppliers.

Further responsibilities of supply may include receiving, inspection, warehousing, inventory control, materials handling, packaging scheduling, in- and outbound transportation/ traffic, and disposal. Supply also may have responsibility for other components of the supply chain, such as the organization's customers and their customers and their suppliers' suppliers. This extension represents the term supply chain management, where the focus is on minimizing costs and lead times across tiers in the supply chain to the benefit of the final customer. The idea that competition may change from the firm level to the supply chain level has been advanced as the next stage of competitive evolution.

In addition to the operational responsibilities that are part of the day-to-day activities of the supply organization, there are strategic responsibilities. Strategic sourcing focuses on long-term supplier relation and commodity plans with the objectives of identifying opportunities in areas such as cost reductions, new technology advancements, and supply market trends.

Lean purchasing or lean supply management refers primarily to a manufacturing context and the implementation of just-in-time (JIT) tools and techniques to ensure every step in the supply process adds value, that inventories are kept at a minimum level, and that distances and delays between process steps are kept as short as possible. Instant communication of job status is essential and shared.

### 4.4.2 Global Supply Management

Supply is becoming more global. Since the end of World War II, many different events and forces have relaxed barriers to world trade. Geopolitical events of the past two decades, such as

the creation of the European Union (EU), the disintegration of the USSR, the reunifi cation of Germany, the North American Free Trade Agreement (NAFTA), the emergence of China and India as global economic powers, and the growth of other emerging economies such as Brazil and the Russian Federation have created major opportunities for the global economy. Furthermore, changes to the global political landscape are continuing at a rapid pace. To seize opportunities in the global marketplace, companies are deploying their organizations on a global scale. For supply managers, this represents the opportunity to deliver improved value to end customers by developing world-class supply relationships in terms of cost, quality, delivery, and performance. Global supply for many companies is a competitive necessity. Managing international supply networks presents a number of challenges in areas such as source identifi cation and evaluation, international logistics, communications and information systems, and risk management.

## 4.5 SUMMARY

Effective demand planning and forecasting is the key to driving business growth and customer satisfaction. Your demand planning reflects how closely you know your customers and their expectations. Demand planning and forecasting tools that can be easily integrated into existing SCM and provide dependable feedback have become a necessity to cohesive, successful SCM environment. Finding and adding the right demand planning and forecasting tool can form the next big step for your collaborative business strategy. Forecasting and demand planning is a practice which not only strengthens the bond between various segments of the supply chain but also between the supply chain and the end customer. The objective of supply planning is to balance supply and demand to achieve your organization's financial and service objectives. Supply plans generate a recommended schedule for purchasing or manufacturing items and list the recommended purchase orders and work orders based on lead times and expected demand. This all ensures products are available to fulfill customer orders.

## 4.6 SELF-ASSESSMENT QUESTIONS

**Q1.** What is Demand Planning? Discuss its functions.

**Q2.** Explain Supply Management and Global Supply Management.

**Q3.** Describe the term ‘Supply Planning’.

**Q4.** What are the different methods of Demand Planning?

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# UNIT 5: ERP: EVOLUTION AND CONCEPT; SCM: QUICK AND ACCURATE RESPONSE SYSTEM

## UNIT FRAMEWORK

## 5.1 OBJECTIVE

After reading this unit, you will be able to understand the

- Concept of ERP in SCM
- Evolution of ERP
- Quick Response System
- Accurate Response System

## 5.2 INTRODUCTION

Enterprise Resource Planning (ERP) is made to automate any task. With ERP, it is easy to manage every department under one single database. This consumes not much time and is easy and fast way to do work with.

Example:
Any enterprise's planning, manufacturing, sales and marketing efforts are put under one management system and then it combines to one single database system.

## 5.3 CONCEPT OF ERP IN SCM

ERP refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk management and compliance, and supply chain operations. A complete ERP suite also includes enterprise performance management, software that helps plan, budget, predict, and report on an organization's financial results.

ERP systems tie together a multitude of business processes and enable the flow of data between them. By collecting an organization's shared transactional data from multiple sources, ERP systems eliminate data duplication and provide data integrity with a single source of truth.

Today, ERP systems are critical for managing thousands of businesses of all sizes and in all industries. To these companies, ERP is as indispensable as the electricity that keeps the lights on.

Widely used in businesses of all sizes, ERP is considered a must-have for large enterprises and is increasingly being deployed in growing small businesses. The complexity of the global economy and modern consumer demands has made streamlining business processes and managing and optimizing data critical. ERP is typically the foundation of these capabilities.

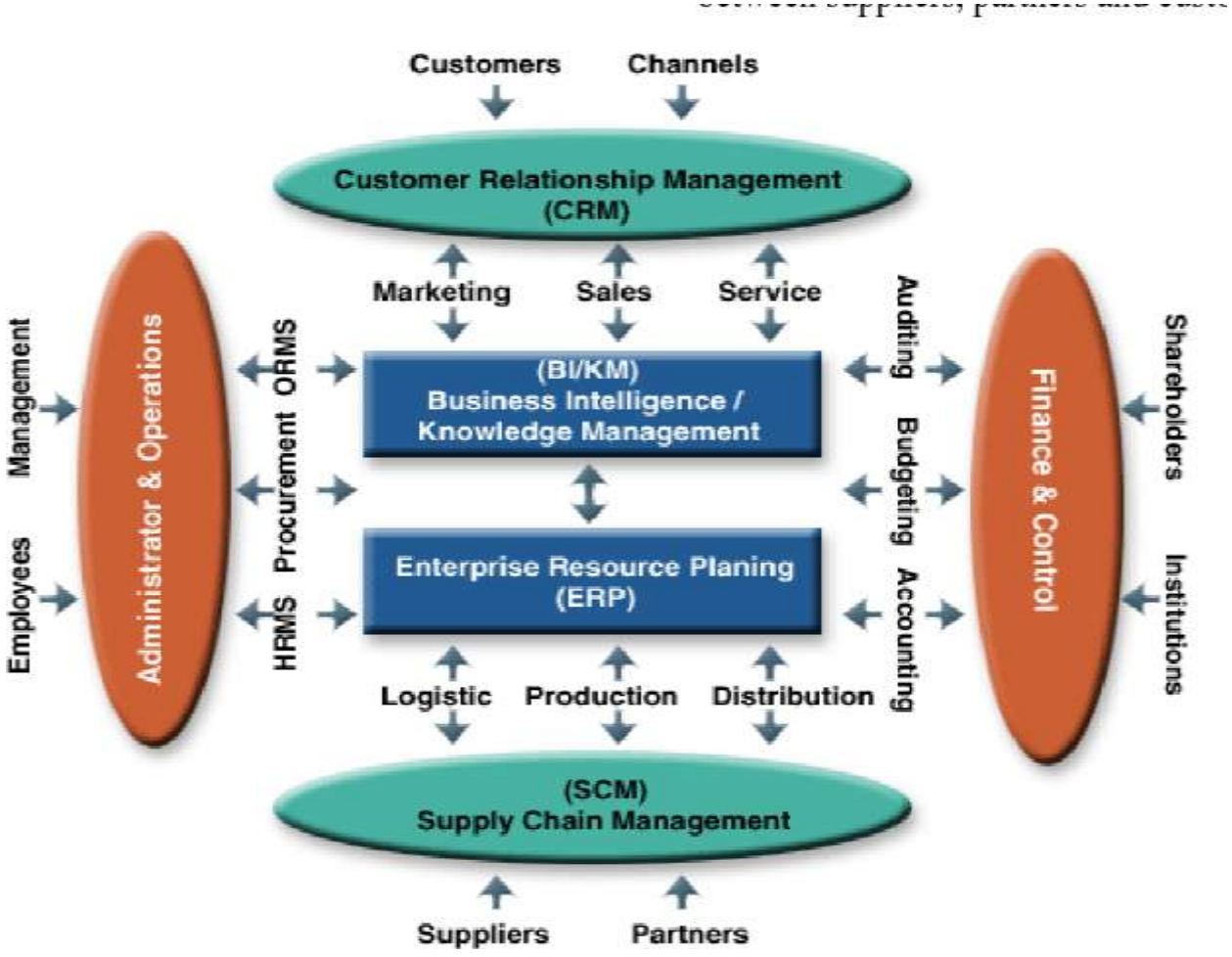



Fig. 5.1 Enterprise Resource Planning System

### 5.3.1 KEY COMPONENTS OF AN ERP SYSTEM

An ERP system consists of software components, or modules, each of which focuses on a distinct business process. Certain modules are considered "core" to nearly every type of business and the first to be deployed:

The ERP finance module automates basic accounting, invoicing, financial analysis, forecasting and reporting. It is often the main reason a company moves to ERP from standalone accounting software. The growing complexity of the business makes apparent the need to have a single system to manage all of the financial transactions and accounting for multiple business units or product lines.

Human resources (HR), also known as human capital management (HCM) is another core process that companies try to improve with ERP. Basic HCM handles employee records, benefits management and payroll but often adds talent management functions, such as recruiting and performance management.

Other ERP modules common to most businesses include order management, customer relationship management (CRM) and purchasing (procurement).

Companies involved in manufacturing or distribution typically add a supply chain management (SCM) module to track inventory levels and manage warehouses and transportation across the supply chain. If their business needs are complex, they might add a warehouse management system (WMS) and transportation management system (TMS) -- perhaps from different software vendors -- to manage these logistics functions.

### 5.3.2 TYPES OF ERP SYSTEMS

ERP products generally vary by the size of the company they're intended for, the type of computing infrastructure they run on and whether they have features specific to a particular industry.

- **Small businesses vs. midmarket vs. large enterprises**

For the small business market, some vendors make entry-level ERP that comes with core HR, finance and other commonly used modules, such as order management and CRM, and is relatively easy to implement.

Other products are meant for the so-called midmarket. Definitions vary, but midmarket is generally defined as companies with several hundred employees and annual revenues between $50 million and $1 billion. Midmarket ERP adds more optional modules, such as SCM and WMS, and can accommodate more users than entry-level ERP.

Some vendors of entry-level ERP sell to both small and midmarket (also called medium-sized) businesses -- often lumped together as SMBs -- and claim their products can "scale" to accommodate growth.

The top category is large enterprises: companies with more than $1 billion in revenue and typically thousands of employees. Not surprisingly, enterprise ERP systems usually have the most modules, with more capabilities in each module and capacity for thousands -- even hundreds of thousands -- of users.

- **On-premises vs. cloud vs. hybrid**

The first ERP systems sold in the 1970s through the 1990s all ran "on premises" on the company's computers. Nowadays, ERP is just as likely to run in the cloud on systems maintained by the vendor or a service provider, and users access the software over the internet from their desktop or mobile devices. Some systems combine on-premises and cloud modules in what's called hybrid ERP.

The different deployment "models" (as the industry calls cloud and on-premises options) have a major impact on an ERP product's capabilities, user-friendliness, cost, implementation speed and target market.

On-premises ERP typically must be paid for upfront, with a software license for a certain number of users. It usually takes the longest to implement -- projects can go on for years -- and upgrading to new versions can be slow. But on-premises ERP has two big advantages over most

types of cloud ERP. It can be customized to meet a unique business requirement and is often easier to integrate with other on-premises systems that are critical to business performance, such as factory automation or warehouse systems

Some companies are reluctant to put such mission-critical systems in the cloud for a variety of reasons, including perceived security risks or loss of data control. Others in highly regulated industries or government may be restricted by where systems and data must be located, which often means keeping the system on premises.

In contrast, cloud ERP usually requires less upfront money because it is paid for typically through a monthly subscription; though, over time, the fees can cost more than a license. The biggest savings usually come with multi-tenant SaaS ERP, a type of cloud ERP where different customers share the same copy of the software, which provides economies of scale that allow the vendor to pass some savings along. SaaS ERP also tends to be more streamlined and support fewer business processes than on-premises ERP, but this simplicity usually makes it easier to use.

Because of the cost savings and deployment speed of the cloud, many ERP products targeting SMBs are SaaS, though there are still some on-premises brands. Large enterprises have historically preferred on-premises ERP, mostly because they had more resources -- time, people and money -- to implement and maintain the complex systems. However, in the past decade or so, many large enterprises have moved to a hybrid model, adding cloud modules for HCM, finance and SCM.

Some ERP systems have features that are needed in specific industries, such as oil and gas, automotive manufacturing, food and beverage, retail and utilities. Often, the ERP vendor partners with a software developer with expertise in a specific industry to create add-ons for a general-purpose ERP system.

### 5.3.3 ROLE OF ERP IN SUPPLY CHAIN MANAGEMENT

ERP systems are all-in-one software suites that companies can use to run almost every aspect of their business. That includes managing the supply chain — the complex, interdependent set of

activities involved in analyzing demand, sourcing materials, manufacturing products and distributing those products to customers. Leading ERP systems include modules that handle key supply chain management functions, such as planning, procurement, manufacturing, inventory management, warehouse management and order management. They enable businesses to coordinate, streamline and automate these activities so they can consistently meet customer demand while reducing operating costs.

Because ERP systems store all business data in a single database, companies gain a unified view of supply chain operations alongside their financials and other important information. The integration among ERP modules helps companies better plan sourcing and manufacturing based on customer demand. This built-in integration also reduces or eliminates the challenges typically associated with integrating multiple applications to handle different supply chain functions. ERP systems also enable companies to automate supply chain operations, leading to time and cost savings while reducing the risk of human error.

Integration among ERP modules improves the flow of information between business units, making teams more collaborative and efficient. For example, access to accurate data on supplier contracts, supply chain capacity and customer demand helps procurement managers buy the right quantities of raw materials to maximize output and meet customer commitments, all while keeping costs under control. Similarly, a complete view of supply chain performance helps logistics leaders spot opportunities for efficiency gains.

### 5.3.4 BENEFITS OF USING ERP IN SUPPLY CHAIN MANAGEMENT

By using ERP to integrate essential supply chain tasks, such as demand planning, sourcing, manufacturing and order management, businesses can realize a wide range of benefits. Here are some of the most common ones:

**Improved efficiency** ERP systems improve supply chain management efficiency in multiple ways. They enable companies to streamline supply chain functions through automation. They improve visibility across the supply chain, so stakeholders can quickly make informed decisions about how to reduce costs in manufacturing, logistics and procurement.

**Increased customer retention** By integrating supply chain data and processes, ERP systems facilitate better planning, streamlined production schedules and more accurate estimates of delivery dates. These gains help businesses ensure that they can reliably fulfill their promises to customers. This consistent performance builds customer loyalty and retention.

**Workflow automation** Cloud-based ERP systems automate the flow of data within and between departments, accelerating supply chain processes while greatly reducing manual effort. For example, the system can automatically alert purchasing groups if the inventory of key raw materials falls below predetermined thresholds.

**Reduced overhead and operational costs** With better visibility into supply and demand, companies can optimize inventory — buying just enough to meet demand without overstocking. This can result in considerable warehouse space and cost savings. Automated processes also reduce administrative costs and errors — like ordering the wrong amounts of raw materials — that can have costly knock-on effects throughout the supply chain.

**Fewer IT issues** Using an ERP system for supply chain management can streamline IT as well as supply chain operations. Companies no longer need to tackle the complexities of integrating data from different software systems or learn how to operate applications from different vendors. ERP modules all share the same data in real time, eliminating the need to convert data between applications.

**Flexible supply chain solutions** Flexibility is essential to a modern supply chain. Companies must be able to quickly detect and respond to rapid shifts in supplier capacity, shipping routes and customer demand. Predictive analytics and scenario planning capabilities help companies identify and address potential risks before they affect operations.

**Fewer bottlenecks** Each step in the supply chain is dependent on preceding steps. For example, poor planning leads to a failure to procure materials at the right time, which leads to inadequate inventory and manufacturing bottlenecks. ERP systems help businesses identify potential bottlenecks, inform the teams involved and allocate the resources needed to maintain production capacity and keep delivering orders to customers on time.

### 5.3.5 ENTERPRISE RESOURCE PLANNING (ERP) ARCHITECTURES

When we talk about architecture of ERP it is also necessary to know how an ERP architecture works and how the system has been deployed in an organization. While the servers may be centralized, the clients are usually spread to multiple locations throughout the enterprise, although ERP applications are most commonly deployed in a distributed and often widely dispersed manner. ERP software and the results are presented to the end user through some user interface. The architecture that supports the connection between the database, processing, and presentation is called Client/Server architecture. The two most commonly implemented architectures are outlined below.

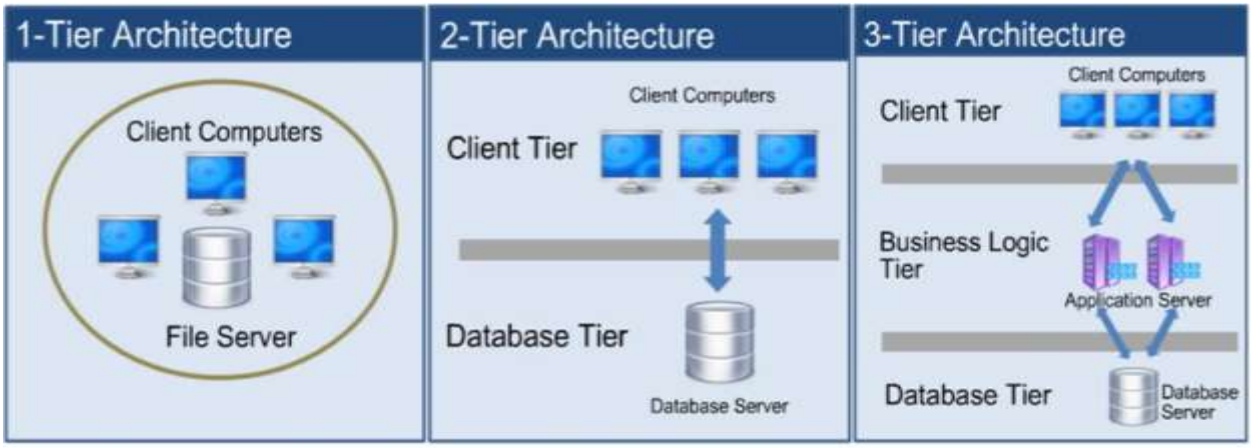



Fig 1: Different Tier Architecture

Fig. 5.2 Different Tier Architecture of ERP

**Two-tier Implementations**

In typical two-tier architecture, the server handles both application and database duties. The clients are responsible for presenting the data and passing user input back to the server. While there may be multiple servers and the clients may be distributed across several types of local and wide area links, this distribution of processing responsibilities remains the same.

**Three-tier Client/Server Implementations**

In three-tier architectures, the database and application functions are separated. This is very typical of large production ERP deployments. In this scenario, satisfying client requests requires two or more network connections. Initially, the client establishes communications with the application server. The application server then creates a second connection to the database server.

## 5.4 EVOLUTION OF ENTERPRISE RESOURCE PLANNING

Enterprise resource planning (ERP) has evolved as a strategic tool, an outcome of over four decades. This is because of continuous improvements done to the then available techniques to manage business more efficiently and also with developments and inventions in information technology field.

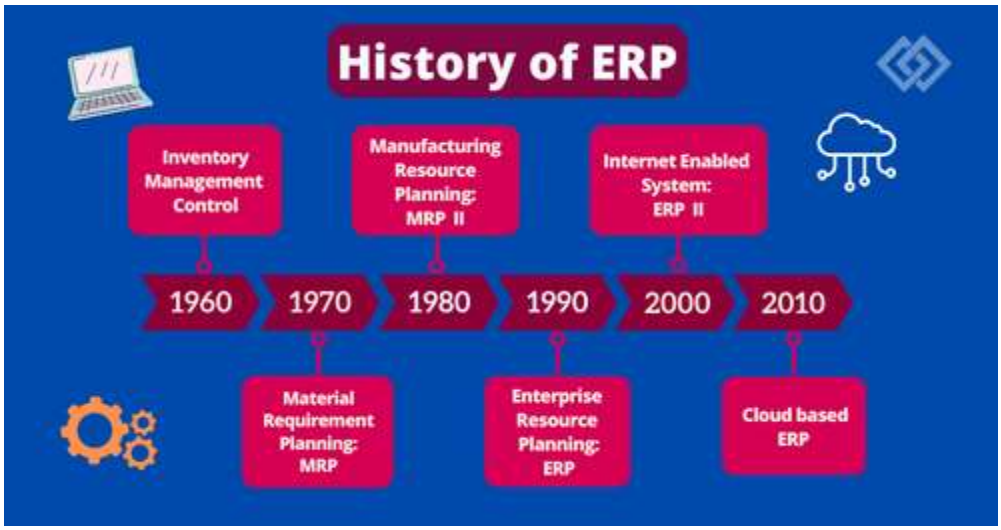



Fig. 5.3 History/Evolution of ERP

### 1. Pre Material Requirement Planning (Pre MRP) stage/Inventory management and control

Prior to 1960s businesses generally relied on traditional ways of managing inventories to ensure smooth functioning of the organizations. These theories are popularly known as 'Classical Inventory Management or Scientific Inventory Control Methods'. Most popularly used among

them were Economic Order Quantity (EOQ); Bill of Material (BOM) etc. However these systems had very limited scope.

ERP system has evolved from the Material Planning System of 1980's. There are various phases through which this evolution process has gone through. There are various phases of development of resource planning system in relation to time and evolution of concept of ERP.


Fig. 5.3.1 Inventory Management and Control

**2. Material Requirement Planning (MRP)**

MRP was the fundamental concept of production management and control in the mid-1970s and considered as the first stage in evolution of ERP. Assembly operations involving thousands of parts such as automobile manufacture led to large inventories. The need to bring down the large inventory levels associated with these industries led to the early MRP systems that planned the order releases. Such planned order releases ensured proper time phrasing and accurate planning of the sub-assembly items, taking into account complex sub-assembly to assembly relationships characterized by the Bill of Materials.

Example:

A typical example is a bicycle manufacture. To manufacture 100 units of bicycles, one needs 200 wheels, 100 foot-pedals, and several thousands of spokes. On a given day, a plant may have 40 units of complete bicycles in stock, 57 units of wheels, 43 units of foot-pedals and 879 units of spokes. If the plant is to assemble 20 units of bicycles for the next 4 days of production, wheels and spokes-is a non trivial problem. If the independent demand of the spare parts is also to be taken into account, one can visualize the complexity of it.

A typical automobile plant with hundreds, if not thousands of parts, has to face problems that are in order of magnitude even more difficult. MRP systems address this need. Using the processing power of computers, databases to store lead-times and order quantities and algorithms to implement Bill-of-Material (BOM) explosion, MRP systems brought considerable order into the chaotic process of material planning in a discrete manufacturing operation.

Essentially MRP addresses a single task in manufacturing alone. Material requirement planning (MRP) system was adopted by firms for creation and maintenance of master data and bill of material across all products and part within an organization. MRP on the other hand was an outgrowth of bill of material (BOM) processing, which is purchase order management that utilizes parts list management and parts development.

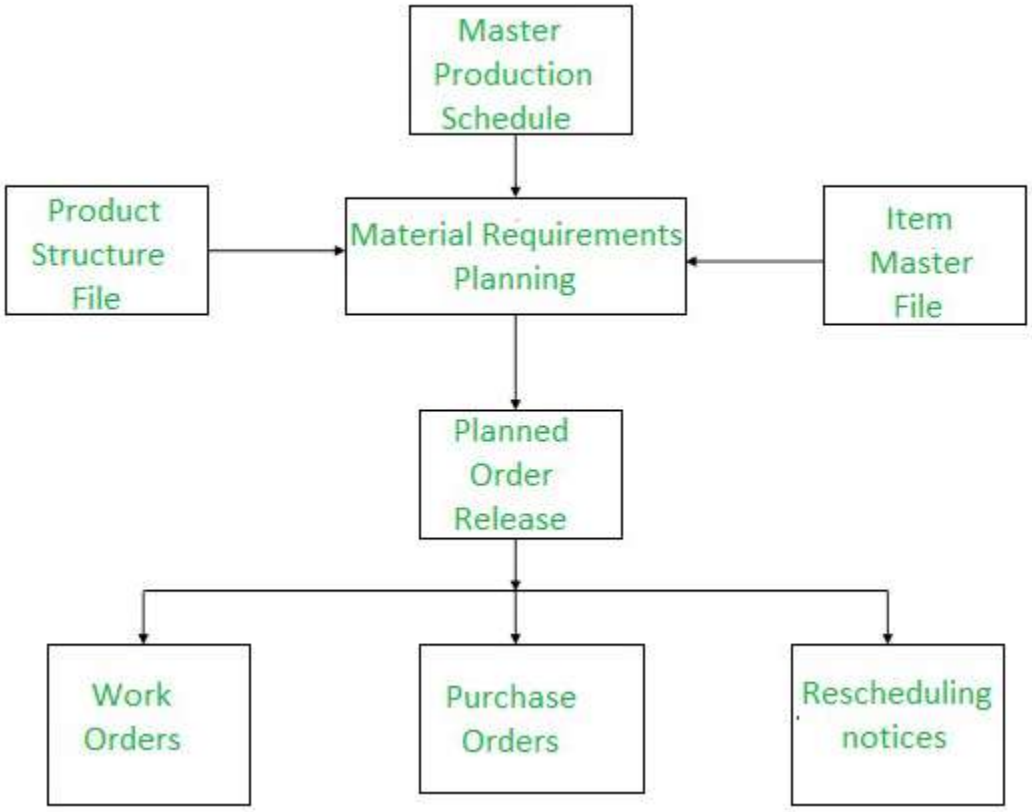



Fig. 5.3.2 Material Requirements Planning

**3. Manufacturing Resources Planning II (MRP- II)**

A natural evolution from the first generation MRP systems was the manufacturing planning systems MRP II that addressed the entire manufacturing function and not just a single task within the manufacturing function. MRP II went beyond computations of the materials requirement to include loading and scheduling. MRP II systems could determine whether a given schedule of production was feasible, not merely from material availability but also from other resource point of view.

Typically, the resources considered from MRP II systems would include production facilities, machine capacities and precedence sequences. The increased functionality enabled MRP II systems provided a way to run the system in a loop. First it was used to check the feasibility of a

production schedule taking into account the constraints; second to adjust the loading of the resources, if possible, to meet the production schedules; third to plan the materials using the traditional MRP II systems. Both MRP system and MRP II systems were fairly successful in industry. Due to the power of information systems-databases, algorithms and their integration, organizations did find real support for efficiently managing the manufacturing function in the eighties.


Fig. 5.3.3 Manufacturing Resources Planning-II

**4. Enterprise Resource Planning (ERP)**

The nineties saw unprecedented global competition, customer focus and shortened product life cycles. To respond to these demands corporations had to move towards agile (quick moving) manufacturing of products, continuous improvements of process and business process reengineering. This called for integration of manufacturing with other functional areas including accounting, marketing, finance and human resource development.

Activity-based costing would not be possible without the integration of manufacturing and accounting. Mass customization of manufacturing needed integration of marketing and manufacturing. Flexible manufacturing with people empowerment necessitated integration of manufacturing with the HRD function. In a sense the 1990s truly called integration of all the functions of management. ERP systems are such integrated information systems build to meet the information and decision needs of an enterprise spanning all the functions of management.


Fig. 5.3.4 Enterprise Resource Planning

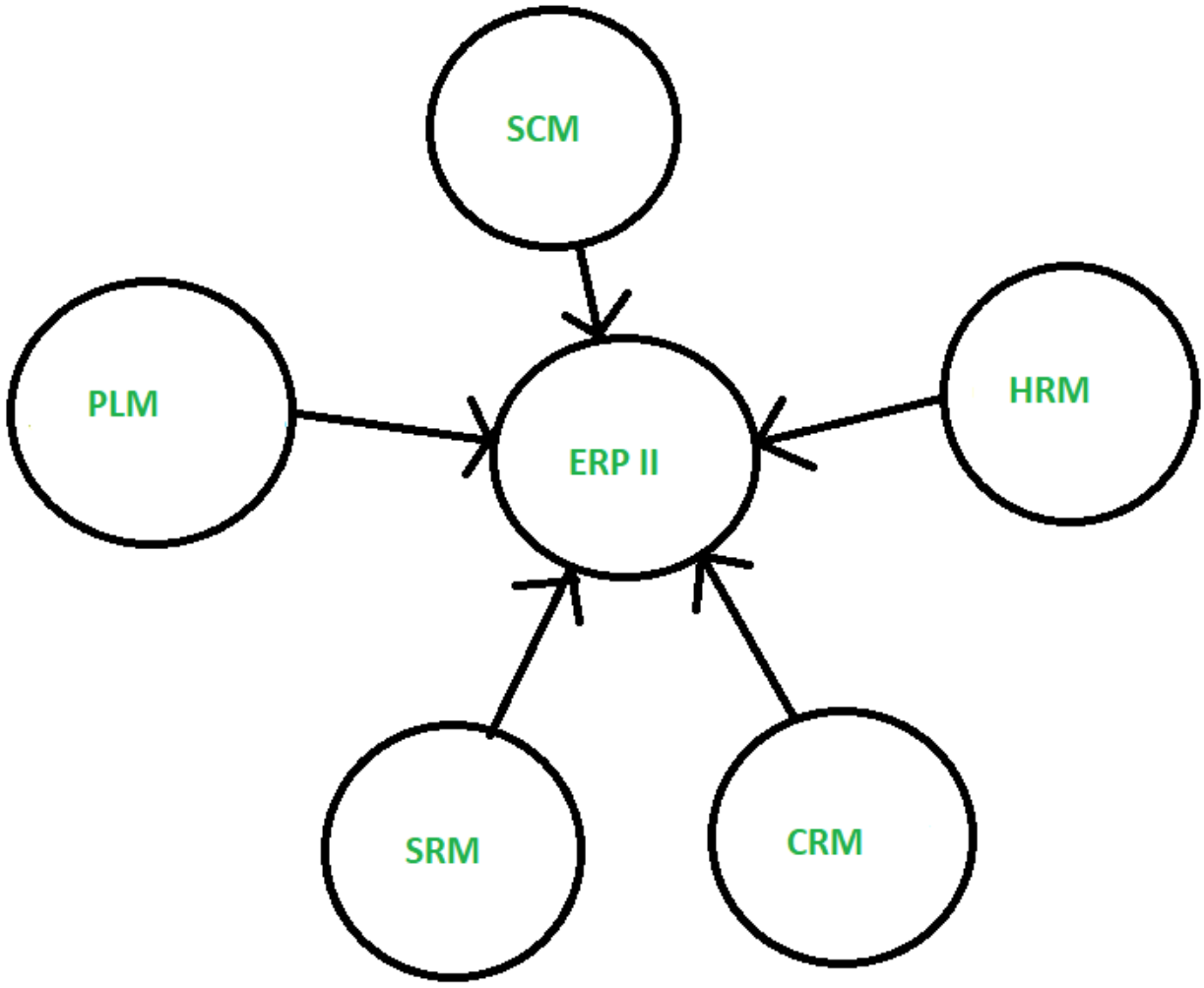
**5. Extended ERP (E-ERP)**

Further developments in the enterprise resource planning system concept have led to evolution of extended ERP (E- ERP) or web - enabled ERP. With globalization on one hand and massive development in the internet technology on the other, need for web based IT solution was felt. Thus E- ERP is development in the field of ERP which involves the technology of Internet and World Wide Web (WWW) to facilitate the functions of an organization around the web.


Fig. 5.3.5 Extended ERP

**6. Enterprise Resource Planning II (ERP- II)**

ERP II is the advanced step of E-ERP. It is the software package which has strengthened the original ERP package by included capabilities like customer relationship management, knowledge management, workflow management and human resource management. It is a web friendly application and thus addresses the issue of multiple office locations.




5.3.6 ERP-II

**7. ERP – A Manufacturing Perspective**

ERP systems evolved out of MRP and MRP II systems. MRP systems addressed the single task of materials requirements planning. MRP II extended the scope to the entire manufacturing function. The manufacturing industry traditionally had a better climate to use computers. First of all the manufacturing community being dominated by engineers had no computer phobia. Second the extensive use of Computer Aided Drafting (CAD), Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) had prepared the manufacturing function to use computers well, in fact exceptionally well. In fact manufacturing engineers contributed

significantly to the theoretical computer science by way of contributions in the areas of graphics, computational geometry, significant visualization, feature recognition etc.

Large corporations like General Motors (GM), Ford, Hewlett Packard (HP), and Digital primarily viewed themselves as manufacturing companies until the 1980s. Naturally complex MRP systems were considered the ultimate in enterprise information systems. The investments in hardware and software to manage such complex manufacturing solutions gave these systems a visibility unparalleled in the industry. Compared to these systems accounting systems, financial systems or personnel information systems were relatively inconsequential to the organization.

With the globalization of operations and the proliferation of computer networks, it was important that the manufacturing organizations extend their information system across the supply chain.

The supplier's information system spread across continents with complex combinations of hardware and software need to be integrated. Similarly the dealer-distributor network had to be integrated with the manufacturing information systems. The reduction in product life cycle necessitated a quick response manufacturing system that had its ears tuned to the market.

This forced manufacturing information systems to have a tighter integration with marketing information systems. The manufacturing flexibility had translated into mass customization calling for further integration of information systems. The opening up of several world economies including that of the Asian giants like China and India, the emergence of trade blocks and consolidated markets such as European Union paved the need for accounting and finance functions to be tightly integrated with manufacturing functions. It was not sufficient anymore just to manufacture and sell but organizations had to arrange for finance, comply with complex trade restrictions, barriers, and quotas.

The balance sheets needed to account for multiple currencies, multiple export import rules and regulations, multiple accounting codes, practices, accounting periods. This necessitated further integration of accounting and financial information systems with manufacturing systems. In fact with large capacities built around the world particularly in Asian countries, outsourcing and contract manufacturing became viable alternative even in the high-tech industries like semi conductor manufacturing.

Suddenly the need was for an Enterprise Information System that looks beyond the manufacturing function to address inbound logistics, outbound logistics, manufacturing, materials managements, project management, quality management, accounting, finance, sales and personnel management. It was nearly impossible to integrate individual modules of information systems. What was necessary was a system that addressed the enterprise needs from the design stage. ERP systems were the natural choice in this changed scenario.

## 5.5 SUMMARY

ERP is a new advancement in technology that can put you ahead of competitors. It also helps to improve productivity in business by aiding employees for better performance. Aside from that, it helps you improve on customer service and satisfaction. Enterprise resource planning (ERP) manages and integrates business processes through a single system. With a better line of sight, companies can better plan and allocate resources. Without ERP, companies tend to operate in silos, with each department using its own disconnected system.

ERP systems promote the free flow of communication and sharing of knowledge across an organization, the integration of systems for improved productivity and efficiencies, and increased synergies across teams and departments. However, moving to an ERP system will be counterproductive if the company's culture does not adjust to the change and the company does not review how the structure of its organization can support it.

## 5.6 QUICK RESPONSE AND ACCURATE RESPONSE SYSTEM IN SCM

### 5.6.1 QUICK RESPONSE SYSTEM

Quick Response (QR) is a retail sector strategy, which combines a number of tactics to improve inventory management and efficiency, while speeding inventory flows. Most QRs are between manufacturers and retailers only. When fully implemented, QR applies just-in-time principles through the entire supply chain, from raw material suppliers through ultimate customer demand.

QR is a management concept created to increase customer satisfaction and survive increasing competition from new competitors. It intends to shorten the lead time from receiving an order to delivery of the products and increase cash flow.

Quick response is the term used in the inventory management which means to reduce the lead time by communicating the real inventory needs quickly. It is used in the JIT inventory model by retailers and manufacturers to communicate their exact demand quickly so that the exact inventory can be delivered just in time there by reducing the time costs and inventory costs.

The QR system, a production and distribution system for quick response to the market, was developed for the U.S. textile industry to survive the global competition with low-cost foreign companies. VICS (voluntary Inter-industry Commerce Standards Association) is the organization that is promoting QR. The EDI (Electronic Data Interchange) protocol used for the QR system, that is a standard protocol for information exchange between the U.S. retail industry and companies, is also called 'VICS', which is also a subset of ANSIX. While 'VICS' is the name of the organization that promotes QR, it is also the name of EDI, i.e. the exchange of data (all data such as order placement and billing data) between companies who support QR.

In order to fully understand the role of supply chain management in an industry it is necessary to study in depth the complexity of the supply chains for specific product groups, number of constituents in each level of the chain, the impact of constituents' performance in the value delivery system in general and to their customers of the chain in particular, their awareness of this impact and which are the areas that need performance improvement for overall efficiency and effectiveness of the value delivery system.

With the application of advanced Communications and Information Technology in the system, now each of the constituents would be able to serve its customer better and improve the value delivery process. The partners in the chain must understand what kind of support need to be provided to each other to ensure overall cost and value optimization of the system.

Some learning experience from case studies

**a) Apparel Manufacturer**

• The company sells lower priced brands to discount stores and upscale line to department stores. It has 20000 SKUs and sold through 6000 different accounts.

• Their efforts were on reducing costs within their exiting SC instead of producing overseas and utilizing time as a speed -to-market advantage.

• Apparel manufacturing is done at 2 units in US and another one offshore. All products are finished at one site and then shipped to two distribution centers.

• Implemented flow replenishment along with EDI connections with several major customers. It replenished inventory at the retailer without a purchase order from the retailer. Products are replenished daily or in economical batches, based on POS transactions transferred from the retailer on a daily or weekly basis,

**b) Electronico – An Electronics Company**

One division produced corporate computer networks and secondary storage for desktop computers. With ever-changing electronics trends, products are short lived and often engineered to order.

• SC is a global network that delivers products and services from the supply base to the end customer through an engineered flow of information and material.

• SC comprises of: mining concerns, component manufacturers, assemblers, distributors, resellers/integrators, retail, end users, return depots and recycling Partners.

• Information is communicated across nodes using various methods to assure delivery of marketing programs. An engineering change order initiates an implementation process, which involves all departments affected by it. Information and communication must flow within predetermined normal response times and these are critical in maintaining strong vendor relationship and assuring delivery of programs within marketing requirements.

The uncertain market reaction to innovation increases the risk of shortage and excess supplies. High profit margins and the importance of early sales to capture market share for new products,

increase the cost of shortages. At the same time short life cycle increases the risk of obsolescence and thus costs of excess supplies. So, most important is to read early sales indication or other market signals and to react promptly. Crucial flow of information occurs not only within the chain but also from the marketplace to the SC. The critical decisions about inventory and capacity are as to where in the SC to position inventory and available production capacity in order to hedge against uncertain demand. Suppliers should be chosen for their speed and flexibility, not for their cost alone.

A leading Japanese apparel manufacturer produces its basic styles in low cost Chinese plants keeping production of high fashion styles in Japan, where the advantage of being able to respond quickly to emerging fashion trends more than offsets the disadvantage of high labour costs.

A lean, efficient distribution channel is exactly right for functional cars, but totally inappropriate for innovative cars, which require inventory buffers to absorb uncertainty in demand. The most efficient place to put buffers is in parts, but doing so directly contradicts the just-in-time system that automakers vigorously adopted.

**Mass Customization**

National bicycle's success of a responsive supply chain was part of new movement called mass customization – building ability to customize a large volume of products and deliver at close to mass-production prices.

### 5.6.2 ACCURATE RESPONSE SYSTEM

Sport Obermeyer, manufacturer of fashion skiwear, adopted a blending of three strategies of reducing, avoiding and hedging against uncertainty.

• To reduce uncertainty, company solicited early orders from 25 largest retailers. This enabled them to forecast national demand with a margin of error of just 10%.

• Once employees were told of the benefits of shaving off each day in lead time by way of saving the cost of air-shipment, they found many ways to shorten the lead time.

• Company asked six members of a committee to forecast for all products and selected those styles when all six individual forecast agreed. Using this average forecast as well as data on the cost over and under production, it developed a model for hedging against the risk of both problems. The model worked out the quantity of each style to make in the early production season (which begins a year before the retail season) and how much to make in February, after early orders are received. This approach, called "accurate response", has cut the cost of both over and under production in half – enough to increase profits by 60%. It also resulted in 99% product availability.

The "accurate response" system distinguishes those products for which demand is relatively predictable from those for which demand is relatively unpredictable, using blend of historical data and expert judgment.

The relatively predictable category should be made furthest in advance in order to reserve more manufacturing capacity for making unpredictable products closer to the selling season. This enables companies to make smaller quantity in advance, see how well is the response for different items early in the selling period and then based on that information, decide which products to make more of.

Unpredictable demand and short-lived products are the hallmarks of the world market for apparel. Demand for fashion apparel, being a function more of taste than of objective consumer needs, long range forecasts tended to be highly inaccurate. Thus resulting shortages (stock outs) represent lost sales opportunities, surpluses represent lost revenues consequent to successive reductions (Markdowns), often to a point below the cost of production.

Due to growing demand uncertainty, retailers discontinued the practice of ordering large quantities of products in advance of the selling season and warehousing them until sold. Instead they ordered goods much closer to the selling season, in small initial quantities that could be replenished as the season progressed. Retailers essentially looked at indirect costs such as those associated with high inventory levels and long lead times.

This pushed the manufacturers to expand product variety, shorten order- fulfillment lead times and achieve higher order-fill rates. These trends drove the Quick Response movement.

### 5.6.3 THE QUICK RESPONSE MOVEMENT

"Quick Response" was the term used by textile and apparel manufacturers and retailers to describe buyer-seller partnership relationship in which the buyer transmitted orders via EDI and the seller promised to fill orders quickly. Many other features, as listed below could be added to these two basic elements, depending on the preferences and capabilities of the partners.

• UPC code symbols attached to product by the manufacturer, and scanned at POS by the retailer

• Electronic Purchase Orders transmitted to vendor

• Vendor marking of retail prices on garments (Pre-retailing)

• POS data by store, transmitted to vendor

• Advance Shipping Notices received from vendor in advance of shipment

• Electronic Invoicing

• Electronic Funds Transfer

The quick response movement had grown with the objective of strengthening the competitive position of the domestic manufacturing industries in the "fiber-textile apparel" chain.

By April 1993 industry standards had been widely adopted by textile producers, apparel manufacturers, retailers, and transport companies. This enabled the retailers and suppliers to develop partnerships with the objective "to have the right quantities of the right goods in the right place at the right time".

Operating on a Quick Response System apparel and textile retailing operations are tied up to the manufacturing operations, to provide the flexibility needed to quickly respond to shifting markets. The strategy consists of a combination of business practices and technology which are aimed at capitalizing on domestic manufacturers' strongest competitive advantage – proximity to the domestic markets – by providing more suitable and acceptable products, higher customer service levels, and shorter lead times than those offered by foreign competitors. QR is intended

to reduce overall inventory levels, increase inventory turns and avoid forced markdowns as well as stock outs.

Under QR mode, retailers and apparel manufacturers eliminate much of the risk inherent in the current system. Forecast error is reduced by planning assortments much closer to the selling season, performing consumer preference tests, limited introductions to pre-test and fine-tune specific style, colour, size options. Inventory risk is reduced by producing smaller initial orders and re-ordering more frequently throughout the season based on actual sales data from the POS, which is collected at the full SKU level.

Although imported goods may cost the retailer much less initially, foreign manufacturers generally require long order lead times (often nine months or more) that may result in larger and more risky inventory investments and consequently more chances of forced markdowns and stock outs at the retail level.

Estimates of the average length of time it takes for a new style of garment to make its way through the traditional apparel pipeline, from fiber production to retail presentation of a finished piece range from 56 to 66 weeks, with garments in actual production only 6% to 17% of that time.

Most important element of QR strategy is an effective information pipeline, characterized by shared information and efficient information flows. Kurt Salmon Associates has outlined a two-step implementation procedure for achieving an effective QR system. The first step is to establish QR partnerships with customers and suppliers and implementing the VICS (Voluntary Inter-Industry Communication Standards)-endorsed standards of the following technologies: UPC product marking, EDI computer-to-computer communication of transactions and shipping container marking with bar codes to streamline distribution.

The second step aimed at developing real-time merchandising and short-cycle, flexible manufacturing, involves the use of point –of-sale data analysis to identify trends, CAD to make important product design decisions closer to the retail selling season, and flexible manufacturing technologies to allow the timely, economical production of small lot sizes.

Though it is contended that a quick response of 30 working days is achievable with currently available technologies, but typically it takes over four times as long, requiring 8days for placement of store order, 32 days for fabric sourcing and planning, 7 days for cutting, 20 days for sewing and a staggering 58 days for the goods to make onto the sales floor, for a total of 125 days.

### 5.6.4 IMPACT OF TECHNOLOGY

Never has so much technology and brainpower been applied to improving supply chain performance. Point-of–Sale scanners allow companies to capture the Customer's voice. Electronic Data Interchange lets all stages of the supply chain hear that voice and react to it by flexible manufacturing, automated warehousing, and rapid logistics. And new concepts such as quick response, efficient consumer response, accurate response, mass customization, lean manufacturing, and agile manufacturing offer models for applying the new technology to improve performance.

## 5.7 SUMMARY

ERP is a new advancement in technology that can put you ahead of competitors. It also helps to improve productivity in business by aiding employees for better performance. Aside from that, it helps you improve on customer service and satisfaction. Enterprise resource planning (ERP) manages and integrates business processes through a single system. With a better line of sight, companies can better plan and allocate resources. Without ERP, companies tend to operate in silos, with each department using its own disconnected system.

ERP systems promote the free flow of communication and sharing of knowledge across an organization, the integration of systems for improved productivity and efficiencies, and increased synergies across teams and departments. However, moving to an ERP system will be counterproductive if the company's culture does not adjust to the change and the company does not review how the structure of its organization can support it.

Supply Chain Management competency contributes to an organization's success by providing customers with timely and accurate product delivery. Excellent customer service performance is

likely to add value for members of the supply chain. Many organizations have switched over from product focus to customer focus. It is important to clearly understand customer service deliverables when establishing Supply Chain Management strategies. This unit has discussed the customer focus in Supply Chain Management. It had deliberated on the key processes required to enhance customer focus in the supply chain

## 5.8 SELF-ASSESSMENT QUESTIONS

**Q1.** What are the salient features of Quick Response System? For what kind of product, it has been found to be beneficial and why?

**Q2.** Briefly explain the "Accurate Response System".

**Q3.** What are the features of ERP?

**Q4.** Throw light on the concept of ERP.

**Q5.** Discuss the stages in the evolution of ERP.

**Q6.** What do you mean by Quick Response System.

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# UNIT 6: USE OF OTHER PLANNING STRATEGIES

## UNIT FRAMEWORK



## 6.1 OBJECTIVE

The objective of this unit is

To understand Logistics Planning

To explore Scenario Planning

To know about Planning Strategies for ERP Implementation

To get aware about other Planning Strategies in SCM

To understand Aggregate Planning Strategies in SCM

## 6.2 INTRODUCTION

In this unit, we will discuss various planning strategies and their use.

## 6.3 LOGISTICS PLANNING

Logistics ensures that goods are moved from suppliers to end users in accordance with the 7R concept of right product at the right place at the right price at the right quantity and right quality for right customer at right cost.

A comprehensive logistics strategy should encompass strategic, operational and tactical levels of logistical planning as well as the four main pain points in the supply chain, including facility locations, customer service levels and inventory and transportation decision-making.

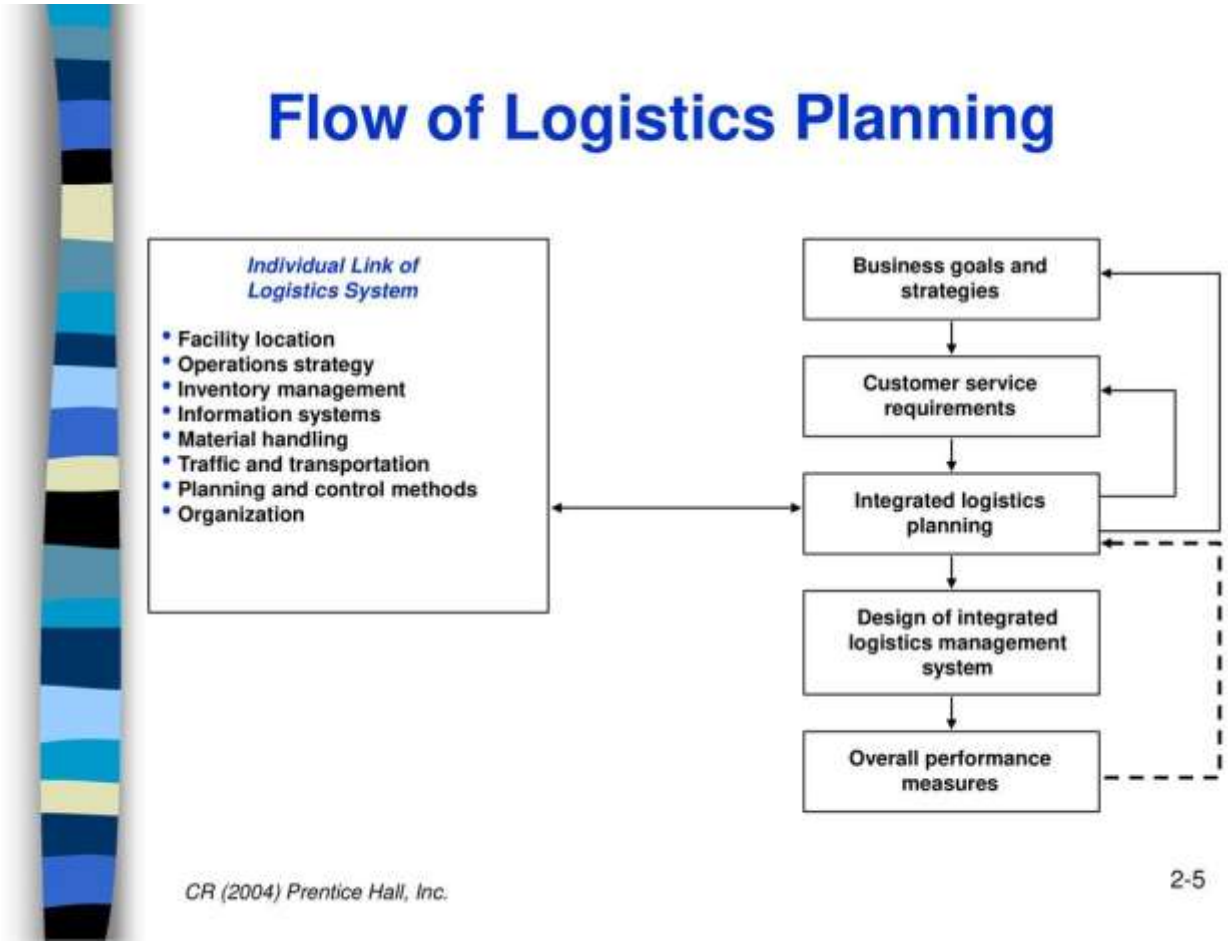



Fig. 6.1 Flow of Logistics Planning

### 6.3.1 Areas of Logistics Planning

- Customer service levels
- Facility location
- Inventory decisions
- Transportation decisions

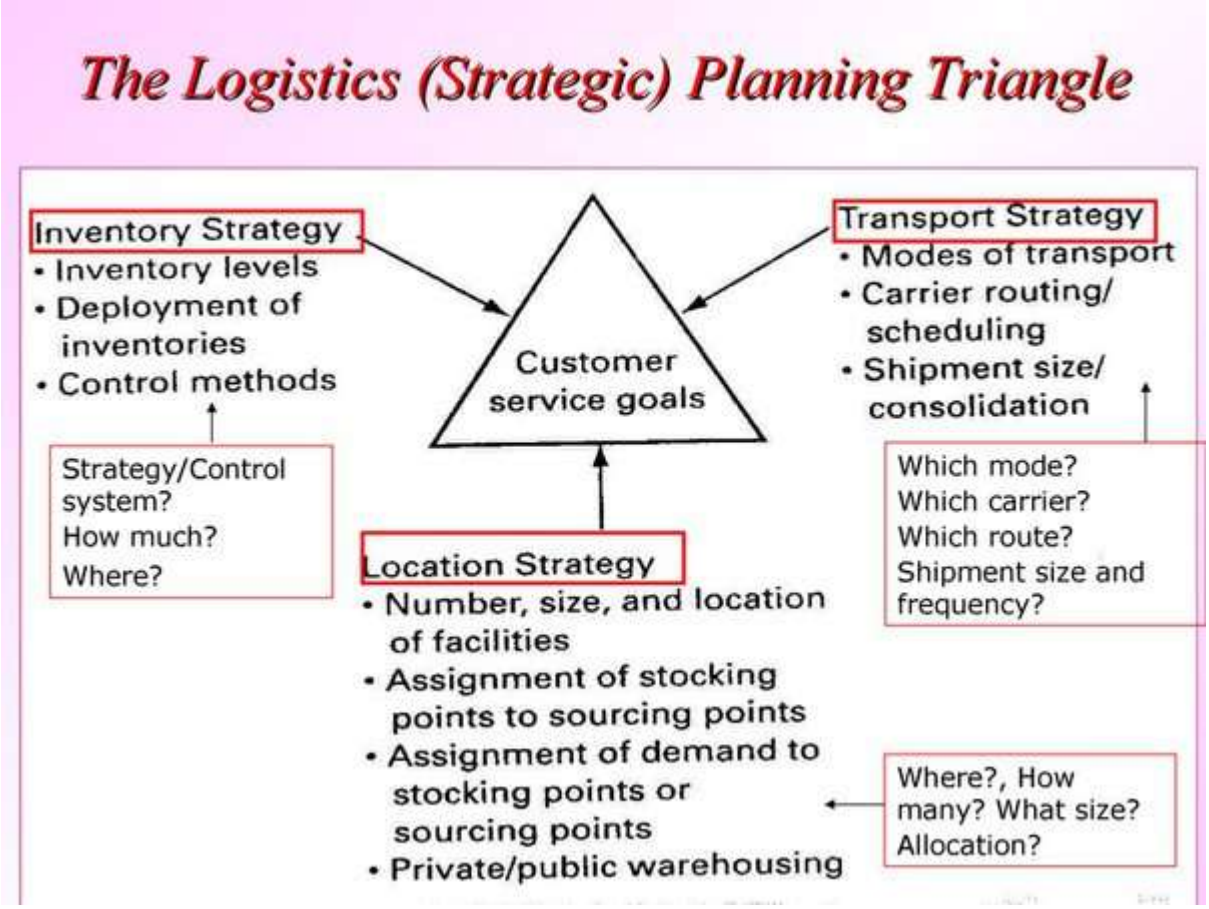



Fig. 6.2 Logistics Planning Triangle

### 6.3.2 Levels of Logistical Planning

- **Strategic planning:** long term decision making, > 1 years
- **Tactical planning:** mid term decision making, < 1 years
- **Operational planning:** short term decision making, , everyday

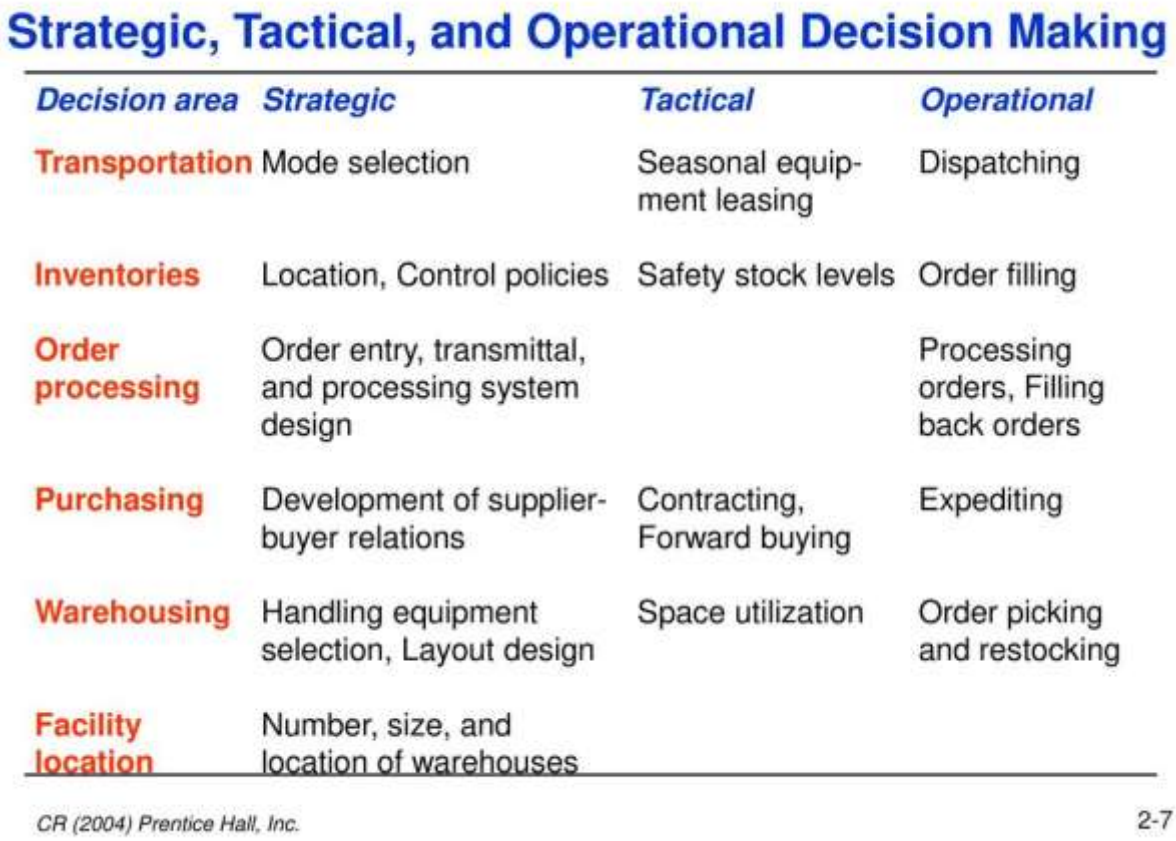



Fig. 6.3 Strategic, Tactical and Operational Decisions

### 6.3.3 Benefits of Logistics Planning

The primary objective of any logistics strategy is to deliver the right products to the right customers at the right time and at the least possible cost. An effective logistics strategy can help your company minimize investments and other costs by defining the service levels at which your organization is most cost-effective. The result is a win-win situation: your company benefits from cost efficiency, and your customers get what they need, when they need it, boosting customer satisfaction.

In a changing environment, logistics planning minimizes risk by enabling companies to anticipate change and develop strategies to adapt to those changes. Supply chains are always in a state of flux, so many companies develop logistics strategies for specific product lines,

geographic regions or customer segments, enabling them to adapt to market changes impacting one region or business line while maintaining efficiency across others.

### 6.3.4 Major aspects of strategic logistics planning

The three major aspects of strategic logistics planning include long-term goals and the means and process for achieving those goals.

**Long-term goals:** Long-term goals include customer satisfaction, your company's competitive advantage and supply chain management.

**Means:** The means for achieving your long-term goals include delivering value and customer service.

**Process:** The process for achieving your company's long-term goals includes how you'll execute your logistics strategy, as well as anticipating and managing change and relating each element of your logistics strategy to the company's overarching business objectives.

A strategic logistics plan typically covers five or more years. On a more granular level, a strategic logistics plan should include the following elements:

- An overview of the logistics strategy in general terms and how it relates to other business functions.
- Logistics objectives and how each relates to cost and service for the product and the customer.
- Descriptions of each strategy that will support the overall strategic logistics plan. These strategies should include inventory and warehousing, order processing and fulfillment, transportation and customer service.
- A breakdown of each logistic or operational plan including timing, costs for implementation and their impact on other business functions and the business as a whole.
- Forecasts of requirements for the workforce, capital and any other necessary assets.
- A financial statement that describes capital requirements, operating costs and cash flow in detail to paint a clear financial picture for executives and stakeholders.

- A business impacts analysis that details anticipated impacts on profits, customer service and other business functions.

Aligning your logistics goals to broader business objectives is a crucial component of an effective logistics strategy. According to Trissa Strategy Consulting, 63% of successful companies have every business unit aligned to their overall corporate strategy, from IT and human resources to marketing and supply chain management. Likewise, 64% of successful companies build their budget around their strategy, making elements such as financial forecasts, capital requirements and analysis of operating costs and cash flow vital to your company's success.

### 6.3.5 Live Examples

Consider Amazon.com, which provides books selected from the internet store delivered to your door (within a stated period). The marketing proposition is simple and based on convenience. The same product could be purchased from a bookshop. If the back-office operation of Amazon either takes six weeks to deliver the book once ordered, or fails to meet a promised delivery date, then the probability is that the customer would be dissatisfied.

The same applies to FedEx with its delivery next day before 10am promise. Speed is becoming an important aspect of service provision.

McDonald's controls its supplies along the entire length of its supply chain from meat purchasing and paper cups to 28,000 franchise outlets worldwide.

## 6.4 SCENARIO PLANNING

An efficient way to leverage your ERP system for strategic decision making and planning is to use it for scenario planning. Scenario planning is a technique that helps you explore and evaluate different possible futures and outcomes, based on various assumptions, variables, and uncertainties. You can use your ERP system to create and compare different scenarios, such as best-case, worst-case, or alternative-case scenarios, and assess their impact on your financial, operational, and strategic goals. You can also use your ERP system to simulate and test different

strategies, actions, and interventions, and see how they affect your scenarios. By using your ERP system for scenario planning, you can anticipate and prepare for changes, risks, and opportunities, and adapt your strategy accordingly.

## 6.5 PLANNING STRATEGIES FOR ERP IMPLEMENTATION

Imagine a world where businesses seamlessly integrate their operations, enhance productivity, and achieve unprecedented efficiency. This utopia is within reach thanks to the power of Enterprise Resource Planning (ERP) systems. These transformative software solutions have revolutionized how organizations manage resources, optimize processes, and drive growth.

As a matter of fact, according to a study, *the Asia-Pacific is a fast-growing ERP market with a compound annual growth rate of 9.8% by 2027.*

Not only that! If you want to reduce your operational costs, implementing an ERP strategy is one of the best ways to achieve the same. Why?

According to a study, when people were asked to select areas where ERP produced ROI, *the top three answers were reduced IT costs (40%), reduced inventory levels (38%), and reduced cycle time (35%).* That's interesting, isn't it?

However, ERP system implementation is no easy feat. It requires a well-crafted strategy and a deep understanding of the unique challenges and opportunities.

### ERP Implementation Strategies

- Properly Set Essentials Before Taking Action
- Assess Your Alternatives
- Record User Procedures
- Single-Step Implementation
- Phased Rollout

- **Properly Set Essentials Before Taking Action**

It is obvious that the scope of your project can be a crucial concern for you. Companies that fail to hold a steady focus on particular system requirements and processes will find that **ERP implementation** may necessitate added costs and time. A precise scope will assure your project does not pass out of your hand.

- **Assess Your Alternatives**

During the **ERP implementation** process, inadequately handled and mismanaged evaluation exercises can create serious issues. Businesses with uncertain requirements may proceed to choose the wrong vendor, handle data migration inadequately or result in slowed fulfillment.

One should equip oneself accurately, obtain input from team leads & users, and thoroughly assess both your legacy systems and intended **ERP implementation** before initiating any important decisions.

- **Record User Procedures**

To understand how users interact with legacy systems, evaluate and improve workflow and equip users with the brief instructions required to steer a new feature-rich working environment, proper documentation is required. One must create and maintain documents describing pivotal user routines and procedures, both before and during **ERP implementation**.

Record User Procedures

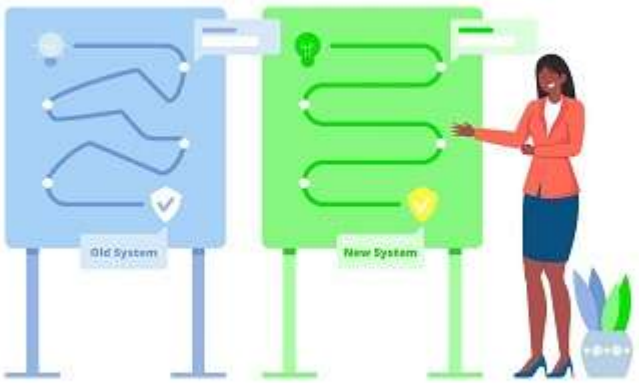
Fig. 6.4 Record User Procedures

- **Single-Step Implementation**

Through the single-step implementation model, all users move to the new system in a go. Single-step **ERP implementation** grants an easy and straightforward way to control the process which is ideal for smaller operations and businesses that may have few users. This in turn helps you to focus easily on your project scope and implementation parameters.

- **Phased Rollout**

Switching to the latest system incrementally over a lengthened period of time can enable early implementation of essential features, and assure that any complications or issues are secluded from working processes that have already been taken online.




Phased Rollout

Fig. 6.5 Phased Rollout

Further, being more manageable than a single-step approach, the phased rollout system implementation approach may involve a more prolonged process, particularly for companies that keep modifying the parameters of an implementation project.

## 6.6 OTHER PLANNING STRATEGIES IN SCM

1. **Production management:** In parallel, capacity planning addresses your own company's production lines in terms of machinery, staff and efficiency. The key question: How much can we realistically produce during the planning period? Keep in mind that this could be less than your demand forecast.
2. **Inventory management:** How a company orders, handles and stores goods can significantly impact costs, operational efficiency and customer satisfaction. Companies aim to manage inventory levels with supply chain partners to keep stock on hand at an optimal level while ensuring reliable customer service.

Inventory management can also provide other financial advantages, such as the ability to capitalize on volume prices from suppliers and accurately include the value of inventory in assets listed in company balance sheets and tax filings. More sophisticated inventory management systems can identify high- and low-performing products and trigger reorders when stock dwindles.

3. **Pricing strategy:** Setting an optimal price is part art, part science. Honing an effective strategy is critical, however, to manage the balance between supply and demand. For example, price cuts can stimulate sales during periods of low demand, helping you cover the fixed costs of production lines and your workforce.
4. **Event management:** This involves identifying all possible supply chain bottlenecks, breakdowns and delays at every link in the chain and developing contingency plans, such as workarounds, buffers and backups.
5. **Integrated business planning (IBP):** This is an approach that links your supply chain planning with the rest of your business, from sales and operations through finance. Because IBP gathers information from across the enterprise, it also can help companies perform better predictive analysis to grow the business and manage risk.

## 6.7 AGGREGATE PLANNING STRATEGIES IN SCM

The aggregate planner must make trade-offs among capacity, inventory, and backlog costs. An aggregate plan that increases one of these costs typically results in reduction of the other two. In this sense, the costs represent a trade-off: To lower inventory cost, a planner must increase capacity cost or delay delivery to the customer. Thus, the planner trades inventory cost for capacity or backlog cost. Arriving at the most profitable combination of trade-offs is the goal of aggregate planning. Given that demand varies over time, the relative level of the three costs leads to one of them being the key lever the planner uses to maximize profits. If the cost of varying capacity is low, a company may not need to build inventory or carry backlogs. If the cost of varying capacity is high, a company may compensate by building some inventory and carrying some backlogs from peak demand periods to off-peak demand periods.

In general, a company attempts to use a combination of the three costs to best meet demand. Therefore, the fundamental trade-offs available to a planner are among

• Capacity (regular time, overtime, subcontracted)

• Inventory

• Backlog/lost sales because of delay

There are essentially three distinct aggregate planning strategies for achieving balance among these costs. These strategies involve trade-offs among capital investment, workforce size, work hours, inventory, and backlogs/lost sales. Most strategies that a planner actually uses are a combination of these three and are referred to as tailored or hybrid strategies. The three strategies are as follows:

1. **Chase strategy—using capacity as the lever:** With this strategy, the production rate is synchronized with the demand rate by varying machine capacity or hiring and laying off employees as the demand rate varies. In practice, achieving this synchronization can be problematic because of the difficulty of varying capacity and workforce on short notice. This strategy can be expensive to implement if the cost of varying machine or labor capacity over time is high. It can also have a significant negative impact on the morale of the workforce. The chase strategy results in low levels of inventory in the supply chain and high levels of change in capacity and workforce. It should be used when the cost of carrying inventory is high and costs to change levels of machine and labor capacity are low.

**2. Flexibility strategy—using utilization as the lever:** This strategy may be used if there is excess machine capacity (i.e., if machines are not used 24 hours a day, seven days a week) and the workforce shows scheduling flexibility. In this case, the workforce (capacity) is kept stable, but the number of hours worked is varied over time in an effort to synchronize production with demand. A planner can use variable amounts of overtime or a flexible schedule to achieve this synchronization. Although this strategy does require that the workforce be flexible, it avoids some of the problems associated with the chase strategy, most notably, changing the size of the workforce. This strategy results in low levels of inventory but with lower average machine

utilization. It should be used when inventory carrying costs are relatively high and machine capacity is relatively inexpensive.

**3. Level strategy—using inventory as the lever:** With this strategy, a stable machine capacity and workforce are maintained with a constant output rate. Shortages and surpluses result in inventory levels fluctuating over time. In this case, production is not synchronized with demand. Either inventories are built up in anticipation of future demand or backlogs are carried

## 6.8 SUMMARY

With a well-conceived and communicated strategic plan, an owner or management team will likely get what they want in terms of organizational performance, but without one, they will most likely not get the desired performance and everyone in the organization will suffer to some extent.

## 6.9 SELF-ASSESSMENT QUESTIONS

**Q1.** Discuss different planning strategies for ERP implementation.

**Q2.** Explain other strategies of SCM.

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## MBA : LOGISTICS AND SUPPLY CHAIN MANAGEMENT

## BLOCK 4: LOGISTIC AND TRANSPORTATION

In **Block 4** you will learn about logistics; logistics management; Types of logistic activities; Importance of logistics management; Integrated logistics and its support; Determinants of designing logistical system; Transportation, Warehousing and Packaging.

**Unit 11** discusses Introduction to logistic management, meaning and importance of logistics, meaning of logistics management, classification of logistics activities and importance of logistics management

**Unit 12** explains the Integrated Logistics Management Variables Affecting the Evaluation and Growth of Integrated Logistic, Activities Related to Integrated Logistics, Integrated Logistics Support. Brief History of Integrated Logistics Support, ILS Elements, Effectiveness of ILS, Determinants of Designing Logistics Management, Steps in Designing the Logistics System, System Design Elements and Logistics Management Information System

**Unit 13** deals with the Transportation, Transportation Management System, Evolution of TMS, Freight Management Logistics, Containerization, Warehousing, Warehouse and Distribution Centre Packaging

## UNIT 11: LOGISTICS MANAGEMENT

**UNIT FRAMEWORK**

## 11.1 OBJECTIVES

At the end of unit, you will be able to understand

- Introduction to logistic management,
- meaning and importance of logistics,
- meaning of logistics management,
- classification of logistics activities and
- importance of logistics management

## 11.2 INTRODUCTION

Logistics management is the part of the supply chain 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 to meet customer requirements.

Logistics management is the process of managing the activities that are required to transport goods from its source to the final customer. That process involves a series of logistics activities such as order processing, material handling, packaging, warehousing, transportation and customer service management. The logistics management process is used for tangible goods such as raw materials, finished products, equipment and machinery to food or other consumable items. A person who works in this field is called a logistician or logistics manager.

## 11.3 MEANING OF LOGISTICS

Logistics is the process of planning and executing the efficient transportation and storage of goods from the point of origin to the point of consumption. The goal of logistics is to meet customer requirements in a timely, cost-effective manner.

Originally, logistics played the vital role of orchestrating the movement of military personnel, equipment and goods. Today, the term logistics applies to any context that requires moving commercial goods within the supply chain.

Many companies provide logistics services to manufacturers, retailers and other industries with a large need to transport goods. Some of these logistics providers own the full range of infrastructure, from jet planes and trucks to warehouses and software, while others specialize in one or two parts. DHL, FedEx and UPS are well-known logistics providers.

Typically, large retailers and manufacturers own major parts of their logistics network. Most companies, however, outsource the function to third-party logistics (3PL) or fourth-party logistics (4PL) providers. A business might turn to a 3PL provider to manage specific aspects of logistics, such as warehousing, while retaining some oversight of these operations. Businesses outsource all aspects of logistics to 4PL providers, including oversight and management. Outsourcing an entire supply chain relieves customers of time-consuming and costly logistics processes.

Logistics is the management of supply and transportation to deliver the goods on time and in good shape. handling of operations is a part of the logistics industry, and the need to perform efficient and cheap operations is of utmost importance in the modern competitive world.

Managing a warehouse or warehousing means keeping track of inventory and making sure orders are filled. It also involves managing warehouse infrastructure and processes, such as in a fulfilment centre where orders are received, processed, and sent out (shipped to the customer). Most warehousing operations use software like ERP to manage the warehouse efficiently. Warehousing as an industry is a part of the logistics industry.

Customs management, also called "global commerce management," is often thought of as a part of logistics because of the paperwork that must be done at international borders and shipping ports to show that government rules are being followed.

Artificial intelligence (AI) and driverless vehicle technology are expected to have a big impact on logistics in the future. Some logistics companies are already using AI to improve package tracking and predict problems based on their algorithms. With the use of modern algorithms, it is becoming possible to predict future problems and solve the problems in advance.

In the meantime, driverless vehicles like forklifts, delivery trucks, and drones will become more common in warehouses, warehouse yards, and highways.

Logistics is the process of getting resources, storing them, and moving them to where they need to go. Finding possible distributors and suppliers and figuring out how efficient and easy to reach they are part of logistics management. Logistics managers are called "logisticians."

When the word "logistics" was first used, it meant how the military got, stored, and moved equipment and supplies. This phrase is now often used in business, especially by manufacturers, to discuss how resources are handled and moved along the supply chain.

## 11.4 IMPORTANCE OF LOGISTICS

Even though delivering packages on time and in good condition has always been crucial to the supply chain, it has become even more mission-critical in recent years. This has happened as omnichannel commerce has become more prevalent, allowing customers to order customised products from their mobile devices and have them delivered the same day to their homes or stores.

Suppliers, manufacturers, distributors, and retailers have all had to enhance their logistics procedures to outsmart the competition and meet the requirements of the fast-paced world of logistics. To better understand the supply chain, they have also had to streamline their operations and integrate all the processes and operations.

Due to the prominence of e-commerce companies, like Amazon, logistics embodies more than the actual movement of products from one place to another.

## 11.5 DEFINITION OF LOGISTICS MANAGEMENT

Logistics management may be defined as follows: According to the Council of Logistics Management, logistics can be defined as "that part of supply chain 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".

Logistics Management is an all-inclusive term that encompasses both planning and execution of four key aspects of logistics, i.e. transportation, distribution, warehousing and purchasing. Another pertinent factor that logistics management takes into account is the flow of goods in forward and reverse order.

Logistics management consists of the process of planning, implementing and controlling the efficient flow of raw-materials, work-in-progress and finished goods and related information-from point of origin to point of consumption; with a view to providing satisfaction to the customer.

## 11.6 LOGISTICS MANAGEMENT EXPLAINED BY TECHOPEDIA

Logistics management involves numerous elements, including:

- Selecting appropriate vendors with the ability to provide transportation facilities
- Choosing the most effective routes for transportation
- Discovering the most competent delivery method
- Using software and IT resources to proficiently handle related processes

In logistics management, unwise decisions create multiple issues. For example, deliveries that fail or are delayed lead to buyer dissatisfaction. Damage of goods due to careless transportation is another potential issue. Poor logistics planning gradually increases expenses, and issues may arise from the implementation of ineffective logistics software. Most of these problems occur due to improper decisions related to outsourcing, such as selecting the wrong vendor or carrying out delivery tasks without sufficient resources.

To resolve these issues, organizations should implement best logistic management practices. Companies should focus on collaboration rather than competition. Good collaboration among transportation providers, buyers and vendors helps reduce expenses. An efficient and safe transportation provider is also vital to business success.

## 11.7 CLASSIFICATION OF LOGISTICAL ACTIVITIES

Logistics (or Logistical Activities) may be broadly classified into two categories:

I. **Inbound logistics**; which is concerned with the smooth and cost effective inflow of materials and other inputs (that are needed in the manufacturing process) from suppliers to the plant. For proper management of inbound logistics, the management has to maintain a continuous interface with suppliers (vendors).

II. **Outbound logistics** (also called physical distribution management or supply chain management); is concerned with the flow of finished goods and other related information from the firm to the customer. For proper management of outbound logistics, the management has to maintain a continuous interface with transport operators and channels of distribution.

III. **Production Logistics and Management**

Production logistics management manages the transportation of goods during the production process. This involves the staging of materials from production warehouses to the production line at the right time to streamline the production process.

IV. **Third-Party Logistics Management**

Third-party logistics management refers to the outsourcing of logistics management activities. Third-party logistics management can involve outsourcing inbound or outbound logistic activities.

V. **Supply Management Logistics Management**

This involves the planning, procuring and coordinating materials that are needed at a certain time at a particular place for the production of a task. This includes transportation of the materials as well as a place to store them. Additionally, evaluating the level of supply at the different stages of the process is required to

ensure the needs of the customer are met, for example delivering materials to a construction site or parts for a manufacturing plant.

VI. **Distribution Logistics Management**

This takes stored materials and transports them to where they need to go. The issues in this involve moving materials; including loading, unloading and transportation, as well as keeping track of the stock and how it's used. This type of logistics management controls the movement of supplies from a central warehouse to the stores that sell the product to the public.

VII. **Customer Service Logistics Management**

Customer service logistics management consists of ensuring products are delivered on time and damage-free to ensure customer satisfaction. To do this, organizations use logistics management tools and techniques to track customer interactions along the logistics management process of order processing, handling, transportation and delivery of goods.

VIII. **Reverse Logistics Management**

This is about the management of reclaiming materials and supplies from the customer back to production. For example, reverse logistics management is concerned with the return of unwanted or unused products from the end customer seeking a refund.

## 11.8 IMPORTANCE OF LOGISTICS MANAGEMENT

Logistics management is significant for the following reasons:

**1. Cost Reduction and Profit Maximization:**

Logistics management results in cost reduction and profit maximization, primarily due to:

a. Improved material handling

b. Safe, speedy and economical transportation

c. Optimum number and convenient location of warehouses etc.

**2. Efficient Flow of Manufacturing Operations:**

Inbound logistics helps in the efficient flow of manufacturing operations, due to on-time delivery of materials, proper utilization of materials and semi-finished goods in the production process and so on.

**3. Competitive Edge:**

Logistics provide, maintain and sharpen the competitive edge of an enterprise by:

a. Increasing sales through providing better customer service

b. Arranging for rapid and reliable delivery

c. Avoiding errors in order processing; and so on.

**4. Effective Communication System**:

An efficient information system is a must for sound logistics management. As such, logistics management helps in developing effective communication system for continuous interface with suppliers and rapid response to customer enquiries.

**5. Sound Inventory Management:**

Sound inventory management is a by-product of logistics management. A major headache of production management, financial management etc. is how to ensure sound inventory management; which headache is cured by logistics management.

**6. Boost Business Profitability**

It has the ability to improve the operational excellence which is necessary to grow and expand your business. Managing logistics is extremely crucial as it helps the organisations to gain deep insights of the supply chain. This also increases the order fulfilment rate and enables strong business outcomes. Providing value to customers by implementing the latest technological innovations can improve the productivity and profitability of the operations.

**7. Improve Customer Experience**

Track different aspects of the supply chain is the essence of the logistics process. It allows companies to communicate effectively with the customers and provide fast and quality service to

them. Hence, smooth logistics operations create enormous value to the customers, which in turns build the brand reputation. Providing better customer services is a key to success for businesses.

**8. Reduce Operational Cost**

Logistics management leads to transparency and visibility in the operations. This tends to improve overall efficiency of the business as it provides route optimization to enhance on-time delivery and reduce the fuel cost. It is an important element to keep your expenses lower by analysing and monitoring the real-time data. Also, an effective logistics management leads to supply chain transparency which is necessary for businesses to optimise asset utilisation.

**9. Ensure Seamless Delivery**

Professionally organised logistics tends to deliver the right products at the right time. In the modern world, delivery processes are continuously evolving as fast and safe shipping adds value to the customer experience. Logistics management focuses on delivering the products to the customers on time or ahead of schedule. Therefore, the on-time delivery is the primary focus of the well-organised SCM strategies.

**10. Success of Supply Chain**

Logistics management deals with numerous aspects of supply chain such as production, automating functions, material handling, distribution and so on. Monitoring these networking within the supply chain is a major component for the efficient functioning of the business operations. Moreover, a successful supply chain management helps you boost your business value. Additionally, organisations can gain a clear advantage over the competition.

**11. Improve Warehouse Management**

When you optimize the logistics activities, it allows you to control and monitor your warehouse operations. Centralising the complex task by developing warehouse inventory plans is always advisable for the businesses to operate effectively. Warehouse management activities involve storage and material handling of goods. It is a core pillar in the transportation industry that starts from auditing and tracking to distributing the goods to its final destination.

**12. Enhance Visibility**

Managing your logistics is important for business growth as it plays a major role in improving connectivity, interoperability, and visibility of the operations. You can analyse every stage of your supply chain in real-time. Gaining essential information enables businesses to control cost and figure out efficiencies. Therefore, transparency across the supply chain tends to reduce failures and help you in meeting the customer demands. Ensuring synchronised supply chains is a vital process to benefit both the companies and customers.

**13. Intelligent Route Planning**

Executing delivery and logistics operations with an intelligent route planning software can lead to great customer service and minimal expenses. Optimization of routes with the most efficient GPS tracking company in Jaipur is considered to be an important aspect of logistics management as implementing route planning software reduces the manual dependencies and amplifies timely delivery. In addition, it also increases safety of drivers, products and vehicles. Importance of logistics management to handle the transportation is enormous for business growth.

**14. Risk Management**

Preparing a risk management plan enables business owners to clearly understand the disruptions in an effective way. Assessing your supply chain activities to evaluate the impact of operations can guide the business to predict the supply and demand beforehand. Logistics management can develop an effective approach of risk management to minimise the impact of business threats. Streamlining the logistics planning processes is important for creating value for customers.

**15. Scalability**

Managing and monitoring the distribution network is necessary to meet the industry's growing demands. The software has the ability to create the business more scalable by quickly responding to disruptions. Therefore, embracing cutting-edge softwares focuses on demand-driven logistics expansion and scalability. Optimizing the logistics planning activities and identifying the emerging trends can also enhance the accuracy of the operations.

## 11.9 SUMMARY

Logistics management includes key activities such as product selection, quantification and procurement, inventory management, storage, and distribution. Other activities that help drive the logistics cycle and are also at the heart of logistics are organisation and staffing, budget, supervision, and evaluation. A logistics system organisation needs to have an appropriate logistics unit having adequate resources and authority. This enables to bring about necessary changes and ensures effective implementation of the activities of the logistics cycle. It maintains effective supervision and quality at all levels with written policies and procedures.

## 11.10 SELF-ASSESSMENT QUESTIONS

**Q1.** What is logistics?

**Q2.** What do you mean by logistics management?

**Q3.** Discuss the various logistical activities.

**Q4.** How logistics management is important for organisations?

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# UNIT 12: INTEGRATED LOGISTICS AND LOGISTICAL SYSTEM

## UNIT FRAMEWORK



## 12.1 OBJECTIVES

After reading this unit, you will be able to understand

- Integrated Logistics Management
- Variables Affecting The Evaluation And Growth Of Integrated Logistic
- Activities Related To Integrated Logistics:
- Integrated Logistics Support
- Brief History Of Integrated Logistics Support
- ILS Elements Include
- Effectiveness Of ILS
- Determinants Of Designing Logistics Management
- Steps In Designing The Logistics System
- System Design Elements
- Logistics Management Information System

## 12.2 INTRODUCTION

The movement of raw materials and components to a manufacturing company must be managed. So must the movement of finished goods from the manufacturing plant to further processing, to the retail, or to the final consumer. The management of this movement is called integrated logistics management.

## 12.3 INTEGRATED LOGISTICS MANAGEMENT

Integrated Logistics is defined as, "the process of anticipating customer needs and wants; acquiring the capital, materials, people, technologies and information necessary to meet those needs and wants optimizing the goods-or-service-producing a network to fulfill customer requests; and utilizing the network to fulfill customer request in a timely way."

Integrated logistics is a service-oriented process. It incorporates actions that help move the product from the raw material source to the final customer.

## 12.4 VARIABLES AFFECTING THE EVALUATION AND GROWTH OF INTEGRATED LOGISTIC

The first was the growth of the consumer awareness and the marketing concept. Product line expanded to meet the rising demand for more selections. This product line expansion put great presser on distribution channels to move more products and keep cost down, especially in transportation and inventory.

A second factor was the introduction of the computer. Computer experts and integrated logistic manager quickly found a multitude of computer application for logistic. This application offered still greater efficiency in transportation routing and scheduling, inventory control, warehouse layout and design, and every aspect of integrated logistic. In fact computers allowed integrated logistic managed to modal integrated logistic system and then analyse the effect of proposed change. This application greatly advance the system's approach

The third variable leading to the growth of integrated logistics was the worldwide economy in the 1970s and 1980s. Global recession and rising interest rates caused many firms to refocus attention on reducing cost advantage; many firms were forced to revaluate overall transportation needs. Also, rising interest rates turned attention to maintaining minimum inventory levels because of the cost of capital

Globalization of business and the development of world trade blocks are a fourth factor influencing the growth of integrated logistics. Integrated logistic can provide firms with a cost advantage. Furthermore, trading blocks in Europe. Southeast Asia, Asia, Africa and the Americans (European Union, association of Southeast Asian nations and the Asian- pacific economic cooperation, southern African development community, North American free trade agreement and now the free trade agreement of the Americas) require integrated logistics to tie the participating countries into single marketplaces.

The final factor affecting integrated logistics is the growth of just-in-time manufacturing (JIT), supply management, transportation, and electronic data interchange (EDI) in the 1980s and 1990s. As manufacturers adopted total quality management (TQM), JIT, and EDI, integrated logistics management has come to the forefront. Effective TQM and JIT require optimizing the inbound and outbound transportation and more efficient inventory management.

## 12.5 ACTIVITIES RELATED TO INTEGRATED LOGISTICS

- Physical distribution.
- Materials management.
- Logistics engineering.
- Business logistics.
- Logistics management.
- Integrated logistics management.
- Distribution management.
- Supply chain management.

Although the activities include under each term vary, they share one key ingredient: "The concept of a continuous uninterrupted flow of the product."

## 12.6 INTEGRATED LOGISTICS SUPPORT

Integrated Logistics Support (ILS) is a technical process in which support and logistics considerations are integrated within the design life cycle of a product or system. The overall aim is a cost-effective and durable system that performs to its maximum capabilities.

A lean, functional system that requires minimal support thereby increasing one's return on investment (ROI): functional, reliable and usable whilst conforming to standards of best practice.

ILS is popular with product support, e.g. distribution and customer service systems.

### 12.6.1 BRIEF HISTORY OF INTEGRATED LOGISTICS SUPPORT

Originally developed by the military, ILS has been adopted by the commercial business world who apply it to many of their processes. It consists of a series of support elements, integrated into the system life cycle and measured at regular intervals.

The ILS whole is greater than the sum of its parts. In other words, the combination of all the support elements results in a highly effective process that boosts productivity of product support or customer service systems.

### 12.6.2 ILS ELEMENTS

Maintenance Planning

Logistics Support Analysis

Training

Human Resources/Human-Machine Interface

Support and Test Equipment

Computer Resources

Technical Data

Facilities

Packaging and Handling/Storage

Transportation/Delivery

This list is by no means exhaustive.

The result is a streamlined system that is easy to support and with a strong customer service ethos.

## 12.7 EFFECTIVENESS OF ILS

The answer to that is a set of pre-defined metrics or 'RAMT' for short (reliability, availability, maintainability and testability). These metrics are used to measure the performance of each support element throughout the lifespan of the system.

In some situations, 'system safety' metrics are used as part of a risk management strategy.

### Design, test and refine

This is an iterative process whereby each support element is tested on repeated occasions. Schedules are used which contain criteria specially designed for this process to ensure product support or customer service systems are in optimum condition.

An analysis is carried out to determine a set of tasks specific to an individual element. This helps with testing and suggestions for improvements.

One way to think of this is as a ‘continual improvement process’ in which every aspect is tweaked to improve its functionality. Regular maintenance, upgrades, repairs, training courses and tests are the tools used to achieve this.

Testing is followed by the production of a report outlining recommendations for change or improvement. It will highlight known errors that are disrupting operational efficiency, slowing down processes and leading to employee and management dissatisfaction.

You apply ILS as a means of refining your existing product support or customer services system until it meets approved guidelines and regulations.

**The human element**

People are an important part of any organisation. Their skills and experience contribute to the performance and efficiency of the system. Hence, why it is important that one nurture the capabilities of these employees ensuring they are able to cope with the demands of their role, often in pressurised conditions.

Human Resources are a vital part of the ILS process. The aim is to match the right person with the right job and there are various ways of doing this.

These include psychometric and/or proficiency tests that define an individual employee’s personality, skills and aptitudes. Once these have been analysed, management can allocate employees to roles in keeping with the results of these tests. Finding a perfect fit between the two.

The ILS process can help HR and senior management to devise teams consisting of a set number of employees, meeting Key Performance Indicators (KPI’s) as part of an overall strategy. This may mean a reduction in headcount but the trade-off is improved productivity and lower costs.

Additional support provided in the form of specially designed training courses, keeping employees up to date with the latest technologies and processes.

**Training the trainer**

A word about training: this is another vital part of the ILS process that is implemented throughout. It covers training materials, techniques and equipment and applies to training officers/instructors and trainees.

Training modules are devised for new employees, providing them with the theory and practical skills necessary for their role. They are regularly tested on their knowledge and ability to carry out their role to meet the needs of the organisation.

Training officers are assessed on a regular basis to see if they are familiar with their materials and the manner in which this is delivered to the attendees. Training material is updated in accordance with management requirements and business goals.

**Form and functionality**

Regular maintenance is crucial to the operational efficiency of product support and customer services systems. ILS believes in optimal functionality of a system, achieved by a schedule of regular upgrades, maintenance and repairs. This pro-active rather than reactive approach means that a system is always in tiptop shape and fully operational.

This reduces the risk of a drop in productivity caused by a system failure, disruption or malfunction. If a piece of equipment breaks down due to a lack of maintenance then the effects can be costly.

The conventional business model factors in the cost of repairs and adopting a short-term approach, only undertakes this whenever there is a problem.

## 12.8 IMPACT OF LOGISTICS ON THE GLOBAL ECONOMY

Logistics has two effects on organizations and the global economy. For starters, a company incurs numerous expenses, one of which is logistics costs. These expenses and logistics costs influence economic decisions and vice versa.

Second, logistics allows the sale of products and services, as well as the associated customer service and a variety of economic operations. Many businesses place a high value on customer service, and logistics can help them gain a competitive advantage.

A successful ILS requires the implementation of an integrated logistics support plan (ILSP). This ILSP is created during the concept phase of system procurement and updated throughout the life cycle of the system. It will also help management navigate the various stages of the life cycle.

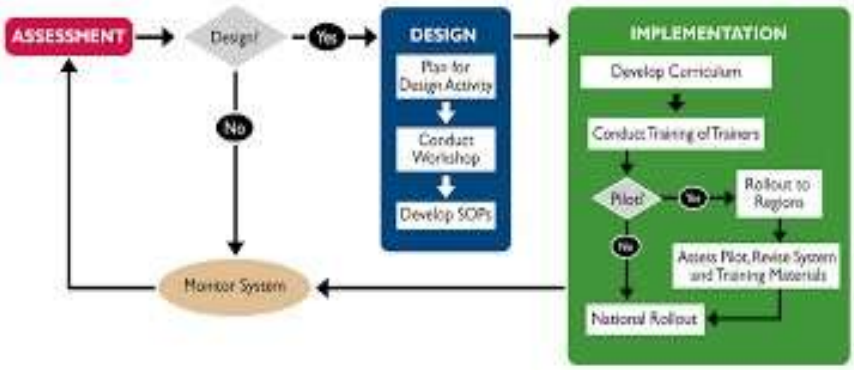
The following are some of the advantages of effectively implementing an ILSS:

- A more effective system that is used by the customer throughout the system's lifespan.
- A system that adheres to the operational and user requirement statements throughout the system's lifecycle.
- A more efficient business that meets budgets by projecting realistically, measuring actual expenditures, and avoiding surprises.
- There will be no crisis upgrades, modifications, or costly repairs as a result of premature activities.
- Avoids costly failures in vital, expensive, and time-consuming products.

## 12.9 DETERMINANTS OF DESIGNING LOGISTICS MANAGEMENT

In virtually all health programs, products move from one place to another. The way the products move may not be rational, the quantities of products that move may not be based on actual data, or the methods used to move the products may not be standard. The purpose of designing a logistics system is to standardize the flow of commodities and information. The technical design of a logistics system is one part of a larger process (see figure).

The overall process begins with an assessment to determine whether the six rights are being met and if the logistics system needs to be designed/redesigned. After you make your decision, then you plan and conduct the design activity. System managers should develop standard operating procedures (SOPs) to document design decisions and to use as a job reference. As part of the implementation, curriculum is developed based on the SOPs, and the system is rolled out, usually using a training-of-trainers (TOT) approach. After the system is implemented, you will need to continually monitor the system to ensure that the improvements are having the intended impact.




## 12.10 STEPS IN DESIGNING THE LOGISTICS SYSTEM

Each step in the process is described below, including key questions that must be addressed at each step. Additional guidance and tips related to the technical aspects of the logistics system design are also provided.

### 1. Complete an assessment and determine the need for design.

Your first step should be to conduct a formal or informal assessment to identify system strengths and weaknesses and to determine whether you need to design a logistics system, or redesign certain aspects of an existing system. In most cases, a lack of logistics procedures and tools and poor functionality is obvious; however, an assessment is still necessary to inform the design of the new system. Designing (and implementing) a system requires significant resources, both time and financial; therefore, if it's not broken, don't fix it.

Before beginning a system design, you need to understand the context in which the system operates/will operate. This enables you to understand what you can and cannot include in your system. For example, if the government requires you to use a certain form, then do not spend your time designing a different form that would serve the same purpose.

After you determine that the logistics system (or lack of a logistics system) is the cause of an existing problem, then it is time to design a system; if not, continue to monitor the system using the process.

Important questions at this stage include—

• How did you arrive at the decision to begin a system design (or redesign)?

• What system are you being asked to design?

**2. Plan and conduct the system design activity**.

You should conduct the system design in an organized and participatory manner, preferably during a workshop. Perhaps most critical to the success of the design is identifying the appropriate people to participate in the design process. The system should be designed, at least in part, by the customers of the system—everyone involved in implementing the system, as well as those who will contribute resources to operating the system. Designers should come from every level of the system: ministry officials and other partners at the central level, as well as personnel from intermediary levels (region, district) and health centers. To achieve the goal of implementing the system, you must engage the users of the system in the design process. Typically, a system design requires about 15 to 20 participants; the workshop should last approximately five days. In some cases, it can be appropriate for a small group of people to do a preliminary design, and then present options for the design to a larger group of stakeholders.

After you identify the members of the system design team, you will need to address other issues:

• What format will you use for the design activity—a series of focus groups, one large workshop, or a combination of the two?

• When and where will you conduct the system design activity? What arrangements do you need to make?

• How much of the design will you complete during the actual activity? • How many or which elements of the system design will you finish after the activity?

During a typical system design workshop, you will make decisions about all the major technical components of the system, specifically the LMIS, ICS, and storage and distribution. Basic elements covered in the design activity include the following:

**Review basic logistics principles.**

Start with a review of basic logistics principles; this will ensure that all members of the design team have a common understanding of the logistics principles they will apply during the design activity, and they will have a common vocabulary. After logistics basics, give participants time to apply their new knowledge in describing their own system.

**Agree on system parameters and boundaries.**

This includes reaching an understanding on any already existing elements that could be opportunities for the new or redesigned system, parameters that can or cannot be changed, and any other parameters that need to be considered during the design process.

**Design the pipeline.**

Ensure that the pipeline shows the levels in the system and the flow of information and commodities.

**Design the LMIS.**

Ensure that the LMIS includes drafts of all records and reports, including feedback reports already in the system. The design of the LMIS is integrally linked to the design of the ICS. After deciding on the ICS, it is important for you to go back to the LMIS that was designed and ensure that the two aspects of the system still work well together.

**Design the ICS.**

The ICS should include max-min stock levels, emergency order points, and review periods for each level in the system. You should decide on which levels in the pipeline will requisition (pull) and which will allocate (push) products. To assist in this design, you should do some analysis of typical lead time in advance using key informant interviews and a review of stock cards and transaction records.

**Identify storage and distribution requirements.**

Ensure that the storage and distribution recommendations conform to the suggested LMIS and ICS.

**Identify roles and responsibilities.**

Ensure that everyone involved in the health system has clearly defined roles and responsibilities.

**Develop an implementation plan.**

The workshop design team should provide input about the appropriate timing for implementation, as well as the required preparations. The implementation plan should consider the points noted in step 3 below.

Undoubtedly, outstanding issues will not be resolved during the workshop. Document these and follow up, as appropriate. If any issues might prevent the system from working, you must highlight and address them.

As part of the design step, you should develop an SOP manual that documents all the steps in the system. It should be drafted immediately after the system has been designed. After the SOPs are developed, they are reviewed by stakeholders, changes are made, and final approval is sought. This approval process involves convening stakeholder meetings to ensure the approval of all stakeholders; the ministry of health should own and endorse this document.

**3. Implement the system.**

Implementing a logistics system is a dynamic process that requires ongoing training, monitoring, and evaluation. The success of a system design is defined by how effective and efficient the system is in practice. No matter how well it is designed, the system will fail without a well-planned, properly resourced implementation plan. To maintain the momentum created in the workshop, the implementation phase should begin immediately after the system design is complete. An implementation plan includes key activities, timelines, and roles and responsibilities. It should also include answers for the following questions:

• What model of training will be used?

• How many sites need to be trained? How many individuals need to be trained?

• How many trainings, in total, are needed?

• How will the trainings be scheduled (i.e., what region/district/state/province should you start with)?

• Who will conduct the trainings?

• Will the system be implemented all at once or through a pilot/phase-in period?

• What resources are needed to implement the system (new LMIS forms, computers, training of staff, etc.)?

Steps in implementing the system include the following:

**a. Develop training materials**.

Using adult learning methods, these materials are designed to teach the staff how to use the SOP manual and job aids; and how to use the corresponding forms to order, monitor, and manage their health commodities.

**b. Training-of-trainers (TOT).**

The TOT teaches the participants how to apply adult learning theory to train health facility staff in how to order, monitor, and manage health commodities according to the SOP manual. Printing of materials and forms must be done prior to this stage, because the official forms must be used during the trainings. The group that completes the TOT is responsible for training the rest of the appropriate staff.

**c. Roll-out trainings.**

After the TOT is complete, the trainers should develop a schedule to train all relevant staff during a specific number of weeks or months.

**d. Mop-up trainings or other OJT training activities.**

After the system has been rolled out, be prepared to continue training staff. New staff are constantly being hired; they will need to be trained and other staff will need refresher trainings. You can include these training as part of an annual workshop, or ongoing OJT, to ensure that the system continues to function. In addition, you should incorporate technical information on managing the system into the routine supervision of the logistics personnel.

**e. Monitor the system.**

A logistics system is dynamic and needs to be flexible to accommodate changes that occur within the program or system. Continuous quality monitoring, re-evaluation, and improvements to the system must be fixed processes. To ensure that the system can be adapted to accommodate changes with minimal disruptions to the supply chain, early identification of issues or changes is essential. You should note:

• How is the system performing?

• What problems or issues that arise need to be resolved?

• Is the problem or issue a fault of the system design, or a fault in implementation or operations?

• How can problems be resolved?

• What resources are available to adjust the system?

## 12.11 SYSTEM DESIGN ELEMENTS

When designing or redesigning a system, the key elements to evaluate are: the overall pipeline, LMIS, ICS, storage and distribution, and roles and responsibilities. Many of these components have been described in detail in previous chapters. This section describes specific design considerations for each element.

**Pipeline:**

Flow of commodities and information One of the first steps in the design process is to draft an overall pipeline, i.e., the system through which the commodities will flow down from the upper levels to the clients and the information will flow throughout the system. In general, the fewer the number of steps in the resupply process and the fewer levels in the pipeline, the better. The movement of commodities down through the system should be based on good commodity management practices, not political or other considerations. However, if you are working in the context of an existing system, the flow of commodities must take into account any elements that you cannot change; even if, from a commodity management perspective, the resulting flow is not the most efficient.

**Logistics Management Information System (LMIS)**

When you design a logistics system, you must collect the right data that are needed to make logistics decisions and you must get that data to the people making those decisions. Furthermore, you do not want people spending their valuable time collecting and reporting information that will not be used for making decisions. As discussed earlier, you know that the system will require the following types of records:

• Stockkeeping records keep information about products in storage (collect stock on hand and losses and adjustments data).

• Transaction records keep information about products being moved through the system.

• Consumption records keep information about products being consumed or used (collect consumption data). If consumption records will not be used, system designers must ensure that consumption data is collected and reported up the system.

In addition to the records used to collect logistics data, the LMIS must also receive summary reports to report consumption, stock on hand, and losses data to the higher levels of the system. The LMIS should also produce one or more feedback reports, which will communicate information up and down the supply chain—from facilities through to central-level stakeholders.

Some of these records and forms may already be available; if so, you need to verify that they can be used as is. Other records and forms may exist but they may need to be revised. And, you may need to create new records or forms for the first time.

When designing the LMIS, you should consider the following points:

• What data are needed for commodity management?

• What records and reports are needed for commodity management?

• What unit of measure should be used (tablet, piece, bottle, etc.)?

• How will consumption data be collected (on a consumption record?)?

• Who at the facility level will be responsible for reporting data?

• At what frequency should logistics data be reported to higher level(s)?

• How will the report/order get to the higher level(s)?

• Where should reports and requisition forms be sent? What department, division, or unit needs to receive the report or requisition? What will they do with the reports and/or requisitions they receive?

• What approvals, if any, are required for the resupply process?

• Should some or all the commodity names be preprinted on LMIS forms?

• Can any elements of the LMIS be automated? If so, which ones? If using automation, how will information be transmitted from one level to the next?

Review all LMIS forms currently in use in the country to see if the forms that you need already exist.

• Can they be used as they are?

• Do they need revision?

• Do any new or missing LMIS forms need to be designed?

After the initial LMIS is designed, you can create a map of the flow of information, indicating which LMIS forms are used at each level of the pipeline, where the forms move, and who is involved in the flow of information. Verify that the flow of information supports logistics decisionmaking.

**Inventory control system (ICS)**

When designing a logistics system, the type of max-min inventory control system that you choose will dictate how and when commodities will be resupplied throughout the system. The ICS and the related max-min stock levels for the commodities will also have a direct impact on the resources needed to implement the system, including what resources will be needed (storage capacity, vehicles, human resources, time), as well as when and where these resources will be

needed and how they are used. The type of max-min system you choose will also dictate some of the LMIS requirements.

A number of factors should be considered when you select an inventory control system and when you define the details of that system. As described in chapter 4, considerations include—

• What type of max-min inventory control system works best for your program (i.e., forced ordering, continuous review, or standard)?

• At each level of the system—

– What is the longest lead time for resupplying commodities to the next level down?

– How often should the level be resupplied with commodities (review period)?

– What is the estimated safety stock level?

– What is your calculated minimum stock level?

– What is your calculated maximum stock level?

– What is the longest lead time for an emergency order? What is the corresponding emergency order point?

– Will the system use delivery or pick-up to get the products from the supplier to the recipient?

• Based on the expected lead times, review periods, and safety stock levels, is the total length of the in-country pipeline too long for the product with the shortest shelf life? Can it be shortened?

• Who should determine the resupply quantities at each level of the pipeline (allocation/push or requisition/pull)?

• Can one ICS serve all products, or are different systems needed, depending on the characteristics of the products or geographical diversity of the country?

• Can the budget support the quantities of commodities that are required to maintain the established max-min stock levels?

After you design the initial ICS, map the flow of commodities throughout your pipeline, including the max-min stock levels. Ensure that the overall length of the total pipeline does not exceed the shelf life of the products managed by the system. You should also verify that the lead time, safety stock, and review period stock levels are correctly calculated for the max-min stock levels.

**Storage and distribution**

The inventory control system that you choose for your system will dictate the volume of commodities that will be stored and distributed through your supply chain. If you have shorter review periods, then the storage space needs will decrease, but the transportation needs will increase because you will be moving smaller quantities of products through the system more often. If you have longer review periods, then the storage capacity requirements will increase, as will the amount of money being tied up in inventory; you will need larger vehicles to move larger volumes of stock, although deliveries will not occur as often. As detailed in chapter 8, when determining your storage and distribution resource requirements, you should consider the following elements:

• For each storage facility at each level, consider the following questions:

– Do you have sufficient storage space?

– Do you have cold chain storage capacity, if required?

– Do you have a sufficient number of staff? Are these staff skilled in commodity management?

– What role will warehouse staff have in reports/data management (i.e., processing orders, picking, packing labeling, loading supplies on trucks, etc.)?

• How will commodities move from higher levels to lower levels (i.e., distribution or pick-up system)?

• Are vehicles available to distribute or pick up commodities between each level of the system?

Storage space requirements must be determined for each facility, at each level, of the system; facilities must have the storage capacity to store up to the maximum stock level set for that level.

Transportation resources must be available at whichever level is responsible for physically moving the products: thus, higher-level facilities will need vehicles if they are to deliver commodities to the lower levels; lower-level facilities will need vehicles if they are to pick up commodities from the resupply facility at the higher level.

**Roles and Responsibilities**

After an initial system design is drafted, make a list of each position that will be involved in the logistics system; identify the various roles and responsibilities for each person, by level, if possible (i.e., start with all staff at the facility level that have logistics responsibilities, then move up the system, level by level, to the central level). You will need to clarify the skill set needed to fulfill those responsibilities and to ensure that all roles and responsibilities needed to operate the logistics system are assigned to a specific job title or job function.

For the LMIS, specifically, roles and responsibilities will include those related to—

• collecting logistics data

• reporting logistics data

• aggregating logistics data, if applicable

• analyzing logistics data, including quality check

• managing computerized data management system, if applicable

• generating and disseminating feedback reports.

For ICS, specifically, roles and responsibilities will include those related to—

• determining resupply quantities

• approving resupply quantities

• conducting physical inventories

• monitoring stock levels.

For storage and distribution, specifically, roles and responsibilities will include those related to—

• receiving orders from the lower level

• physically receiving the products at the storage facility

• processing commodity orders (picking, packing)

• maintaining adequate storage conditions

• maintaining cold chain equipment, if applicable

• processing emergency orders, if applicable

• scheduling commodity deliveries, if applicable

• monitoring storage capacity

• maintaining vehicles in working order.

In addition to the specific areas mentioned above, roles and responsibilities should also be defined in other areas:

• monitoring logistics system performance (for example, stockout rates and reporting rates)

• supervision and on-the-job training

• production and distribution of logistics tools (forms, records, reports)

• role of program staff (family planning, HIV and AIDS, malaria, etc.) in monitoring commodity availability and supporting the logistics system.

After you assign the roles and responsibilities, double-check your lists to ensure that the roles and responsibilities are assigned logically, all functions within the logistics system have been assigned appropriately, and there is no redundancy.

**12.12 SUMMARY**

Over the years the development of information technology has been shown, that an integrated logistics system is increasingly important mainly for distribution-oriented companies that are exposed to high domestic and global competition. Survival of distribution, logistics and

manufacturing companies has become a fundamental problem mainly because of high competitive fight. Framework of an integrated logistics system described in this article includes information about the system, relationships and its operating philosophy. An inevitable trend and development in the future will be more intensive by using of new information or virtual reality technologies, which is necessary to increase productivity in logistics, "the distribution" of industry. Using the potential of integrated logistics is one of the steps to a successful logistics company.

## 12.13 SELF-ASSESSMENT QUESTIONS

**Q1.** What is meant by integrated logistics?

**Q2.** What are the key activities of integrated logistics?

**Q3.** Discuss the variables affecting integrating logistics.

**Q4.** What is integrated logistics support?

**Q5.** Write the steps involved in logistics system.

## 12.14 TEXT AND REFERENCES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# UNIT 13: TRANSPORTATION, WAREHOUSING, PACKAGING

## UNIT FRAMEWORK

## 13.1 OBJECTIVES

After reading this unit, you will be able to understand

- Transportation
- Transportation Management System
- Evolution of TMS
- Freight Management Logistics
- Containerization – Concept
- Wareousing
- Warehouse and Distribution Centre Packaging

## 13.2 INTRODUCTION

In this unit, you will learn about transportation, warehousing and packaging.

## 13.3 TRANSPORTATION

In business, at its most basic level, transportation is simply moving products and materials from one place to another. This includes shipment of raw materials to the manufacturer and movement of finished product to the customer. Transportation also includes the movement of parts to

assembly areas as they are assembled. Modes of transport include air, rail, road, 12 water, cable, pipeline and space. The field can be divided into infrastructure, vehicles and operations. Transportation is important since it enables trade between people, which in turn establishes civilizations.

### 13.3.1 TRANSPORTATION MANAGEMENT SYSTEM

A transportation management system (TMS) is a logistics platform that uses technology to help businesses plan, execute, and optimize the physical movement of goods, both incoming and outgoing, and making sure the shipment is compliant, proper documentation is available. This kind of system is often part of a larger supply chain management (SCM) system. Sometimes known as transportation management solution or transportation management software, a TMS provides visibility into day-to-day transportation operations, trade compliance information and documentation, and ensuring the timely delivery of freight and goods. Transportation management systems also streamline the shipping process and make it easier for businesses to manage and optimize their transportation operations, whether they are by land, air, or sea.

### 13.3.2 EVOLUTION OF TMS

Up until 2010, transport was still managed manually; irrespective of whether it involved direct delivery of product to a production line, or delivery of product to build inventory levels. Although tracking systems have been in place decades, the visibility of consignments through the general haulage network has been all but non-existent. Over the past decade, the use of telematics to locate vehicles and set up geo-fences has become standard as the cost of installing such systems has fallen. However, these systems will become increasingly obsolete as the ubiquity of smart phones and other mobile devices has resulted in the development of easily accessible and cost effective applications that are able to track consignments from departure to delivery. These systems are revolutionizing the way in which vehicles are tracked and controlled, bringing with them some obvious and significant benefits: they are usually cheap to buy and operate; most people already have access to a smart phones or tablet, and they offer an unprecedented level of flexibility and mobility.

Furthermore, the running and transmission of data using mobile over the networks costs a fraction of the price that companies currently pay to track vehicles. The transmission of mobile

data also facilitates the centralization of data transmitted in real time. This means that 13 people can see their proof of delivery (PoD) almost immediately after delivery, which also saves the costly administration process of scanning PoDs when the vehicle returns to base.

**Managing data:**

Implementing a TMS won't automatically reduce transport costs, as complex systems they can be difficult to implement, and unless the time and money is invested upfront then the returns will not be realized. Accurate data is also critical to the success of any system, and the process of ensuring accurate data is maintained can be the single biggest success factor.

There are two types of data required in a TMS:

1. Static or reference data which remains constant for a defined period of time e.g. transport rates, product dimensions, type of container etc.

2. Dynamic data which is changeable and flows through the system on a daily basis e.g. demand – orders and order lines.

An effective TMS will utilize the static data, assess the demand, consider how it's packed and, based on the combined information, choose the optimum method of shipping. Demand flows through to the TMS as orders are placed on the production ERP and a good TMS will dynamically figure out the optimum transport mode and routing. There are now transport apps emerging which can be used as a standalone option or part of a modular based transport system offering access to a whole range of facilities/operations in real time including:

- booking collection slots online
- live tracking of consignments
- access to interactive delivery information, uploading any changes in schedule so that live information is always available
- instant download of Proof of delivery
- instant delivery of photographs and videos of damaged products

- Geo-fencing which automatically triggers a notification when pre-set boundaries are crossed.

Using these applications, carriers and their customers can view and manage an entire delivery manifest, allowing instant access to a whole range of information previously unavailable.

**Transport infrastructure:**

Transport infrastructure consists of the fixed installations, including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, 14 warehouses, trucking terminals, refuelling depots (including fuelling docks and fuel stations) and seaports. Safe, efficient and sustainable transport infrastructure is important for any country around the world. Funding and constructing transport infrastructure projects can be complex and risky. They are often built on challenging and sensitive environments and over unexpected geotechnical conditions.

### 13.3.3 MODES OF TRANSPORTATION IN LOGISTICS

Logistics is a very diverse and complex industry. It involves many modes of transportation and ways of shipping goods. Sometimes, it may be challenging for a company to choose the right mode of transportation to reach the best result. It can be especially difficult to domestic or global shipping.

Different modes of transportation:

There are several main transportation modes in the freight shipping industry:

- Ocean
- Air
- Rail
- Road
- Intermodal and Multimodal

All of these modes are extremely important and play a significant role in the industry. However, there are many differences in terms of price, shipped commodities, transit distance, etc. While some modes may be the perfect solution to one business, at the same time may be absolutely useless to another one.

- **Ocean shipping:**

Ocean shipping is the most popular way of moving large volumes of goods overseas. Compared to air, the ocean is a much more cost-efficient option yet a rather slow one. This mode of transportation works best for shippers who need to move goods on a distance longer than 400 km. Also, it works for oversized, hazardous, liquids, and weird-shaped freight. Ocean shipping is common among large and mid-sized businesses because they need global shipping on a regular basis. The freight is stacked in containers that are later loaded onto the ships or barges.

- **Air shipping:**

Probably the fanciest shipping mode, the air is a reliable and extremely quick way to ship freight. Obviously, extraordinary speed comes at a higher price. Because of its larger cost, the air is mostly used by bigger companies but small businesses often use it too. This option is the perfect solution for retail companies and light industries. Essentially, there are specialized aircraft for hefty cargo but in general, planes are not developed for handling oversized freight of unusual shape.

- **Over-the-Road Shipping**:

Over-the-road transportation is the most popular, the most frequently used, and the most indemand mode of transportation. It works for everyone, from individual shippers to large enterprises. Also, road transport comes with a wide variety of equipment and shipping modes.

There are two main types of over-the-road transportation:

full truckload (FTL) and less-thantruckload (LTL).

FTL shipping means that one shipper takes the entire truck capacity to move the freight when LTL suggests partial use of the trailer by several shippers. There are also various types of trailers

that serve different shipping needs: dry van, flatbed, refrigerated, etc. It is easy to get a freight quote from the carrier and choose the needed equipment.

- **Intermodal and Multimodal:**

Choosing the right mode of transportation may be difficult, especially if you have a long and complicated route. Intermodal and multimodal can transportation solves this problem, as they are two types of combination transportation modes. Generally, intermodal and multimodal shipping suggest the combination of road, rail, ocean, or air for a single shipment. The only difference between both methods is that intermodal is handled under a single bill, while multimodal goes with separate bills from all the carriers involved. Generally, intermodal and multimodal can be very beneficial to the shipper in terms of price and flexibility. Ultimately, each mode of transportation has its advantages and drawbacks.

### 13.3.4 FREIGHT MANAGEMENT LOGISTICS

Freight management logistics encompass the technology, experience, human resources and knowledge utilized to facilitate effective, efficient and expeditious coordination between carriers and shippers and ensure goods are delivered on budget, and on time. This allimportant network provides the critical guidance and support so vital for the smooth operation of the ever-evolving freight forwarding industry. Freight management logistics 16 comprise the core mechanisms and infrastructure at the heart of this estimated $270 billion global business. Though essentially invisible to the land-based general public, international maritime shipping accounts for about 90 percent of world trade, and without such logistical precision underpinnings, would simply not be possible.

**The Role of Freight Forwarders:**

Overseeing these mechanics and ensuring this exactitude is a freight management logistics team dedicated to:

- Maintaining relationships with steamship lines
- Minimizing empty miles by coordinating efficient shipping routes
- Negotiating freight rate contracts

- Ensuring continued customs compliance and insurance protection.

Freight forwarders manage the following logistical responsibilities:

- Communication
- Tracing and Tracking
- Warehousing and Distribution
- Customs
- Insurance

**Factors that affect freight rates**:

Rates for freight transportation might seem like they're calculated using some complex algorithm that makes little sense. However, there are several factors that impact the rates for LTL (less than a truckload) freight shipping. Here are 6 of those factors to help take the mystery out of freight transportation pricing:

**1. Classification of freight** – All LTL freight to be shipped must be assigned a freight class and appropriate NMFC codes (National Motor Freight Classification) based on the type of freight it is. Different types of freight classifications have different rates. This is why working with a knowledgeable freight broker is so important that they ensure freight shipment has the correct classification and NMFC codes.

**2. Distance of shipment** – Generally speaking, the farther the distance, the higher the cost. Additional costs related to distance may be added if the shipment is going to an area the transport carrier doesn't serve, and the shipment has to be transferred to a second carrier to get it to the desired destination. A good freight agent is your partner in keeping such switchovers to a minimum.

**3. Weight of freight** – LTL freight weighs between 151 lbs. and 20,000 lbs. With such a large range, weight is calculated per 100 lbs. Generally, the more a shipment weighs, the lower the

cost per 100 lbs. This creates a bit of a discount incentive for larger and heavier freight shipments.

**4. Carrier base rate** – Each carrier has their own base rate, which is calculated per 100 lbs. However, your freight broker may be able to negotiate the base rate for a particular shipment with a carrier if that carrier needs volume to create full truckloads on certain routes.

**5. Absolute Minimum Charge** – Every carrier has an Absolute Minimum Charge or AMC that is the lowest possible charge for that carrier. Many carriers increase their AMC over time, particularly if they have a high number of shipments at or close to the AMC because the carrier has greater costs for AMC shipments over larger, heavier shipments.

**6. Added surcharges** – Surcharges are added to freight rates for extra services or services beyond the standard dock-to-dock or business-to-business delivery. For example, a carrier may add surcharges for residential delivery (or pick-up), inside delivery, lift gate service, or delivery to a location with limited access, such as schools, churches, prisons and storage facilities. Additionally, fuel surcharges are typically added to every freight quote across nearly all carriers.

**Transport network**

The complete system of the routes pertaining to all means of transport available in a particular area, made up of the network particular to each means of transport. A transport network, or transportation network is a realization of a spatial network, describing a structure which permits either vehicular movement or flow of some commodity. Examples include but are not limited to road networks, railways, air routes, pipelines, aqueducts, and power lines.

**Route Planning**

Route planning is about how to create driving directions or routes for multiple locations in the most efficient way. Here is a definition from the website Business Dictionary: “Computing the most cost-effective route involving several nodes or stopovers by minimizing the distance travelled and/or time taken”. There are many terms to describe the process of “route planning,” it can be seen with the following wordings:

- Route planning and schedule

- Route optimization
- Route management or route making
- A trip planner, planner journey, or trip planners
- Fleet management, vehicles or of several fleets
- Vehicle management or driver management

All these terms are related and all points are similar place (e.g., creating the best driving directions (or routes) to multiple locations, addresses or stops). Route optimization is a part of the route planning process because it's about optimizing the routes in terms of speed and efficiency. Routes or vehicle management could encompass a more comprehensive array of issues, including maintenance and so on.

## 13.4 CONTAINERIZATION – CONCEPT

Containerization is the international shipping practice of storing a number of pieces of freight within a large container and transporting them as a single unit. This technique offers benefits to shippers, including less cargo handling, greater cargo protection and reduced shipping costs. Standardized containers, typically in 20- or 40-foot lengths, can be transported over long distances and transferred between transportation modes more efficiently.

### 13.4.1 ADVANTAGES OF CONTAINERIZATION

- Less handling of cargo
- More protection against pilferage
- Less exposure to elements
- Lower shipping costs

Even if containerization conveys numerous advantages to freight distribution, it does not come without challenges.

The main advantages of containerization are:

- Standardization.

The container is a standard transport product that can be handled anywhere in the world (ISO standard) through specialized modes (ships, trucks, barges, and wagons) and equipment. Each container has a unique identification number and a size type code.

- Flexibility.

It can be used to carry a wide variety of goods such as commodities (coal, wheat), manufactured goods, cars, and refrigerated (perishable) goods. There are adapted containers for dry cargo, liquids (oil and chemical products), and refrigerated cargo. Discarded containers can be recycled and reused for other purposes.

- Costs.

Lower transport costs due to the advantages of standardization. Moving the same amount of break-bulk freight in a container is about 20 times less expensive than conventional means. Containers enable economies of scale at modes and terminals that were not possible through standard break-bulk handling.

- Velocity.

Transhipment operations are minimal and rapid, and port turnaround times have been reduced from 3 weeks to about 24 hours. Because of this transhipment advantage, transport chains involved containers are faster. Containerships are faster than regular freighter ships.

- Warehousing.

The container is its own warehouse, protecting the cargo it contains. This implies simpler and less expensive packaging for containerized cargoes, particularly consumption goods. The stacking capacity on ships, trains (doublestacking), and on the ground (container yards) is a net advantage of containerization. With the proper equipment, a container had can increase its stacking density.

- Security and safety.

The container contents are unknown to carriers since it can only be opened at the origin (seller/shipper), at customs, and the destination (buyer). This implies reduced spoilage and losses (theft).

### 13.4.2 DRAWBACKS OF CONTAINERIZATION

- Site constraints.

Containers are a large consumer of terminal space (mostly for storage), implying that many intermodal terminals have been relocated to the urban periphery. Draft issues at the port are emerging with the introduction of larger containerships, particularly those of the post-panamax class. A large post-panamax containership requires a draft of at least 13 meters.

- Capital intensiveness.

Container handling infrastructures and equipment (giant cranes, warehousing facilities, inland road, and rail access) are important capital investments that require large pools of available capital. Further, the push towards automation is increasing the capital intensiveness of intermodal terminals.

- Stacking.

The complexity of the arrangement of containers, both on the ground and modes (containerships and double-stack trains), requires frequent restacking, which incurs additional costs and time for terminal operators. The larger the load unit or the yard, the more complex its operational management.

- Repositioning.

Because of trade imbalances, many containers are moved empty (20% of all flows). However, either full or empty, a container takes the same amount of 20 space. The observed divergence between production and consumption at the global level requires the repositioning of containerized assets over long distances (transoceanic).

- Theft and losses.

High-value goods and a load unit that can forcefully be opened or carried away (on a truck) implied a level of cargo vulnerability between a terminal and the final destination. About 1,500 containers are lost at sea each year (fall overboard), mainly because of bad weather.

## 13.5 WAREHOUSING

Warehousing is the act of storing goods that will be sold or distributed later. While a small, home-based business might be warehousing products in a spare room, basement, or garage, larger businesses typically own or rent space in a building that is specifically designed for storage.

Warehousing and all that goes along with it is part of a sophisticated industry known as logistics management. Logistics includes procurement, inventory management, and distribution. It falls under the supply chain umbrella, which also includes product development, marketing, sales, and other product-related disciplines.

Whether the purpose is strictly storage or storage plus order fulfillment, warehouses use specific elements that help manufacturers, distributors, and retailers monitor inventory and store it safely. An overview of basic elements includes:

Shelving and rack systems that offer maximum storage capacity and easy product access. A climate control system for the product being stored. This is particularly important for frozen products or those requiring refrigeration, including certain pharmaceutical or laboratory products, and others that degrade if exposed to too much heat. Inventory control software that tells the product owner – who isn't necessarily the building owner – where all individual units are in the system at all times.

Equipment that can move products from point A to point B – forklifts, pallet jacks, bins that hold products for orders, and conveyor belts, for example. Shipping supplies for order fulfillment.

People who load products into a warehouse and others ("pickers") who fill orders in a true distribution center, plus those who manage the facility and operation. Security to protect stored products.

Access to cost-effective transportation to bring products in or move them out as orders are fulfilled. That often means easy access to interstates, rail lines, or airports.

A warehouse is a commercial building for storage of goods. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses, customs, etc. They are usually large plain buildings in industrial areas of cities, towns and villages.

They usually have loading docks to load and unload goods from trucks. Sometimes warehouses are designed for the loading and unloading of goods directly from railways, airports, or seaports. They often have cranes and forklifts for moving goods, which are usually placed on ISO standard pallets loaded into pallet racks. Stored goods can include any raw materials, packing materials, spare parts, components, or finished goods associated with agriculture, manufacturing and production. In India, a warehouse may be referred to as a godown.

### 13.5.1 WAREHOUSE AND DISTRIBUTION CENTRE

The terms warehouse and distribution centre are often used interchangeably, however, a warehouse provides only storage; and a distribution centre not only stores the products but also executes the orders. In a distribution centre the emphasis is on processing and moving goods on to other parts of the supply chain. Modern supply chains equipped with better information can forecast product demand well in advance, plan accordingly and deliver the right product in the right place at the right time. Therefore, the static warehouses are evolved into distribution centres.

The differences between a warehouse and a distribution centre are:

- A warehouse is used for storing products while a distribution centre, apart from storing products offers value-added services like product mixing, order fulfilment, cross docking, and packaging.
- A distribution centre stores products for relatively lesser periods compared to a warehouse. Hence, the flow velocity through the former is much greater than the latter.
- A distribution centre is customer-centric bridging the supplier and its customers. While the role of a warehouse is to store products efficiently, the role of distribution centre is to efficiently meet customer requirements.

- Typically retail and warehouse orders are shipped from a distribution centre and not from a warehouse. Basically, a warehouse generally does not serve external customers like a distribution centre.
- The operations at a distribution centre are much more complex than that at a warehouse. As a result, the distribution centres are equipped with latest technology for order processing, warehouse management and transportation management.
- Warehouses exist and serve a purpose. An example is when inventory is pre-built months in advance to meet the high seasonal demand and is stored in typical warehouses before being sent to a distribution centre for customer service. However, the importance of warehouses in supply chain has gone down and the distribution centres have now emerged as the nerve centres of the modern supply chains.

### 13.5.2 WAREHOUSING ELEMENTS

The basic elements that help monitor inventory and store it safely in a warehouse, whether only storage or also order fulfilment, are:

a) Shelving and rack systems that offer maximum storage capacity and easy product access.

b) A climate control system for the product being stored. This is particularly important for frozen products or those requiring refrigeration.

c) Inventory control software giving details where all individual units are in the system.

d) Equipment for moving products within the warehouse.

e) Shipping supplies for order fulfilment.

f) Pickers or people who load products into a warehouse, others who fill orders in a true distribution centre, and those who manage the facility and operation.

g) Security to protect stored products.

h) Access to cost-effective transportation to bring products in or move them out as orders are fulfilled. That often means easy access to highways, railways, or airports.

### 13.5.3 FUNCTIONS PERFORMED BY WAREHOUSES

Warehouses usually perform the following functions:

**a) Procurement:** The first step in warehousing where goods are received unloaded and moved to pre-receipt inspection point and for accounting purpose.

**b) Sorting:** Items received in bulk are sorted out item-wise for better storage and easy identification. Heavy and big sized items are kept separate.

**c) Breaking (dividing):** Items received in bulk are broken down into smaller portions and packed separately to cater to the requirements of various retail outlets and customers.

**d) Storage:** After sorting and dividing, items are stored with proper identification and location to take them out as and when required. Big retailers also use computers and merchandise-based software packages to locate, identify and maintain accounting of the items.

**e) Making items available for consignment/shipment:** In warehouses, goods are stored for short period, and as per the orders from retail outlets or customers; goods are dispatched to the destinations.

**f) Material handling:** Material handling is a part of physical distribution system consisting of proper handling equipment used for loading, unloading, lifting, and moving goods from one place to another.

**g) Display:** To promote sales, some warehouses display products.

**h) Inventory control:** It includes procuring goods and keeping its proper records. Warehouses are also responsible for inspection, maintenance, and accounting of goods to prevent any thefts and unforeseen mishaps. Proper accounting results in avoiding large fluctuations in inventory levels.

**i) Processing:** Certain goods are not to be consumed in the form they are produced. It requires processing to make them consumable. For instance, ripening of fruits or juice extraction, seasoning of timber, crushing of wheat, polishing of paddy etc. Some warehouses also perform these activities as per the demand from the owners.

**j) Grading and branding:** Some warehouses perform the functions of grading and branding of goods on the behalf of the producers, wholesalers, or the importer of goods. Besides usual activities, some warehouses provide mixing, blending, and packaging assistance for the convenience of handling and sale.

**k) Transportation:** In a few cases, warehouses provide transportation facility. It collects goods from the factories and sends these goods to the place of delivery.

### 13.5.4 TYPES OF WAREHOUSES

The following are the types of warehouses.

**a) Private Warehouses:** Private warehouses are owned by the business enterprises to store their products. Because of heavy cost of construction and maintenance of these warehouses, their number is quite small. Only big business houses can afford to have such type of warehouses.

**b) Public Warehouses:** These are also known as duty paid warehouses and open for public at large. Most of the small and medium business organisations cannot afford to have their own warehouses on account of large financial investment in their construction and maintenance. They make use of these types of warehouses, which may be owned by an individual or some agency whose main object is to provide storage facilities to people for certain fees or charges. These warehouses operate within rules and regulations formed by the government. Public warehouses are especially useful to business houses, usually situated near railway lines or main roads, to provide quick transportation services. Goods lying in the warehouse can be hypothecated for getting loan and financial assistance. Public warehouses ensure greater security and handling of goods on account of latest mechanical devices used in handling and preserving the goods. Goods can be branded, graded, and packed in desired sizes in the warehouses.

**c) Bonded Warehouses:** Bonded warehouses situated near the port, are used for imported goods which are not granted clearance on account of nonpayment of custom duty by the importer of these goods. Goods can only be removed after the custom duties are paid. Bonded warehouses may be run by the government or licensed private agencies having strict control and supervision imposed by custom authorities on their operation and functioning. The importer of the goods can inspect and check the goods. After making part payment of the custom duty, goods can be

proportionately withdrawn from these warehouses. Goods kept in these warehouses can be branded, packed, graded, and labelled in the warehouse itself. Bank loans can be raised with the help of receipt issued by these warehouses as a collateral security. There is a least possibility of goods being exposed to any risk of theft, damage, and deterioration. The entrepôt trade i.e., reexport of imported goods is greatly facilitated as the importer can have the delivery of goods without paying any custom duty.

**d) Special Commodity Warehouses:** These warehouses are constituted for storing a particular type of commodity, e.g., tobacco, cotton, wheat etc. The nature of the commodity is important in selecting the type of warehouse. Storage tanks are needed for storing petrol, and godowns for storing agricultural products.

**e) Cold Storage or Refrigerated Warehouses:** These are the warehouses which are used for storing perishable commodities like eggs, butter, fruits, vegetables, fish, fresh meat etc. Goods stored in cold storages can be held for longer time making possible the regular supply of certain commodities throughout the year.

**f) Institutional Warehouses:** Different institutions and bodies have their own warehouses on account of the nature of their operations. Banks keep the stock of the companies in these warehouses as security against the loans advanced. Railways maintain warehouses to store large quantity of goods to be dispatched to different parts of the country, or goods received for the purpose of delivery are kept till they are disbursed to the claimant. Various transport agencies also maintain warehouses for storing the goods which are to be dispatched and received. The Food Corporation of India has many big warehouses throughout the country for storing agricultural products.

## 13.6 PACKAGING – CONCEPT

The Packaging refers to all those activities related to designing, evaluating and producing the container for a product. Simply, the box-like container, wherein the product is stored to protect it from any physical damage and at the same time attracting the customer through its appeal is called as packaging. The product might have three layers of packaging, such as, a toothpaste come in the plastic tube (primary package), then it is packed in a cardboard box (secondary package) and then finally is packed in a corrugated box (shipping or third package). Nowadays,

the packaging is not limited to the protection of a product alone, but it has been used as a marketing tool for building the brand equity and boosting sales.

In today's scenario, most of the companies use packaging as an important marketing tool because of the following factors:

- The packaging enables the self-service; as in the case of purchases done in the supermarkets and retail mart the customers select the products on their own without any assistance from the retailers. Thus, the company must design its product package in such a way, that it is capable enough to draw customer's attention towards it.

- It helps in increasing the consumer affluence, which means the customers are willing to pay even more for the convenience, appearance, dependability of the better packages.

- The packages help in increasing the brand recognition among the customers. As soon as the customers see the package, they can instantly relate it to the company or brand. For example, the Brooke Bond's Taj Mahal Tea comes in the blue pack with an image of a Taj Mahal on its box; this gives an identity to the brand.

- The innovative packaging also helps in bringing huge profits and benefits for the firm. Here, the company gives a unique design to its product package with the intent to grab customer's attention. For example, the calcium Sandoz bottles targeted at 3 children and women have been designed to make them attractive to the target segment (A dog shaped bottle for kids, while a lady-shaped bottle for women).

Thus, the packaging is capable of influencing a buyer to initiate sales since the buyer comes in contact with the package first and then after with the product.

### 13.6.1 LOGISTICAL PACKAGING – CONCEPT

Logistical Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use. It also refers to the process of design, evaluation, and production of packages. As explained below, the main use for packaging is protection of the goods inside, but packaging also provides us with a recognizable logo, or packaging, we instantly know what the goods are inside.

**Purposes:**

- Physical Protection - The objects enclosed in the package may require protection from, among other things, shock, vibration, compression, temperature, etc.

- Barrier Protection - A barrier from oxygen, water vapour, dust, etc., is often required.

- Containment or Agglomeration - Small objects are typically grouped together in one package for reasons of efficiency.

- Information transmission - Packages and labels communicate how to use, transport, recycle, or dispose of the package or product. With pharmaceutical, food, medical, and chemical products, some types of information are required by governments.

- Marketing - The packaging and labels can be used by marketers to encourage potential buyers to purchase the product. Package design has been an important and constantly evolving phenomenon for dozens of years.

- Security - Packaging can play an important role in reducing the security risks of shipment. Packages can be made with improved tamper resistance to deter tampering and also can have tamper-evident features to help indicate tampering. Convenience - Packages can have features which add convenience in distribution, handling, display, sale, opening, use, reclosing and reuse.

- Portion Control - Single serving or single dosage packaging has a precise amount of contents to control usage. Bulk commodities (such as salt) can be divided into packages that are a more suitable size for individual households. It is also aids the control of inventory: selling sealed one-liter-bottles of milk, rather than having people bring their own bottles to fill themselves.

### 13.6.2 OBJECTIVES FOR PACKAGING

Three main objectives of packaging are:

1. Protection: The basic objective of packaging for industrial goods such as components and machinery is to protect the product while in transit. But packaging for consumer goods has a broader aim.

2. Cognizability: It is not enough for packaging to protect the product. Since the product is meant for sale in final form to the ultimate customers, it must also make the particular brand recognizable and appealing to buyers. This is very important in the case of packaged foodstuffs and other frequently purchased items from supermarkets and self-service stores. Here several brands of a product are displayed next to one another on the shelves, and it is important that the color and design of a package attract the attention of the customers and thus play a major part in promotional strategy. The packaging lends charm to the product and reinforces the brand name. If the packaging does not induce the consumer to pick the commodity's brand in this situation, then all previous promotional efforts to differentiate these brands are wasted. Thus, packaging is an aid to advertising.

3. Shortage and usage: Packaging also facilitates the storage and use of products. Thus packages may be so designed as to conduce to the ease of handling by consumers and by members of the channel of distribution.

### 13.6.3 FUNCTIONS OF PACKAGING

A package design is supposed to attract attention and convey an easily identifiable image. It must tell consumers what the product is and why they should buy it.

In short, packaging provides:

- A containment function
- A protection-in-transit function
- A storage function
- A usage facilitation function
- A promotion function.

**First,** packaging protects the product on its way to the consumer. A package protects a product during shipment. Furthermore, it can prevent tampering with products notably medications and food products in the warehouse or the retail store.

**Second,** it provides protection after the product is purchased. Compared with bulk (that is, unpackaged) items, packaged goods generally are more-convenient, cleaner, and less susceptible to losses from evaporation, spilling, and spoilage.

**Third,** it becomes a part of company's trade, marketing, wholesaling and retailing programme. A product must be packaged to meet the needs of wholesaling and retailing middlemen.

**Fourth,** it becomes a part of a company's consumer marketing programme. Packaging helps identify a product and thus may prevent substitution of competitive products.

All these suggest that developing and designing a package is not unlike designing the product itself. The package designer must be as buyer-oriented as the product designer.

### 13.6.4 ESSENTIAL ELEMENTS OF EFFECTIVE PACKAGING DESIGN

The average consumer may think he or she shops based on practicality and logic, but usually, that is not the case. A lot of subconscious work goes into the average consumer's choice of a product when presented with choices on a store shelf or an e-commerce page, and these choices may be made in a split second, even when people tell themselves they are "browsing".

Effective packaging design understands consumers and allows them to satisfy themselves that they are making a rational decision, while still appealing to emotion, culture, and preferences. It is a lot to ask from simple packaging design, but brands know that design can mean the difference between a successful product and one that languishes on the shelf.

Here are six essential elements of effective packaging design:

**1. It must call attention to itself:** Packaging design does not necessarily have to shout the loudest from the shelf, but it must stand out by communicating the very essence of the product's unique selling proposition. Shapes, colors, orientations, and textures all play a role. Even brands that pride themselves on understated or elegant packaging designs often make those designs so that they are different from others, and may stand out because of their understated or elegant nature.

**2. It must make the brand and purpose clear**: Even the most generic budget brands make their product and purpose clear, or else nobody will buy them because nobody will know what they

are. While the budget brand may simply state "Tomato Sauce," other brands must make that clear as a baseline for all other packaging design considerations. People will not buy a product if they do not know what it is and what it does.

**3. It should awaken emotions:** Emotions are closely linked to memories, and brand packaging designs that provoke emotions are more memorable than those that do not. Precisely what those emotions are may vary. Some brands may appeal to consumers' sense of nostalgia, joy, or aspiration, for example. Marketing that plucks at people's emotions is more effective than marketing that simply touts features and benefits. That is because the emotional parts of the brain are key to forming long-term memories.

**4. It should strive for "Iconic Assets":** Think of brand icons that are recognized the world over. Coca-Cola, Apple, and Nike are just three examples. Not every brand will achieve iconic status, but packaging design should strive for it. The more iconic a brand's design or logo, the easier it is for people to spot in newer contexts (such as new flavor offerings).

**5. It should capture and call out benefits:** "Clean labeling" is hot right now. It means that labels offer clear, concise information about the brand and product, including health benefits, company values, and packaging sustainability. If your packaging is biodegradable or easy to recycle, the design should say so. If your product is low-sugar, organic, or plant-based, likewise, it should say so clearly. People care about unique product attributes.

**6. It should be designed for its target audience:** While designing for the target audience is not always this straightforward, it is important for brands to learn to whom, exactly, their packaging designs appeal. Testing could show, for example, that a particular packaging design gives the impression of being "for women," "for older people," or "for trendsetters," and you should know this. If your packaging design does not align with your target audience, it is probably time for a refresh.

Packaging design must not only contain products adequately and safely, it must include required elements like ingredient and nutritional information, as well as barcodes and other necessary elements. At the same time, it must appeal to consumers, often amid dozens of competing items. Packaging design should never be an afterthought because it is such a crucial element of the marketing strategy. Brands that ensure their packaging fulfills all the key elements consumers

expect from packaging designs gain an edge over their competitors, whether they are sold online or in physical retail stores.

### 13.6.5 TYPES OF PACKAGING MATERIALS

The types of packaging materials used in the industry are extremely wide and they range from light and economical materials such as plastic films or cardboard boxes to complex reusable structures of different packaging materials, such as those used by the aeronautical industry to move parts of the aircraft before its assembly.

A classification criterion for the types of packaging is the amount of materials they are formed of:

- Monomaterial: Those made of a single packaging material.
- Multimaterial: Those formed by two or more materials.

The importance of this classification usually lies in monomaterials normally simplifying the process of packaging and recycling. Conventional materials, like the previously mentioned, are commonly used for structural purposes mainly, while more complex materials are used for special applications such as with inert gases to prevent deterioration by oxidation.

**Design of the packaging solution**

Another typical property for the selection must be added to the functional criteria of the packaging; the cost of the materials and the packaging process which tend to be decisive in their choice. For example:

- According to the costs, in industries such as the bottled water industry it is common that the bulk of the cost of each unit is logistics and packaging more than the product itself.
- In technological industries, such as telephony or jewellery, it is an almost anecdotal cost.

In order to define the materials used in a particular packaging, it is necessary to take into account the needs of the product itself, for instance, containers or bottles are required for gaseous or liquid products.

Packaging solutions must be designed taking into account:

- Product dimensions.
- Transport dimensions and fragility.
- The risks that the product-packaging system will suffer during the distribution cycle: vibrations, falls, shocks, storage time, climatic conditions.

On the other hand, the properties of packaging materials may be subjected to requirements that are not strictly of the distribution cycle like the facing needs that are imposed by marketing criteria, local laws requirements, labeling or other conditions imposed on the selection of materials used for packaging because of environmental reasons. The selection of packaging solutions will be determined by the product dimensions, its transport and fragility, the risks during the distribution cycle and other facing needs.

**Classification of packaging materials**

The classification of the different types of packaging materials can be made from several perspectives.

From a functionality point of view;

- Containment materials (bottles, carafes, drums.)
- Materials that provide stiffness (corners, corner pieces, etc.)
- Grouping materials (grouping boxes, shrink films, among others)
- Cushioning materials (airbags, EPS blocks.)
- Points of sale (SRP, exhibitors.)
- Materials with light protection (lampshade materials, etc.)
- Product life cycle extension materials (barrier materials, active packaging.)

For example, tertiary packaging is usually the one material solutions are applied to for shipping. It is typically both wooden and plastic pallets, with carton handles, plastic appliqués, ropes and other resources. In tertiary packaging it is common to use slings or straps to group, made of plastic or metal, as well as cases for protection against inclement weather, dust, sun or even pests.

**From the material perspective;**

The classification of packaging in terms of the materials used, there is a great variety.

The most common materials are:

- Plastic used in baling films, blisters, containers or bottles.

- Cardboard and paper, their main task being boxes, labels, separators and elements that help increase stiffness.

- As a combination of the previously mentioned materials, there is multilayer packaging, which normally has barrier properties.

- Wood, used in grouping pallets, in structural elements or, sometimes, as a differentiating element in quality products.

**New technologies for packaging solutions**

Packaging main features have been already discussed above and some of the properties new technologies are providing have been named. Future is already here and it has come to stay. Modern packaging, among many other things, provides what is called active packaging.

- They are able to provide security to trading by reducing incidents of theft.

- They can also provide information. For example, some active packaging can change their colour when the product is at the right temperature to be consumed.

- Others extend the information about the content or redirect the user to websites where they can check the information about the product.

All these new technologies mean that when it comes to talking about packaging materials, new terms must be added such as: active packaging materials, RFID packaging and materials like antennas, chips, printed circuits or luminescent materials. One of the properties of current active packaging is to reduce the appearance of bacteria in products that require hygiene. It can also extend the product life cycle by being subjected to modified atmospheres or by using substances that trap those elements that can deteriorate products. With this aim in mind, materials are used for very advanced packaging like nanomaterial's, such as silver. With the lowering of 3D printing technology, tailor-made solutions are starting to be created for reduced circulation products, mainly cushioning materials, product supports or even some packaging.

### 13.6.6 PACKAGING COSTS – CONCEPT

Packaging Cost means the cost of packaging (such as tubs, lids, cases, sleeves, bands, wrappers, pallets) purchased by Ventura for use in manufacturing or shipping a Product.

Packaging and packing cause significant costs to manufacturers. Therefore, it is important to be aware of the cost factors. Personnel costs are naturally a significant cost issue, but the amount of packing personnel depends on the amount of products, orders and order lines, picking method (sorting/ need for packing) and order periodicity as well as acquisition and disposal of packaging material after use.

Selection of the best and most cost-effective way of packaging and packing is a strategic choice. Packaging can be handled as a function, for example, immediately after production or packaging can be outsourced. Packaging solutions are affected by characteristics of the product, production volumes, market areas, distribution logistics and personnel know-how. Especially, in the export companies can be justified to take care of consumer packaging only in destination country, where packaging can be easily marked with markings required by country in question.

#### Cost factors to be considered

For example, if poor quality packaging is used, this can increase overall costs in terms of the percentage of products that are damaged during shipping. Other factors that can impact the cost of logistics include:

- Transportation costs. The cost of actually moving the product from one point to the next is the largest factor in a total supply chain cost, usually 50% of total cost. This includes, but is not limited to, costs associated directly with transportation such as fuel or shipping charges, insurance, and so on.

- Protection of the product. As noted above, one role of packaging is to protect the product from being damaged during shipment. Packaging that is inadequate to protect the product will create costs associated with damaged or destroyed product; on the other hand, packaging that offers more protection than is necessary will result in higher than necessary logistics costs.

- Handling costs. Moving packaging around, such as moving it from a railcar to a truck, contributes to the cost of shipping a product. The design and shape of packaging can add to or detract from this cost.

- Warehousing costs. Depending on the specifics of a particular shipment, the product may need to be stored for a time before continuing its journey. The cost to store the product can be a function of the packaging used. Packaging that provides adequate protection from the element may enable shipments of certain types of goods to be stored outdoors or in warehouses that are not climate controlled.

- Administrative costs. The cost of tracking, allocating resources to shipment and handling, contacting suppliers, coordinating operations, and so on contribute to the cost of logistics.

- Environmental costs. Environmental factors can contribute to the overall logistics cost of a business. This can take the form of costs for the utilization of landfill resources, fuel costs, and other similar costs. These costs can be concrete identifiable in quantifiable dollar amounts or they can be more subtle, as in the overall cost to the environment of running a given operation.

**Packing Technology**

Intelligent packaging is referred to a variety of implementing means as well as use. Intelligent packaging utilizes, among other things, Nano- technology, bio-plastics, RFID applications, holograms, conductive inks and unique digital imprints. Digital print creates content that is

located on the Internet. This means that all necessary information not need to be included in the package, but some of it may be on the Internet.

Intelligent packaging may e.g. register storage temperature. Often this is necessary, for example, in order to guarantee the quality of medicines. Corrugated board is, however, still a workable material and it can also be developed to pads used in packaging. Lightweight, papers made of microfibers may rise in the future alongside corrugated board. Automation can bring significant cost savings and improve productivity, flexibility and ergonomic benefits also in packing centers. Packaging lines can be, for example, automated and binning handled with automation. Robot cells are easily modifiable, so they are suitable for different products and packaging sizes. The machines does not necessarily have to be renewed if the product changes. Robots re-programming is quite easy. Robots can be used, for example, for a number of different products packaging, labeling and lifting boxes.

## 13.7 SUMMARY

A supply chain is composed of a series of suppliers and customers linked together by a physical distribution system. The physical distribution system involves the transportation of goods through the various modes, the inventories that exist in transit and in distribution centres, along with the physical handling of goods. The efficient operation of the warehouse involves several processing activities. Freight transport and storage are crucial activities in logistics systems planning as they determine the logistics costs and affect the service level provided to customers. Each mode of transportation has different cost and service characteristics. These determine which method is appropriate for the types of goods to be moved. All these logistics activities are linked to each other with detailed information about each. The monitoring of the plethora of information related to the diverse aspects of logistics is a crucial process. These would require integration of various technologies with the logistics data.

## 13.8 SELF-ASSESSMENT QUESTIONS

**Q1.** What is meant by TMS?

**Q2.** What are the various modes of transportation in logistics?

**Q3.** Discuss the advantages and drawbacks of containerisation.

**Q4.** Discuss the essential elements of effective packaging design?

**Q5.** What are the types of warehouses?

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# MBA 3.1

## MASTERS OF BUSINESS ADMINISTRATION

Logistic and Supply Chain management

**UP Rajarshi Tandon Open University**

**Allahabad**

## BLOCK 1-6

**Block 5: SUPPLY CHAIN MANAGEMENT**: BENCHMARKING

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# Unit 14 Supply Chain: Benchmarking

**Unit structure**



**14.0 Objectives**

**After completing this unit the learners are able to**

1. **Know what is benchmarking in SCM**
2. **Steps of benchmarking**
3. **Role of benchmarking in SCM**
4. **Types of Benchmarking**
5. **Process of benchmarking**

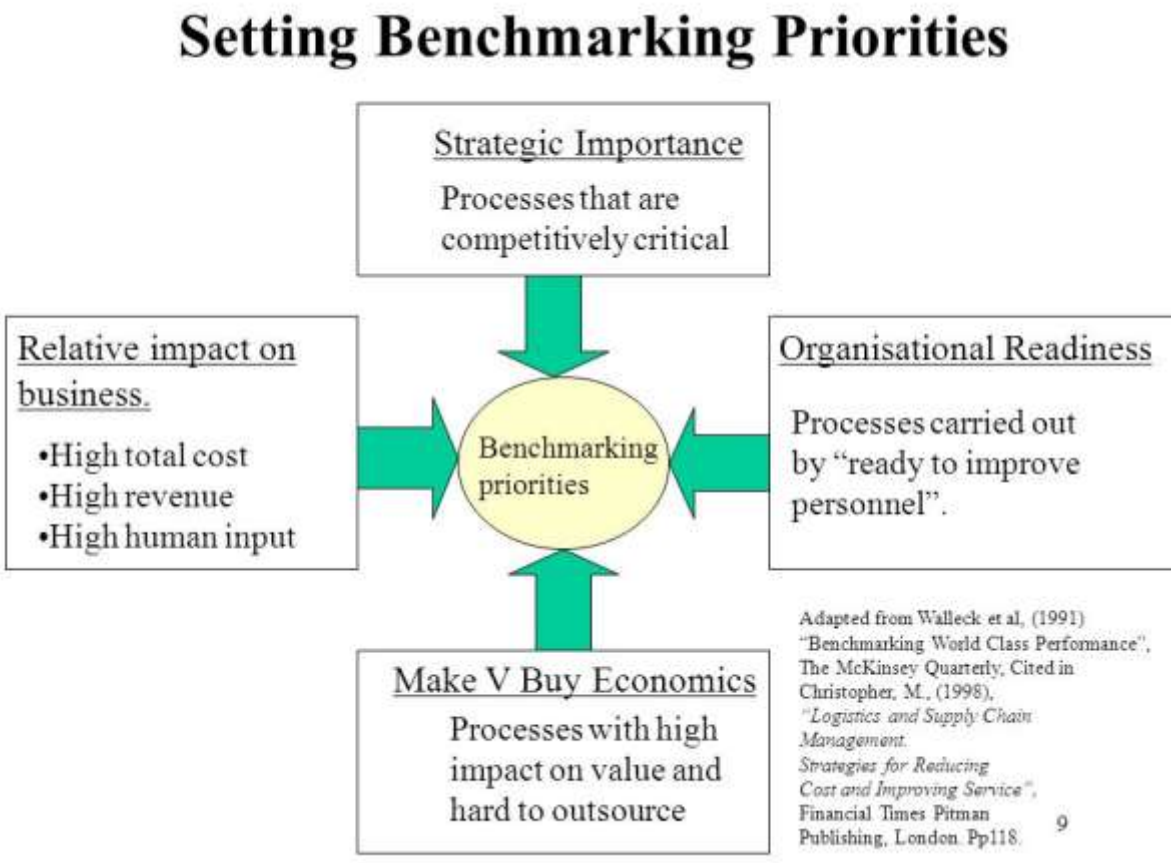
14.1 Introduction: The definition of benchmarking in business: Business benchmarking is the process of comparing industry and general business best practices against your own to identify performance gaps and achieve competitive advantages. This can be applied to any product, process, function, or approach in business. When you compare your organization, its operations, or processes against a competitor, industry peer, or other company, you use data to identify the business' strengths, weaknesses, and opportunities for improvement. The ultimate goal is to get a clear picture of how and where the organization needs to change to improve performance.

Benchmarking is a process of measuring the performance of a company's products, services, or processes against those of another business considered to be the best in the industry, aka "best in class."

The point of benchmarking is to identify internal opportunities for improvement. By studying companies with superior performance, breaking down what makes such superior performance possible, and comparing those processes to how your business operates, you can implement changes that will yield significant improvements.

That might mean tweaking a product's features to more closely match a competitor's offering, or changing the scope of services you offer, or installing a new customer relationship management (CRM) system to enable more personalized communications with customers.

There are two basic kinds of improvement opportunities: continuous and dramatic. Continuous improvement is incremental, involving only small adjustments to reap sizeable advances. Dramatic improvement can only come about through reengineering the whole internal work process.



## 14.2 Steps of benchmarking

Benchmarking is a simple, but detailed, five-step process:

1. Choose a product, service, or internal department to benchmark
2. Determine which best-in-class companies you should benchmark against – which organizations you'll compare your business to
3. Gather information on their internal performance, or metrics
4. Compare the data from both organizations to identify gaps in your company's performance
5. Adopt the processes and policies in place within the best-in-class performers

Benchmarking will point out what changes will make the most difference, but it's up to you to actually put them in place.

## 14.3 Role of Benchmarking in Supply Chain Management

Benchmarking is a valuable tool in logistics and supply chain management that helps organizations to measure their performance against industry best practices and identify areas for improvement. Benchmarking involves comparing an organization's processes, metrics, and practices with those of its competitors or industry leaders to identify best practices and potential performance gaps. In logistics and supply chain management, benchmarking can help organizations to:

**Improve operational efficiency**: By comparing performance metrics such as delivery time, cost, and inventory levels against industry best practices, organizations can identify opportunities to improve their operational efficiency and reduce costs.

**Enhance customer service:** Benchmarking can help organizations to identify areas where they can improve their customer service, such as delivery time, accuracy, and responsiveness.

**Optimize inventory management**: Benchmarking can help organizations to optimize their inventory management processes by comparing their inventory levels, turnover, and carrying costs with industry benchmarks.

**Identify best practices**: By benchmarking against industry leaders, organizations can identify best practices and implement them to improve their operations and performance.

**Stay competitive**: Benchmarking can help organizations to stay competitive by ensuring that they are keeping up with industry trends and best practices.

However, it is important to note that benchmarking is only effective when it is conducted appropriately. Organizations should ensure that they are comparing apples-to-apples when

benchmarking their performance against other organizations. They should also be mindful of the limitations of benchmarking and should not rely solely on benchmarks to make decisions. Instead, benchmarks should be used as a starting point for identifying areas of improvement and for setting performance goals.

## 14.4 Types of Benchmarking

Depending on what you want to focus on, benchmarking can involve looking both inside and outside your business. As such, types of benchmarking generally fall into the following categories, and may be used individually or together.

### 14.4.1 Performance Benchmarking

Performance benchmarking is often the first step businesses take to identify gaps or areas of improvement. It's the process of measuring the performance of specific product lines, services, operations, or other business processes against top performers (other companies, competitors, or industry leaders). This type of benchmarking requires gathering and comparing key performance indicators (KPIs) or other quantitative data, with the goal of measuring metrics such as:

- Time-to-market
- Cost-per-unit
- Net promoter score (NPS)
- Customer retention rates

This analysis isn't limited to competitors and specific industries, but instead looks at any business that excels at a particular process or operation. And since performance benchmarking focuses on operational elements, action items stemming from this analysis might be more short-term in their scope and produce quick results (as compared to findings from strategic benchmarking, which is explained later).

### 14.4.2 Internal Benchmarking

There's a great deal a business can learn from assessing its own performance. With this in mind, internal business benchmarking is the process of comparing metrics or practices from one or more areas of the business — like products, departments and locations to determine the best ways to conduct business moving forward. Internal benchmarking relies on the business' own historical data, which can be analyzed to identify gaps or areas for improvement.

What are examples of what internal benchmarking could look like? It may be:

Interviewing employees to understand whether they use certain technologies, and if so, how they use them.

Analyzing the processes and procedures of high-performing department's output against another department.

Comparing labor costs at one location versus another location.

### 14.4.3 External Benchmarking

External benchmarking looks at data from other organizations in regard to their products, services, processes, and other methods. This information can offer insight into how your business compares to others in or outside the industry, and what you may need to do to improve your standing. Acquiring this data may require more time and effort vs. an internal benchmarking initiative, but the findings can be extremely valuable.

External analysis can take shape via strategic or competitive benchmarking.

### 14.4.4 Strategic Benchmarking

Strategic benchmarking involves comparing performance with a top performer. This could be a direct competitor, but strategic benchmarking looks at any business that has mastered a particular process or operation. And since this benchmarking process requires you to look beyond your own industry, this is a great way to think differently about longstanding practices or consider new approaches.

Findings from strategic benchmarking can be used to adapt a business' methods to your own procedures and processes. And as the name suggests, this analysis is about helping a business look at the larger, future-forward picture. Rather than quick changes, findings from strategic benchmarking encourage businesses to consider core competencies and new product development for long-term improvement.

### 14.4.5 Competitive Benchmarking

Competitive benchmarking helps businesses identify industry performance standards by looking at competitors' products, services, or methods, with the ultimate goal of better understanding where they are in the current market and what they need to improve. One example of competitive benchmarking is comparing a competitor's NPS or customer satisfaction rates against your own. Once you have this information, you can analyze the differences and put an action plan together that addresses how to improve.

## 14.5 Supply Chain Benchmarking Process Steps

Benchmarking comes in all shapes and sizes with little too many steps. The complexity of supply chain management/logistics and shipping procurement call for a well-thought-out plan for tackling the process.

In general, the steps of the benchmarking process are as follows (with some variation in benchmarking process steps as companies adapt their own methodologies to meet their corporate needs).

The following 12 steps are:

1. Choose an area to improve.

2. Define the benchmarking process/scope that will be undertaken.

3. Isolate potential partners for comparison

4. Identify possible data sources -where you will get your information.

5. Collect your data.

6. Isolate discrepancies in the data.

7. Establish process differences

8. Set goals for change.

9. Communicate internally and externally.

10. Align goals.

11. Implement.

12. Review results and adjust.


14.6 Summary

Benchmarking is a process of measuring the performance of a company's products, services, or processes against those of another business considered to be the best in the industry, aka "best in class."

The point of benchmarking is to identify internal opportunities for improvement. By studying companies with superior performance, breaking down what makes such superior performance possible, and comparing those processes to how your business operates, you can implement changes that will yield significant improvements.

Performance benchmarking is often the first step businesses take to identify gaps or areas of improvement. It's the process of measuring the performance of specific product lines, services, operations, or other business processes against top performers

internal business benchmarking is the process of comparing metrics or practices from one or more areas of the business — like products, departments and locations to determine the best ways to conduct business moving forward. Internal benchmarking relies on the business' own historical data, which can be analyzed to identify gaps or areas for improvement.

External benchmarking looks at data from other organizations in regard to their products, services, processes, and other methods. This information can offer insight into how your business compares to others in or outside the industry, and what you may need to do to improve your standing. Acquiring this data may require more time and effort vs. an internal benchmarking initiative, but the findings can be extremely valuable.

Strategic benchmarking involves comparing performance with a top performer. This could be a direct competitor, but strategic benchmarking looks at any business that has mastered a particular process or operation.

Benchmarking comes in all shapes and sizes with little too many steps. The complexity of supply chain management/logistics and shipping procurement call for a well-thought-out plan for tackling the process.

## 14.7 SELF ASSESSMENT QUESTIONS

1. What is benchmarking in SCM?
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   .....
2. What are various steps of benchmarking?
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3. Define and explain the role of benchmarking in SCM?
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   .....
   .....

4. Elaborate various types of benchmarking?
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5. What is internal benchmarking?
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6. What is strategic benchmarking?

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7. Define external benchmarking?

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8. Explain performance benchmarking

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9. Explain the Process of benchmarking

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# Unit 15 Benchmarking Process, Benchmarking Procedure



**15.0 Objectives:**

**15.1 Introduction**

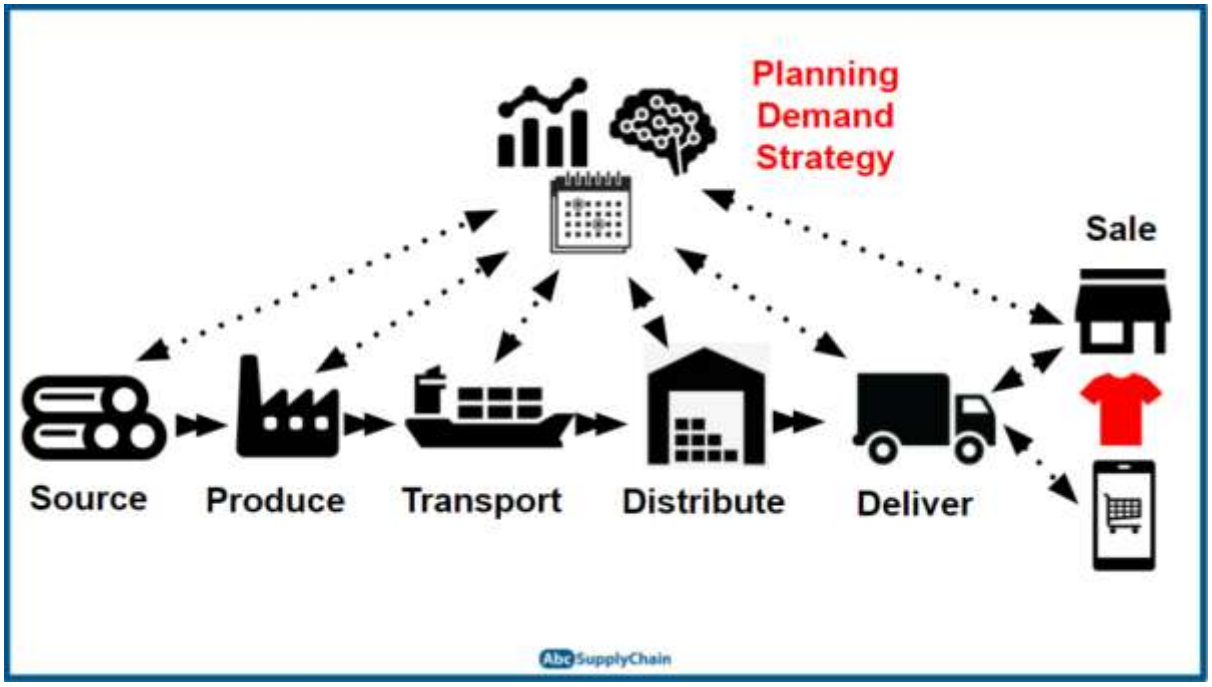
In general, companies perform two types of benchmarking: results benchmarking, which focuses on quantitative performance measures, and best practices benchmarking, which focuses on how well processes are executed. The results of both styles of benchmarking are best used together because results benchmarking only provides a basis for ranking a company, not a strategy to improve its performance. Successful supply chain benchmarking incorporates all of the elements in the global supply chain and focuses on product specifications, operational performance, management practices, and software solutions. Although supply chain benchmarking involves three major elements—the supplier, the distributor, and the interface of the two—customer satisfaction should be the primary motivation for establishing a benchmarking program.

In addition to their efforts to establish resilient operations, supply chain professionals strive to be cost competitive. Successful supply chain benchmarking can help them achieve both goals. When used in conjunction with improvement initiatives, benchmarking offers a performance measurement tool that can measure companies' comparative operating performance, identify best practices and possible improvements, and determine how a business is performing against its potential. Benchmarks can also help businesses assess a variety of costs— the cost of goods, the cost of doing business (including inbound and outbound logistics), and opportunity costs.

But where should companies begin? Previously created benchmarking data—whether quantitative (performance-based) or qualitative (best practice)—can provide a good starting point. Consulting and research firms or other benchmarking service providers can be used to undertake competitive benchmarking projects that identify the strengths and weaknesses of processes used by competing firms within an industry. For companies that have performed internal benchmarking and want to investigate new ways to improve the performance of their

internal processes, external benchmarking can produce significant improvements and identify benchmarking peers in other industries.

Defining the Scope of Supply Chain Benchmarking A company can have multiple supply chains operating within its global supply chain.1 Organizations should therefore think at the metric level and identify the products, channels, and geographies for which data can reasonably be combined.




**15.2 Supply chain KPIs**

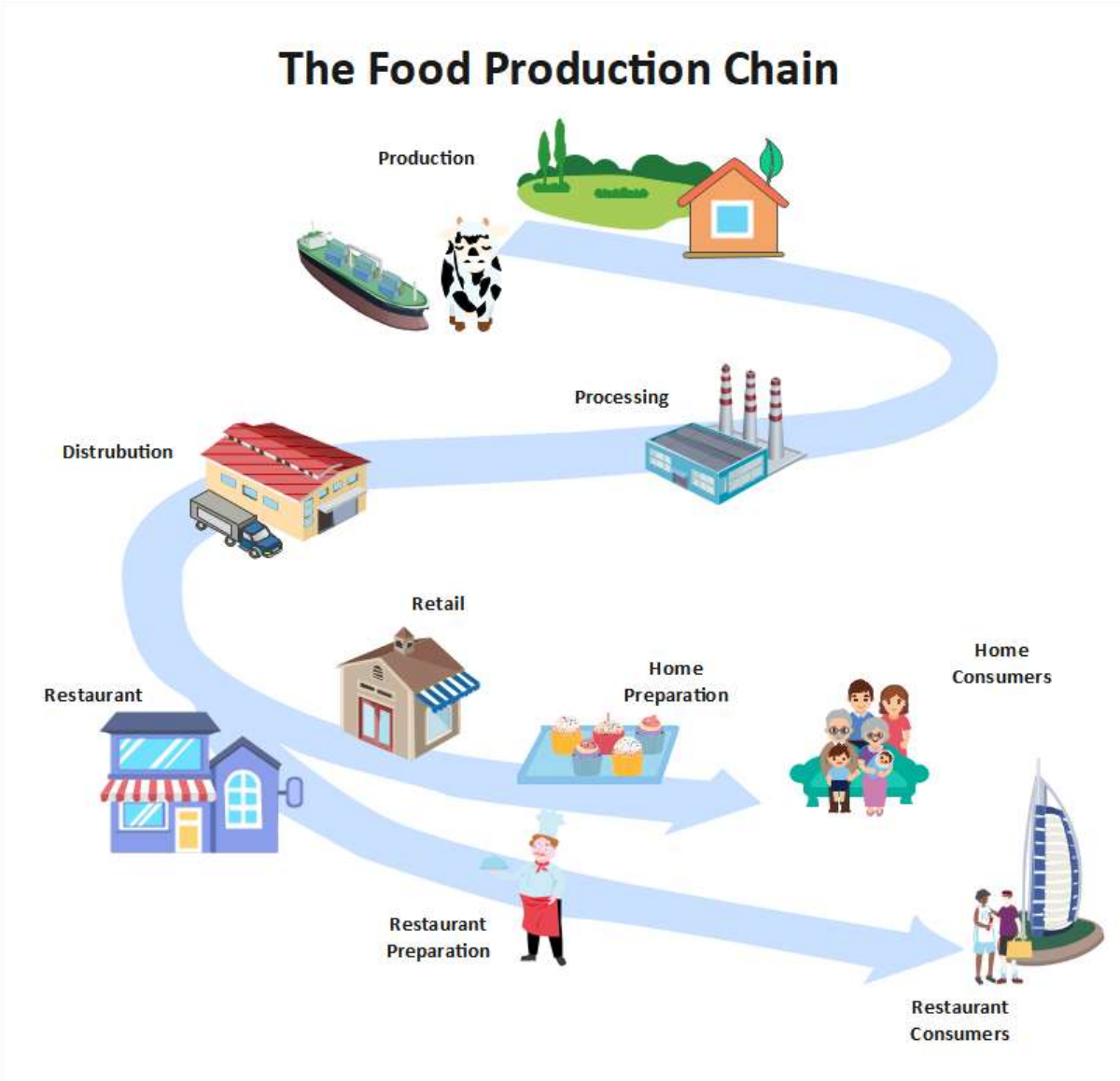
Metrics are an important component of qualitative best practices. Executives can use performance metrics to perform gap analyses and identify areas needing improvement. Two general types of supply chain KPIs−customer facing (e.g., on-time delivery) and internal (e.g., inventory carrying costs) −allow companies to benchmark on several levels. More specifically, supply chain management KPIs should include: Delivery performance metrics On-time delivery, performance to commit, fill rate, and return rates. Cycle-time metrics Promised lead time, actual lead time, and supply chain cycle time. Inventory and cash management metrics Inventory days

of supply, days sales outstanding, days payables outstanding, and cash-to-cash conversion. Supply chain cost metrics Overall supply chain costs, order management costs, inventory carrying costs, supply chain finance and planning costs, supply chain IT costs, procurement department staffing, and savings. Specific benchmark data gained through these metrics are focused on the identification of key capabilities to enable an integrated demand-supply network (IDSN).

### 15.3 Supply chain benchmarks of standard processes

Another way to approach supply chain benchmarking is to look deeper into traditional supply chain processes. Planning (demand management, materials planning, and production scheduling) Many planning KPIs are available, but companies must determine the indicators that are truly important to their organizations' operational performance. Examples include cash-to-cash cycle time, inventory carrying costs, days inventory outstanding, finished goods inventory turn rate, cost of goods sold as a percentage of revenue, forecast accuracy, number of full-time equivalents (FTEs) for the supply chain planning function per $1 billion in revenue, production schedule adherence, total expediting of costs to execute the production plan, value-added productivity per employee, and return on assets.

Procurement (sourcing strategy development, supplier selection and contract management, order management, and supplier appraisal and development) Examples of KPIs benchmarked for procurement include total cost of the procurement cycle per purchase order or per $1,000 in purchases, rate of annual raw material inventory turns, average supplier lead time in days, days payable, number of FTEs for the procurement cycle per $1 billion in purchases, and the percentage of purchases made via an electronic marketplace.




### 15.3.1 Manufacturing

Here Manufacturing includes production scheduling, production, and performing maintenance

Common manufacturing KPIs include finished product first-pass yield (FPY), percentage of defective parts per million (DPMO), and scrap and rework costs as a percentage of sales and quantities shipped per employee. Other KPIs benchmarked for product manufacturing are manufacturing cycle time, actual production rate as a percentage of maximum capable

production rate, annual work-in-process (WIP) inventory turn rate, unplanned machine downtime as a percentage of scheduled run time, warranty costs (i.e., repair and replacement) as a percentage of sales, and labor turnover rate as a percentage of the workforce.

### 15.3.2 Logistics

Here Logistics includes logistics strategy, planning for inbound material flow, warehousing, outbound transportation, and managing returns and reverse logistic

Standard KPIs for product delivery include order fill rate, pick-to-ship cycle times for customer orders, total cost of outbound transportation process per $1,000 in revenue, number of FTEs required to operate outbound transportation per $1 billion in revenue, the percentage of sales order line items not fulfilled due to stock-outs, the percentage of full-load trailer/container capacity used per shipment, and the percentage of orders expedited. Examples of KPIs for logistics/warehousing as a whole include total logistics costs as a percentage of revenue, freight costs as a percentage of revenue, the percentage of sales orders delivered on time, the number of FTEs for the logistics function per $1 billion in revenue, and the ratio of premium freight charges to total freight charges.

### 15.3.3 Identifying the Benchmarking Peer Group

It is important to know a company's processes and its level of performance thoroughly before a benchmarking visit. The benchmarking team should also be clear about what it wants to learn before approaching a potential benchmarking peer group. (After all, the benchmarking peer group members are expecting to receive similar information in return.) Both parties should understand and agree on the expectations of the benchmarking peer group, how the information that is gathered will be treated, who will have access to the data, and how the data will be used.

Because achieving and maintaining customer satisfaction are always the ultimate objectives, best performers are those firms that have higher levels of performance in terms of their customer-facing process capabilities than organizations that meet the industry average or laggard companies (i.e., benchmarked companies that fall in the bottom half of the results pool). Capabilities used to determine high performers include the ability to accurately forecast demand across multiple channels and tiers, obtain timely access to supply chain partners' data, and integrate trading partner data into internal processes.

Best-in-class companies also involve suppliers and customers in the sales and operations planning (S&OP) process and use customer feedback to ensure a more accurate match of demand and supply. These companies also collaborate with suppliers on inventory management levels and on invoice reconciliation to improve invoice and payment processes.

### 15.3.4 The importance of the data coordinator

A data coordinator should run the data collection effort. Responsibilities for this position include pulling the necessary people together, defining tasks, and conducting analyses. Having the right coordinator is critical. The coordinator should be someone with influence in the company and the respect of his or her peers. In order to collect the right data and validate its accuracy, the coordinator should have a thorough understanding of the supply chain function.

### 15.3.5 Improving Performance

After the data is collected, the most difficult step remains— converting the data into an action plan. Data transparency and comparative analysis often result in change management issues that should be managed with great care. Different people will have different interpretations of the numbers, and there may be some organizational resistance to change.

A structured approach should be used to coordinate the action plan effort and ensure a meaningful outcome. The focus should be on relationships between the metrics rather than the comparison of individual KPIs to benchmark numbers (e.g., trade-offs between cost and service levels). There should also be discussions with the peer group members about how to fix any issues.

### 15.4 Benchmarking Pitfalls

There are any number of ways benchmarking projects can go wrong. Here are some of the most common mistakes.

- **Confusing benchmarking with participating in a survey**: A survey of organizations in a similar industry is not really benchmarking because a survey cannot reveal what is behind the numbers.
- Developing action plans based on preexisting "benchmarks" Numbers available from a survey may simply not be applicable to all companies.
- **Forgetting about service delivery and customer satisfaction** A narrow focus on cost benchmarks at the expense of service delivery and customer satisfaction data will not provide the full story.
- **Trying to benchmark at too high or too granular a level** For the supply chain data to be meaningful, the scope of the benchmarking project must be well defined.
- **Not aligning with business goals** For benchmarking to be effective, it must be aligned with the ultimate goal of improving the end-to-end performance of supply chain operations.

- **Not defining clear roles and responsibilities** The absence of an executive sponsor and a data coordinator can result in data access difficulties, defensiveness, blame, and incorrect metrics.
- **Not establishing the baseline** The effectiveness of benchmarking efforts is hampered when the details, costs, and performance levels of all of the company's processes are not known.
- **Difficulty putting the data to work** A simple comparison of company metrics with benchmark numbers that does not take the relationships between the two sets into account can make it difficult to turn results into actionable projects.

### 15.5 Benefits of Successful Benchmarking

In addition to providing useful comparisons with other companies, supply chain benchmarking can identify:

• Performance improvements

• Interdependencies and relationships between key performance indicators (KPIs)

• Better business tradeoffs

• Opportunities for cross-industry best practices

• Baseline information for goal setting, prioritization, and ongoing performance measurements

### 15.6 Self Assessment Questions

**1. What is benchmarking? Explain its process**

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**2. Explain the supply chain benchmarks of standard processes.**

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**3. What are benchmarking pitfalls?**

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**4. Explain the benefits of successful benchmarking**

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# BLOCK 6: RECENT TRENDS

## MBA : LOGISTICS AND SUPPLY CHAIN MANAGEMENT

## BLOCK 6: RECENT TRENDS

In **Block 6** you will learn about Recent Trends in Supply Chain Management; New Developments in Supply Chain Management; Outsourcing Supply Chain Operations; Co-Maker Ship; Role of E-Commerce in Supply Chain Management; Green Supply Chain Management; Distribution Resource Planning and World Class Supply Chain Management.

**Unit 16** discusses Recent Trends in Supply Chain Management, Outsourcing Supply Chain Operations, Outsourcing in Supply Chain Management: Verticals Vs. Horizontals, Outsourcing in Supply Chain Management: Drivers And Benefits, Defining your Approach to Outsourcing in Supply Chain Management, Benefits and Drawbacks in Outsourcing SCM.

**Unit 17** explains the Role of E-Commerce in Supply Chain Management, E-Commerce has a Dual Function in Supply Chain Management, Green Supply Chain Management, Need of Green Supply Chain Management, Benefits of Green SCM, Green SCM for Supply Chain Managers, Green SCM Practices and Companies with a Strong Green Supply Chain Management.

**Unit 18** deals with the Distribution Resource Planning, Advantages of Implementing DRP, Process of Distribution Requirements Planning, Key Considerations for Implementing DRP, Global Supply Chain Management, Elements of Global Supply Chain Management and Building World Class Supply Chain.

## UNIT 16: RECENT TRENDS IN SUPPLY CHAIN MANAGEMENT

**UNIT FRAMEWORK**

## 16.1 OBJECTIVES

After reading this unit, you will be able to understand

- Recent Trends in Supply Chain Management
- Outsourcing Supply Chain Operations
- Outsourcing in Supply Chain Management: Verticals Vs. Horizontals
- Outsourcing in Supply Chain Management: Drivers And Benefits
- Defining your Approach to Outsourcing in Supply Chain Management
- Benefits and Drawbacks in Outsourcing SCM

## 16.2 INTRODUCTION

In this unit, you will come to know about recent trends in SCM.

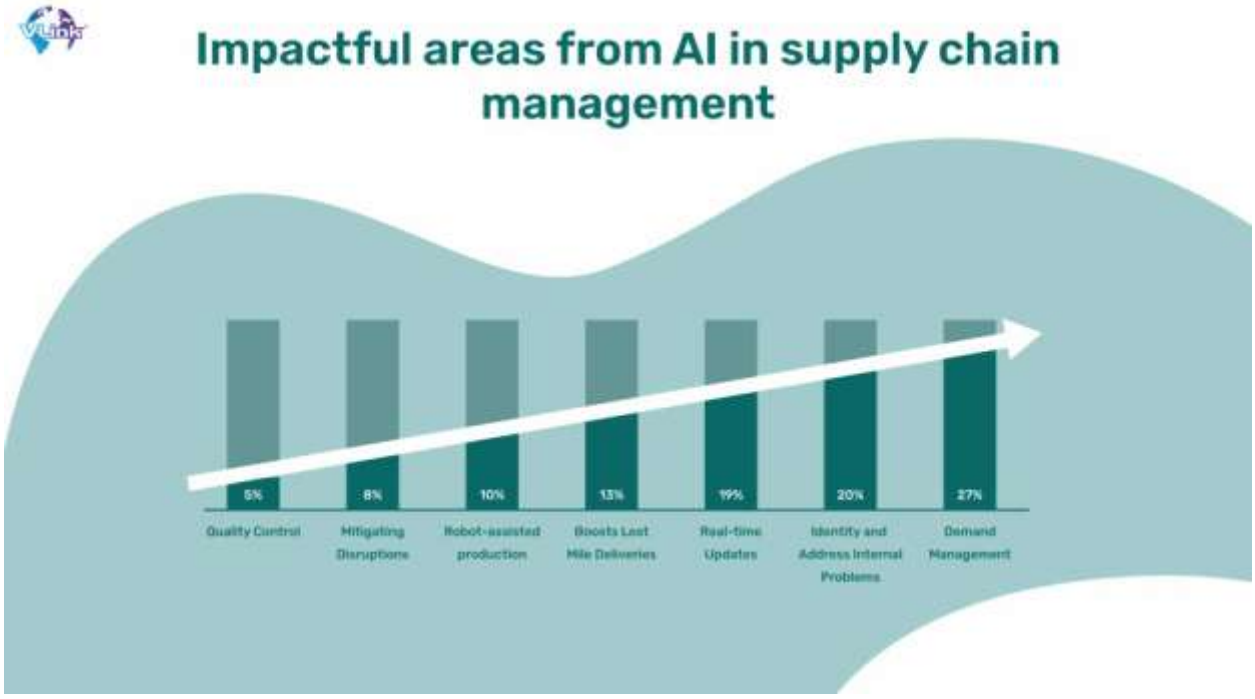
## 16.3 EMERGING SUPPLY CHAIN TECHNOLOGY TRENDS

10 emerging supply chain technology trends

**1- Artificial Intelligence (AI) & Automation**

In several industries, the usage of artificial intelligence (AI) and automation is increasing. Automation, which has existed for decades, uses technology to reduce human inputs and is basically a machine completing a series of activities.

There are several methods to apply AI and automation into your organization's workflow, ranging from improving your manufacturing line to powering digital twin technologies and everything in between.




AI-integrated software solutions have a wide range compatibility feature with multiple functions such as intelligent sourcing, inventory management, and even logistical routes in supply chain management. AI may also be used to track future supply chains or automate supply chains.

Deloitte estimated "79% of companies with high-performing supply chains achieve revenue growth that exceeds the industry average, while businesses with optimized supply chains have 15% lower supply chain costs, less than 50% inventory holdings, and 3X faster cash to cash cycles."

**2- Digital Supply Chain Twins**

With social distancing and remote labor, digital has surpassed manual since it gives real-time data from across the supply chain as well as exact analytics. This helped to avoid several interruptions. They reconstruct a full supply chain and its procedures in a digital environment that is easily accessible.

Real-time data from IoT devices provides complete insight into everything, from consumer orders to specific commodities moving through the supply chain. It can detect production delays and their implications, as well as alert you to machinery that needs to be repaired.

They provide substantial benefits to sectors outside of supply chain management as well but need a significant financial and equipment commitment.

**3- Circular supply chains**

Sustainability has become one of the most crucial factors for the success of supply chain management businesses. Previously, linear supply chains caused waste by discarding unused components after producing a product.


Circular supply chains recycle unwanted pieces back into their value chains rather than generating an item and returning to the beginning of the chain with brand new resources. To summarize, circular supply networks encourage a zero-waste environment.

Customers care about the ethics of the things they purchase. Frequently demanding specifics on how, with what, and where production takes place. Governments frequently set rules that limit trash and encourage reclamation, so consumers aren't the only factors here.

**4- Supply chain as a service (SCaaS)**

Most of the SCM operations are still under the vision of in-house staff people. Nonetheless, we may see more organizations embrace 'Supply Chain as a Service' (SCaaS) business models and outsource tasks such as manufacturing, shipping, and inventory management.


Companies' supply chain management teams will eventually transform into a smaller number of qualified employees focused on making strategic supply chain choices. Control towers will become increasingly common as in-house supply chain teams shrink (Forbes, 2019). These modern digital control towers provide supply chain managers with a complete picture of the supply chain.

Similarly, technological advancements have improved SCM support. This strategy, first seen in SaaS software, allows businesses to cut overhead spending by eliminating fixed expenses in infrastructure, updates, and maintenance.

**5- Blockchain**

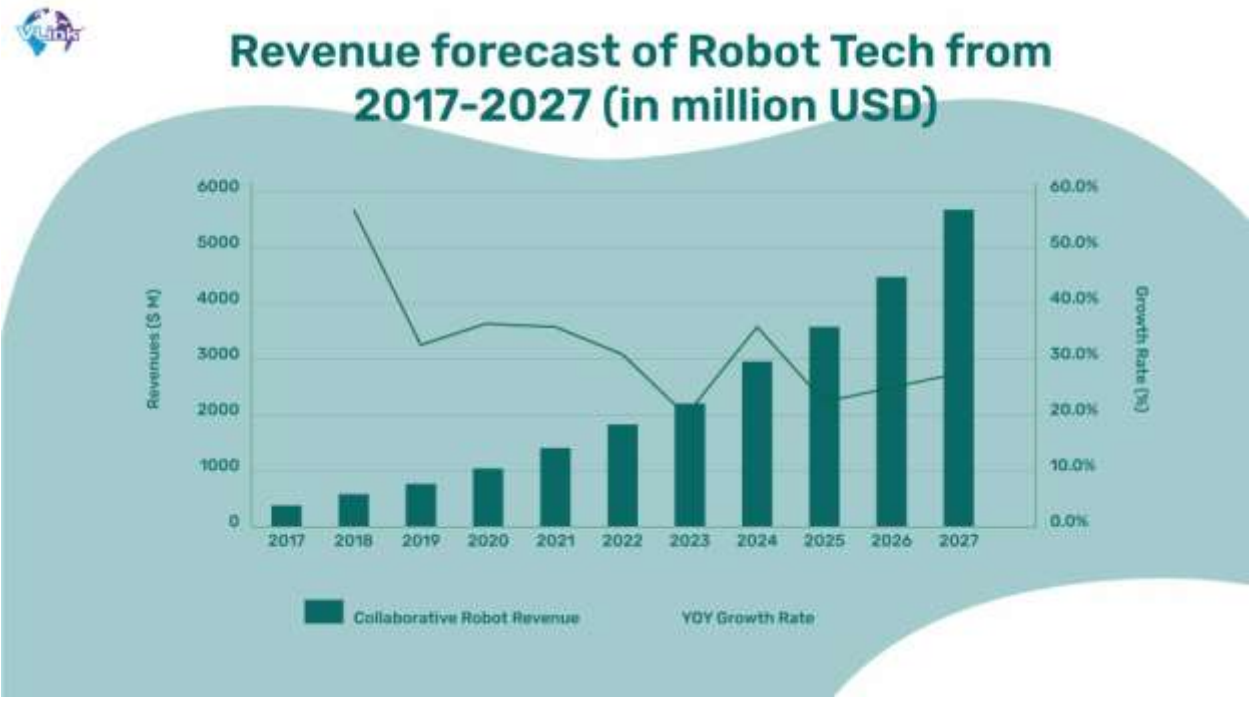
With the rising popularity of blockchain, it makes sense to follow the need for more supply chain visibility. The database structure of blockchain can help supply chains succeed by providing end-to-end transparency. Before we go any further, what precisely is blockchain?

Blockchain makes use of "blocks" of data, whereas traditional databases store information in tables. As data pours in, new blocks are generated and linked to their predecessors as these storage blocks reach their limitations.

With accurate time stamps, these blocks constitute immutable records that provide users with vital insight into all of their transactions. Blockchain allows for enhanced material tracking from the source to the client via the supply chain. Technology reduces down paperwork and administrative processes while boosting transactional security.

**6- Intralogistics Robots**

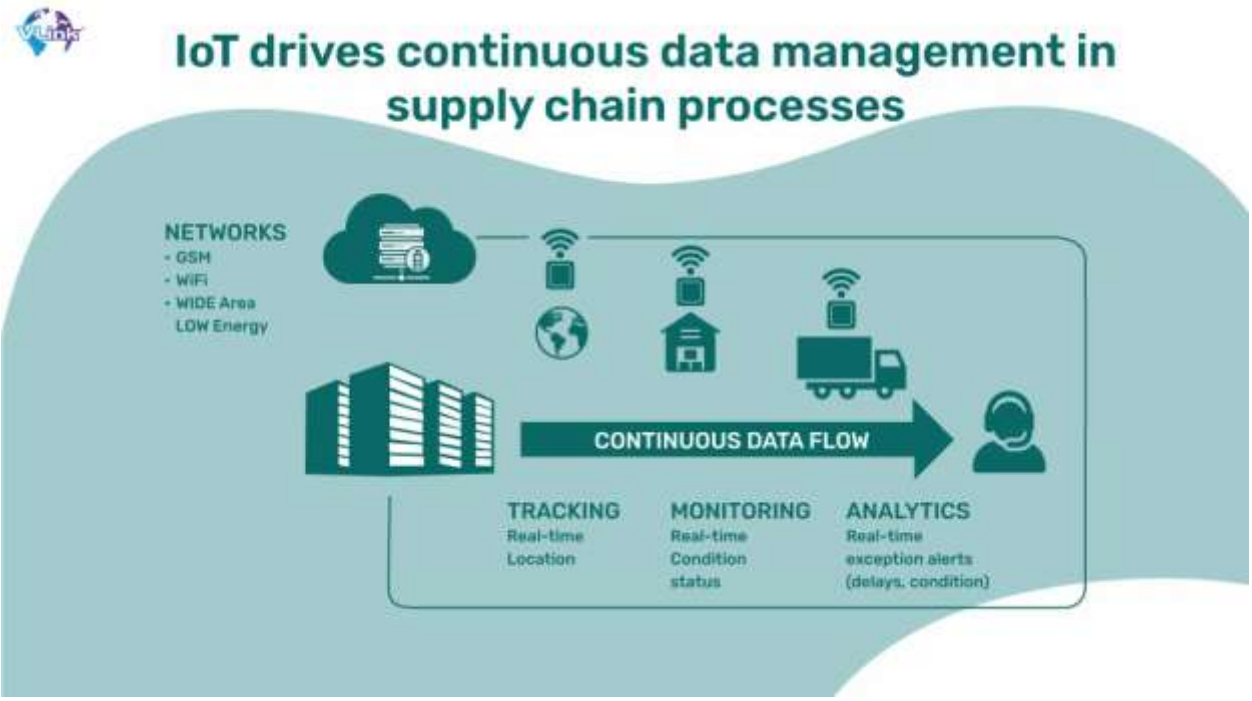
Intralogistics robots greatly increase warehouse automation and efficiency, resulting in speedier operations and the capacity to handle demand surges considerably better. Intralogistics robots are devices that can be operated autonomously, reprogrammed, multi-purposed (capable of being converted to a new use with physical modification), and programmable in three or more axes.




Because they can operate on restricted floor space and reach into shelves, palletizing machines, or conveyors to load and unload items, they are especially intended for intralogistics picking and putting.

**7- Increasing adoption of Internet of Things (IoT)**

The Internet of Things — the simplified connecting of multiple gadgets — improves visibility and connectivity while lowering expenses. Connect devices like smart watches, sensing tools and other wearables can play a major role in benefitting the warehouse environments.




Wearables, in particular, provide solutions that lead to a "touchless" supply chain: the complete removal of the labor-intensive process of selecting things from inventory to fulfill a client request, often known as "picking." Other IoTs enable warehouse and logistics managers to track goods and monitor equipment in a secure manner.

Many firms will also harness the power of IoT by connecting it with essential business tools like business analytics software. These interfaces will enable analytics for IoT device data, allowing businesses to make data-driven choices on supply chain strategy.

**8- Cloud Supply Chain Management (Cloud SCM)**

Cloud systems provide comparable functionality and security to on-premises versions while avoiding sunk costs and customization issues that beset traditional software.

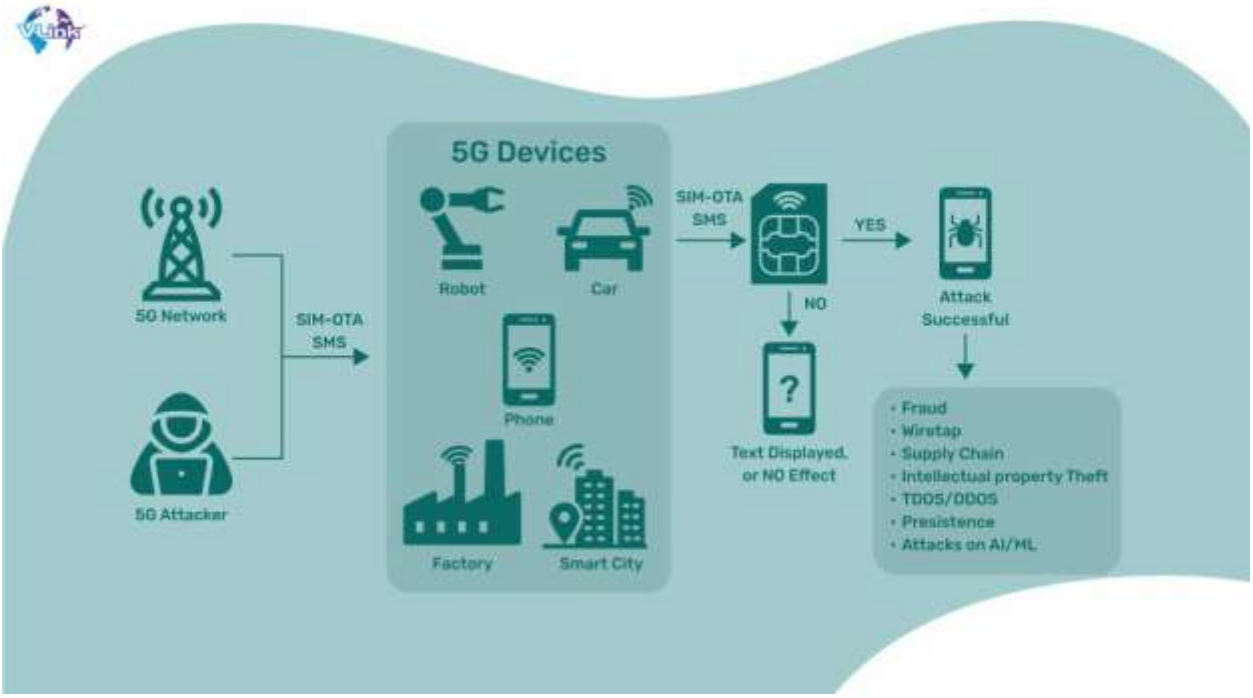
The cloud SCM market is predicted to expand through 2022. According to a new Markets and Markets analysis, the cloud-based supply chain management industry will be worth roughly $45.2 billion by 2027.

Many opponents of cloud-based software in the past were concerned about an outside entity accessing their program, especially with total control over uptime and security. However, as

cloud-based solutions become more widespread, providers strive to be dependable and trustworthy corporate partners.

**9- Networks 5G**

How will the future of supply chain management be affected by the arrival of 5G networks on the global stage? With IoT-enabled gadgets flooding the market, networks capable of handling massive numbers of devices are required.




The transformation of networking from 4G to 5G is impressive as it is resulting in fruitful impacts across industries. 4G networks can accommodate 10,000 devices per square mile, whereas 5G networks can support 100 times that number.

With digital transformations becoming more common, a robust network is required to guarantee that communication between processes, machines, and people is swift and smooth. 5G improves quality and optimizes critical parts of the supply chain, such as logistics, distribution, and warehouse management.

**10- Rise of elastic logistics**

Depending on the linear approach for process management might not be enough to stay updated. Supply chain businesses should be adaptive to new innovations for tackling market changes. And that's where elastic logistics comes to play major role.

Elastic logistics enable the supply chain to rapidly grow or contract in response to market needs. Many factors in the supply chain, including sailing timetables, carrier space, container utilization, and route optimization, benefit from elastic logistics.

The flexibility enables businesses to better manage possible difficulties like overstocking and underutilized vessel capacity. Therefore, firms may benefit from increased stability and stay competitive in the face of market swings.

## 16.4 OUTSOURCING SUPPLY CHAIN OPERATIONS

Supply chain management is defined by the Council of Supply Chain Management Professionals – the most respected authority on the subject – as:

Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

Outsourcing is defined by Iqbal & Dad, in their article Outsourcing: A Review of Trends, Winners & Losers and Future Directions (2013) as:

Outsourcing is handing over one or many of the business processes to an outside vendor or the utilization of outside available services provided by third party to carry out business activities…

Therefore, outsourcing in supply chain management is the handing over of processes within supply chain management to outside service providers.

Co-Sourcing is the sharing of a function or department within your company between internal and third-party providers.

To handle the complexities and continually changing supply chain environment, a growing number of companies work with networks of partners to get things done – an approach which has evolved and adapted to the industry. When it comes to planning, execution, and even the physical work of supply chain management, companies used to look at two clear options: Either tackle a project yourself – insourcing – or hire someone else to tackle it completely: outsourcing. Today, though, we're seeing the rapid emergence of co-sourcing. A more collaborative and communicative style of management, co-sourcing enables each contributing partner to focus on their strengths and unique differentiators, which collectively provides a path for them to develop more sophisticated and specialized capabilities.

## 16.5 OUTSOURCING IN SUPPLY CHAIN MANAGEMENT: VERTICALS VS. HORIZONTALS

To properly evaluate your strategy for outsourcing in supply chain management, break down your supply chain activities into verticals and horizontals. Think of verticals as processes such as sourcing, manufacturing, or logistics management. Conversely, think of horizontals as activities, tactics and tools that enable the verticals such as coordination, day-to-day execution, design, or technology strategy.

Supply Chain Management Vertical – A process in the supply chain that directly adds value to the final product. Examples of verticals are sourcing, manufacturing, and logistics management.

Supply Chain Management Horizontal – An activity, tool, or tactic that enable or improves a supply chain vertical. Horizontals can be strategic, such as network design, or IT integration. Horizontals are also tactical, such as coordination or exception management.

Keep in mind that your company's verticals may look different than others. For example, you may not have a manufacturing operation. Instead, you may have a packaging or bottling vertical.

Your horizontals may also be organized differently than other companies. However, every company will have strategic and tactical horizontals. Tactical horizontals are activities your insourced or outsourced team perform to keep your supply chain running. Strategic horizontals are typically for planning, reorganizing, or optimizing your supply chain, and may run across several verticals at the same time.

## 16.6 OUTSOURCING IN SUPPLY CHAIN MANAGEMENT: DRIVERS AND BENEFITS

Supply chain outsourcing is a common practice, and it is very difficult to find any enterprises that does not outsource some of their tactical and strategic supply chain activities. According to Gartner's Logistics Outsourcing Trends in 2020 research, over 80% of supply chain professionals who responded to their survey indicated they plan to significantly increase logistics outsourcing budgets. Why has supply chain management outsourcing become so common place?

While many readers might instantly think that cost reduction is the main driver of supply chain management outsourcing, research suggests that this kind of thinking is shifting. Gartner further noted in the same above study that supply chain executives are organizing their outsourcing strategy to achieve "faster speed to market, end-to-end visibility and better data quality". It is safe to say that all verticals in the supply chain contribute to these drivers. While Iqbal and Dad (2013) found that the need to focus on a company's core competency is amongst the top driving forces to outsource. Numerous sources have also indicated that being able to take advantage of new technological advances being offered by outsourcing providers is another key reason supply chain leaders are looking outside of their own four walls.

The benefits of outsourcing in supply chain management can also vary by company. Summarizing Karen Bird's points in the above video, outsourcing in supply chain management has the following benefits:

Allows your company to focus on the core business of manufacturing, supplying or delivering products.

Provides your company a chance to tap into different experts who work on supply chain technology, optimization, or design projects on a regular basis and possess a wide range of views.

Gives your company the choice to engage with and leverage external expertise in a flexible way: project, long-term or consultative.

We argue the above benefits apply especially to infrequent and strategic supply chain horizontals such as supply chain technology integration, supply chain network design and manufacturing

asset optimization. Furthermore, these strategic initiatives can be executed collaboratively with both experts inside and outside of the organization on an as-needed basis.

To be clear, we are not suggesting that Fortune 500 companies should give up on building supply chain expertise and competencies within their enterprise. On the contrary! We are advocating that the enterprise must expand their supply chain knowledge in order to become more successful. To do so, it is wise to enlist the help of partners to ramp-up at speed and at scale.


## 16.7 DEFINING YOUR APPROACH TO OUTSOURCING IN SUPPLY CHAIN MANAGEMENT

So, how do you use all this information to determine your supply chain management outsourcing strategy? Before you begin, create a matrix like the below:

| | | Supply Chain Verticals | | |
|---|---|---|---|---|
| | | Sourcing | Manufacturing | Logistics |
| Strategic Supply Chain Horizontals | Network Design | | | |
| | Asset Optimization | | CC | |
| | Technology Integration | | | |
| Tactical Supply Chain Horizontals | Coordination | CC | CC | |
| | Daily Execution | | CC | CC |
| | Exception Management | | | |
| | Supplier Management | CC | CC | |

CC = Core Competency

Your verticals and horizontals may not look the same. Make sure you work with your internal teams to align on what they are. Also, mark each of your internal core competencies to clarify your company's competency strategy.

Once you've determined your matrix and your core competencies, work with each of your teams to determine the best strategy based on the current insourcing and outsourcing strategy, the ability of available suppliers to meet your needs, and the performance of your current supplier.

Your insourcing and outsourcing strategy may not be binary. A hybrid strategy where your internal team works closely with an outsourcing supplier may be the right strategy for you. Hybrid sourcing allows you to stay up to date and build competencies, while leverage external expertise to help you excel in a business process.

A typical organization may have Supply Chain Outsourcing Strategy matrix like this:

| | | Supply Chain Verticals | | |
|---|---|---|---|---|
| | | Sourcing | Manufacturing | Logistics |
| Strategic Supply Chain Horizontals | Network Design | Hybrid | Outsource | Outsource |
| | Asset Optimization | Outsource | Hybrid CC | Hybrid |
| | Technology Integration | Outsource | Outsource | Outsource |
| Tactical Supply Chain Horizontals | Coordination | Insource CC | Insource CC | Outsource |
| | Daily Execution | Hybrid | Hybrid CC | Hybrid CC |
| | Exception Management | Outsource | Hybrid | Outsource |
| | Supplier Management | Insource CC | Insource CC | Hybrid |

CC = Core Competency

## 16.8 BENEFITS AND DRAWBACKS IN OUTSOURCING SCM

Outsourcing supply chain operations refers to the practice of hiring third-party companies to manage certain aspects of a company's logistics and supply chain. While outsourcing can offer

some benefits, it also comes with several drawbacks. Here are some of the key advantages and disadvantages of outsourcing supply chain operations:

**Benefits:**

**Cost savings:** One of the primary reasons companies outsource supply chain operations is to reduce costs. Outsourcing can be more cost-effective than maintaining an in-house team and infrastructure.

**Access to specialized expertise:** Outsourcing can allow companies to tap into the expertise of a specialized third-party provider, who may have more experience and knowledge in certain areas of supply chain management.

**Increased flexibility:** Outsourcing can offer greater flexibility in adapting to changes in demand, supply chain disruptions, and other unforeseen events.

**Focus on core competencies:** By outsourcing non-core supply chain functions, companies can focus on their core competencies and strategic goals.

**Drawbacks:**

**Quality control issues:** Outsourcing can lead to quality control issues, as companies may not have direct oversight of the third-party providers' operations.

**Communication challenges:** Outsourcing can create communication challenges, particularly if the third-party provider is located in a different country or time zone.

**Dependence on third-party providers:** Outsourcing can create a dependence on third-party providers, which can be problematic if the provider experiences issues or goes out of business.

**Loss of control:** Outsourcing supply chain operations means giving up some degree of control over key aspects of the supply chain.

## 16.9 SUMMARY

Outsourcing can be a viable option for companies looking to reduce costs, access specialized expertise, and increase flexibility. However, companies should also be aware of the potential

drawbacks, such as quality control issues and loss of control, and carefully evaluate whether outsourcing is the right choice for their business.

## 16.10 SELF-ASSESSMENT QUESTIONS

**Q1.** Give emerging supply chain trends.

**Q2.** Discuss outsourcing supply chain operations.

**Q3.** Describe outsourcing in Supply Chain Management: Verticals Vs. Horizontals

**Q4.** Brief outsourcing in Supply Chain Management: Drivers and Benefits

**Q5.** What are the benefits and drawbacks in Outsourcing SCM

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# UNIT 17: E-COMMERCE & SCM AND GREEN SCM

## UNIT FRAMEWORK



## 17.1 OBJECTIVES

After reading this unit, you will be able to understand

- Role of E-Commerce in Supply Chain Management
- E-Commerce has a Dual Function in Supply Chain Management
- Green Supply Chain Management

- Need of Green Supply Chain Management
- Benefits of Green SCM
- Green SCM for Supply Chain Managers
- Green SCM Practices
- Companies with a Strong Green Supply Chain Management

## 17.2 INTRODUCTION

The supply chain and logistics process in the e-commerce industry is a complex and delicate balancing act. The logistics team ensures that products get to their customers promptly while keeping costs low. But how is supply chain management used with e-commerce? Here's how:

| Supply Chain and Logistics process in the E-commerce industry |
| --- |
| Plan the supply chain |
| Source materials |
| Manufacture products |
| Store product inventory |
| Plan delivery routes and routines |
| Deliver goods to customers |

**Plan the supply chain**

With the advent of e-commerce, the supply chain has become more complex. With so many different product categories, a company must figure out how to optimize its supply chain for each product type. If a company doesn't plan its supply chain well enough, it could waste inventory and slow delivery times.

**Source materials**

The second step in knowing how supply chain management is used with e-commerce is sourcing materials. This includes finding suppliers and negotiating contracts with them. It can also mean managing your materials if you are planning on selling directly to customers rather than through retailers or other distributors.

**Manufacture products**

This step involves processes like injection molding or 3D printing and assembly lines where workers combine finished products from components sourced elsewhere in the supply chain.

**Store product inventory**

The next step in the e-commerce supply chain is to store product inventory. This means that you need a warehouse to hold all your products and a system for storing and tracking them.

**Plan delivery routes and routines**

Once you have an inventory system in place, you need to plan how you will deliver your goods to customers. This includes figuring out what routes are best for different types of deliveries and how often they should occur. Some companies use their employees as delivery drivers, while others hire outside contractors or partners to help with this process.

**Deliver goods to customers**

The final step in understanding the supply chain in e-commerce is getting your product from its warehouse into the world where customers can buy it. This may involve sending a truck with an employee driver to make local deliveries or hiring a third-party logistics company (3PL) that specializes in shipping large quantities of products across long distances using specialized vehicles like boats or trains.

## 17.3 ROLE OF E-COMMERCE IN SUPPLY CHAIN MANAGEMENT

Having looked at the meaning of supply chain management and how it impacts e-commerce, let us now look at e-commerce applied to supply chain management and some of its impacts.

**Increased demand for fast and timely delivery**

One of the effects of the rapid growth of e-commerce on customer behavior is an increase in the demand for fast delivery services. With giant e-commerce businesses such as Amazon setting the pace in offering same-day delivery or 2-day delivery, smaller businesses are under pressure to try to emulate the same.

As a result, businesses have to modify or improve their supply chain management system to cope with the challenge of fast and efficient delivery services and remain relevant in a pool of other e-commerce businesses.

**Increased Price Competition**

The birth of e-commerce has given customers a preferred and more convenient way of shopping. Rather than walking into a physical store, they can now buy whatever they want from the comfort of their homes. Owing to this preference, the growth of this industry has skyrocketed in recent years, giving rise to several e-commerce businesses worldwide.

As a result of this, customers are spoiled with options when it comes to shopping online. As such, there is stiff price competition between e-commerce businesses in the same space. This increased competition has led to businesses re-strategizing their supply chain management system to accommodate this increased competition in price and enable them to compete.

**New and innovative ways to reach customers.**

E-commerce has created new and innovative ways for businesses to reach their customers. Businesses no longer have to go through the traditional retail channels to sell their products. Thanks to e-commerce, customers can now purchase various items with the click of a single button.

Thus, this has made it easier for the supply chain management system to better cater to customers' needs. By increasing the means of reaching customers, the supply chain system is equipped with more ways to reach customers and make the products available to them. Also, supply methods such as drop shipping have eradicated the need for warehouse storage, streamlining the supply chain.

**Easier exchange of documents and data**

The conduction of business transactions electronically has enabled the faster and easier exchange of documents between the concerned parties. Various supply chain documents can now be easily uploaded to the internet and sent to the receiver who receives them from his end. Thus, allowing business transactions to be conducted within the shortest possible time.

Also, e-commerce enables faster and easier payment between the various parts of the supply chain. Payment can be made electronically and confirmed within seconds of payment, enabling faster and more streamlined supply chain activities

**Improved customer experience**

E-commerce has enabled the easy collection of various customer data online. By visiting your site and scrolling through your products, customer preferences and products of interest can be collected and used to improve customer experience. Customer experience can be improved by constantly displaying personalized content on their screens using data gotten from your site.

An improved customer experience can enhance the flow of products to the end users by increasing their chances of purchasing the products. Thus, leading to a more efficient and effective supply chain management system.

## 17.4 E-COMMERCE HAS A DUAL FUNCTION IN SUPPLY CHAIN MANAGEMENT

Customers are no longer limited to purchasing items from retailers alone. E-commerce has given them the privilege of shopping for raw materials and other items directly from manufacturers, dealers, and distributors through their websites or platforms such as Alibaba or AliExpress. Retailers can also buy products from manufacturers, wholesalers, and distributors through their e-commerce sites.

In addition, businesses can fulfill customer orders directly from the supplier using drop shipping. When these orders are placed on their websites, they simply contact the manufacturers through their websites. The manufacturers then send the products directly to the customers. This fulfillment concept restricts the retailer to just collecting payment from the customer and paying

for the manufacturer's services and cancels the need for supply chain management systems. Thus, giving eCommerce a duality of function in supply chain management.

Whether you run a shipping company in UAE or a small retail store, the contribution of e-commerce to supply chain management is immense. Other roles played by this industry in supply chain management include:

- Provides real-time information about inventory levels and order status, allowing businesses to make better decisions.
- Allows for easy collaboration between suppliers and customers
- Reduced transportation costs, etc.

## 17.5 GREEN SUPPLY CHAIN MANAGEMENT

Green supply chain management (GSCM) involves sustainable environmental processes built into conventional supply chains — from manufacturing to operations to end-of-life management — incorporating the principle of 4R1D (reduce, reuse, recycle, reclaim and degradable).

Green supply chain management is a critical piece of the puzzle regarding sustainability and reducing our carbon footprint. In layman's terms, it is the process of managing the environmental impact of the supply chain. It can include anything from reducing energy consumption to recycling and composting.

Green Supply Chain Management is a set of green management practices to help organisations operate more sustainably and efficiently. It's also sometimes called sustainable supply chain management or green logistics.

It evaluates the sustainability and environmental impact of every product and process along the supply chain, from sourcing raw materials to manufacturing, distributing and delivery. Green SCM looks for ways to minimise waste and pollution, conserve resources, and reduce the carbon footprint of products and services.

Green SCM is not just about being green for the sake of being green. It's also about improving sustainability and making operations more efficient. It is a holistic green method taking into account the triple bottom line of sustainability: people, planet, and profits.

With green SCM, companies can also contribute to their corporate social responsibility (CSR). It helps companies meet their environmental goals and improve their public image. Many green SCM initiatives also have the added benefit of reducing costs. For example, green transportation initiatives can reduce fuel consumption and save money, and green packaging initiatives can reduce materials and waste disposal costs.

The National Association of Manufacturers, green SCM is becoming more critical to companies. The survey found that nearly half of respondents said they have a green SCM program in place, and another third said they are considering implementing one.

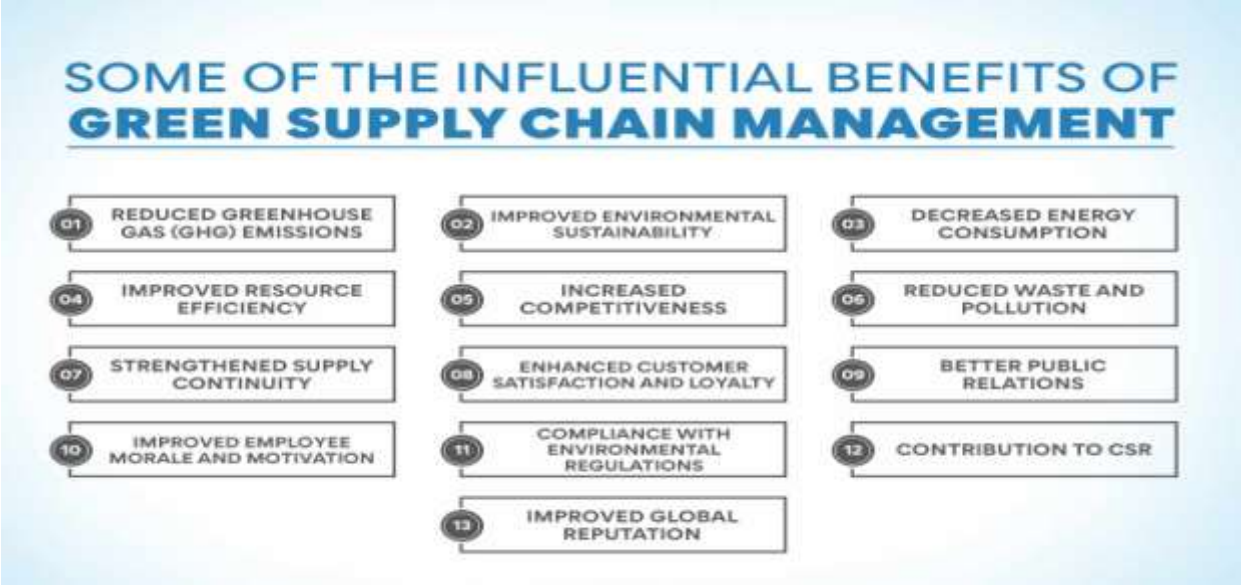
In a nutshell, green supply chain management is about minimising waste and pollution, conserving resources, and reducing the carbon footprint of products and services. A growing number of businesses recognise the importance of green SCM and are implementing programs to improve their sustainability.

## 17.6 NEED OF GREEN SUPPLY CHAIN MANAGEMENT

A growing number of consumers show interest in buying products with minimal environmental impact. If businesses want to stay competitive in today's market, they need to start implementing green supply chain management practices into their business. Let's understand green supply chain management (Green SCM) in detail to see how it can benefit businesses and the environment.

## 17.7 BENEFITS OF GREEN SCM

Green SCM comes with an abundance of benefits that both the company and society will enjoy. Some of the influential benefits that green SCM bring to the table are:




**Reduced Greenhouse Gas (GHG) Emissions**

Greenhouse gases like carbon dioxide ($CO_2$) and methane ($CH_4$) are released when fossil fuels are burned. Green SCM can help reduce these gases' emissions by promoting the use of green energy sources, green transportation methods, and energy-efficient manufacturing processes. Regularly adopting green SCM practices makes it possible to achieve a significant reduction in GHG emissions over time, which will help mitigate climate change.

**Improved Environmental Sustainability**

Green SCM practices can help to improve the environmental sustainability of a company's operations. It is because green SCM practices often lead to reduced resource consumption, waste generation, and improved energy efficiency. In turn, these benefits can help to reduce a company's environmental impact and improve its overall sustainability performance.

**Decreased Energy Consumption**

It is evident that green SCM practices would lead to decreased energy consumption. It is due to the fact that green practices often revolve around being more efficient with resources. In other words, green practices aim to do more with less energy consumption. Therefore, it only stands to reason that green supply chain management would decrease overall energy consumption.

**Improved Resource Efficiency**

It goes without saying that greening your supply chain will make it more resource-efficient. After all, one of the main goals of green operations is to minimise waste and optimise processes. By working with green supply chain partners, you can be sure they are also committed to resource efficiency and waste reduction. There is also the potential to share best practices and learn from each other to further green operations.

**Increased Competitiveness**

In today's business environment, being green is no longer just an option – it's a necessity. A green supply chain can give the company a competitive edge by helping to improve its bottom line and increase its customer base. The business that is seen as green and sustainable are the ones that will thrive in the future. Hence, staying ahead of the curve and adopting green practices in the supply chain that will future-proof the business is essential.

**Reduced Waste and Pollution**

Every business should look for ways to cut waste and pollution, and green supply chain management can help. Working with green suppliers can reduce the amount of waste produced throughout the supply chain. It is not only beneficial for the environment but can also save the business money. Reduced wastage in production and packaging can lead to increased profits, so it's a win-win for everyone involved. Hence, green supply chain management is good for the environment and makes good business sense.

**Strengthened Supply Continuity**

Many green initiatives improve supply chain efficiency and reduce waste, resulting in increased reliability and cost savings. For example, a company might choose to source locally produced materials to reduce transportation costs and emissions. It will increase the continuation of the supply chain without making any big changes.

**Enhanced Customer Satisfaction and Loyalty**

In many cases, green initiatives can lead to increased customer satisfaction. For example, a product manufactured using sustainable practices can be seen as more trustworthy and of higher

quality. It can lead to increased customer loyalty and repeat business. Customers will be inclined towards companies that they perceive as being environmentally responsible.

**Better Public Relations**

Going green can also improve a company's public image and reputation. It is especially true if the company is in a highly-polluting industry. Implementing green initiatives can show the public that the company is committed to reducing its environmental impact. As a result, companies may find it easier to attract and retain customers. It is evident that green SCM can positively impact various aspects of a company's operations. As the world increasingly focuses on sustainability, businesses need to understand and implement green practices in their supply chain.

**Improved Employee Morale and Motivation**

Not just customer satisfaction but green SCM is also linked with employees' morale. Increased motivation has a direct link to employee productivity. And green SCM policies can increase employee motivation by providing opportunities for employees to work on green initiatives and be recognised for their efforts. They will be able to see the tangible results of their work and feel good about contributing to a more sustainable future. Such revelations will also inspire green behaviour outside of work, which can have a positive ripple effect on the environment.

**Compliance with Environmental Regulations**

Many countries have environmental regulations in place that businesses must comply with. It can be a challenge for companies, primarily if they are operating in multiple countries with different regulations. Green SCM can help companies meet these requirements while reducing their environmental impact. With green SCM, businesses can make sure they use environmentally-friendly practices throughout their supply chains.

**Contribution to CSR**

Green SCM is not only good for the environment but also for a company's reputation. It can contribute to a company's CSR (Corporate Social Responsibility) initiatives. A green supply

chain can help a company to be perceived as environmentally responsible and committed to sustainable practices. It will positively impact the company's brand and reputation.

**Improved Global Reputation**

In today's business world, consumers and other stakeholders are increasingly interested in working with companies that are strongly committed to environmental sustainability. As such, green supply chain management can help to improve a company's reputation in the eyes of these important groups. When a company green-ifies its supply chain, it often sees an improved reputation from consumers and other businesses. It is because green practices are becoming increasingly important to the general public, and companies that don't adopt them are seen as being behind the times. In addition, green SCM can help a company form closer relationships with its suppliers as they work together towards a common goal.

## 17.8 GREEN SCM FOR SUPPLY CHAIN MANAGERS

If you aspire to become a professional supply chain manager, you must understand the concept of green supply chain management and how you can implement it into your business. It is essential to talk about green SCM with your team and clients. As a supply chain manager, there are a few terminologies you must keep a few things in mind regarding green SCM:

**Green Supply Chain Management:** The greening of supply chain processes to reduce negative environmental impacts

**Greenwashing:** The act of making false or misleading claims about the environmental benefits of a product or service

**Sustainable supply chain management:** A holistic approach to SCM that takes into account social, economic, and environmental concerns.

**Life Cycle Assessment:** A tool to evaluate the environmental impacts of a product or service over its entire life cycle

**Carbon footprint:** A measurement of carbon dioxide ($CO_2$) and other greenhouse gases emitted by an individual, organisation, event, or product.

## 17.9 GREEN SCM PRACTICES

There are a number of green SCM practices that companies can adopt. Some standard practices include:

- Improving energy efficiency
- Recycling materials
- Using green transportation options
- Using recycled or recyclable packaging materials
- Working with green suppliers
- Reducing waste throughout the supply chain
- Implementing green manufacturing processes
- Using green energy sources

Each company will have different green SCM goals, depending on their particular circumstances. However, all companies can benefit from reduced costs, improved efficiency, and a smaller environmental footprint. It has the potential to improve not only a company's bottom line but also its relationships with suppliers, consumers, and other stakeholders. Implementing green supply chain management practices can be a challenge, but the rewards are definitely worth it.

## 17.10 COMPANIES WITH A STRONG GREEN SUPPLY CHAIN MANAGEMENT

There are plenty of global companies that have already adopted green practices in their supply chain management.

Nike, for one, has been using green supply chain management since the early 1990s. The company has a green. The supply chain management team is responsible for ensuring that its suppliers meet Nike's standards for green manufacturing.

Nike also offers green supply chain management training to its suppliers so that they can learn how to reduce their environmental impact.

Other companies that have adopted green supply chain management include IBM, HP, and Dell.

These companies have all implemented green practices into their supply chains in order to reduce their environmental impact and improve their sustainability.

## 17.11 SUMMARY

With the rapid development of e-commerce technology, e-commerce enterprises, especially B2C enterprises, have sprung up. This competition based on e-commerce technology has changed the traditional supply chain model and improved the operation efficiency of the supply chain. However, with the use of e-commerce technology, the supply and demand relationship between e-commerce enterprises has become extremely complicated. The original risk management system in the past has long been unable to adapt to the development needs of e-commerce enterprises in the new era.

## 17.12 SELF-ASSESSMENT QUESTIONS

**Q1.** What is Green SCM?

**Q2.** What are Green SCM practices?

**Q3.** Discuss the Green SCM for supply chain managers.

**Q4.** Define the role of E commerce in supply chain management.

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## UNIT 18: DISTRIBUTION RESOURCE PLANNING AND WORLD CLASS SCM

### UNIT FRAMEWORK

18.1 Objectives

18.2 Introduction

## 18.1 OBJECTIVES

After reading this unit, you will be able to understand

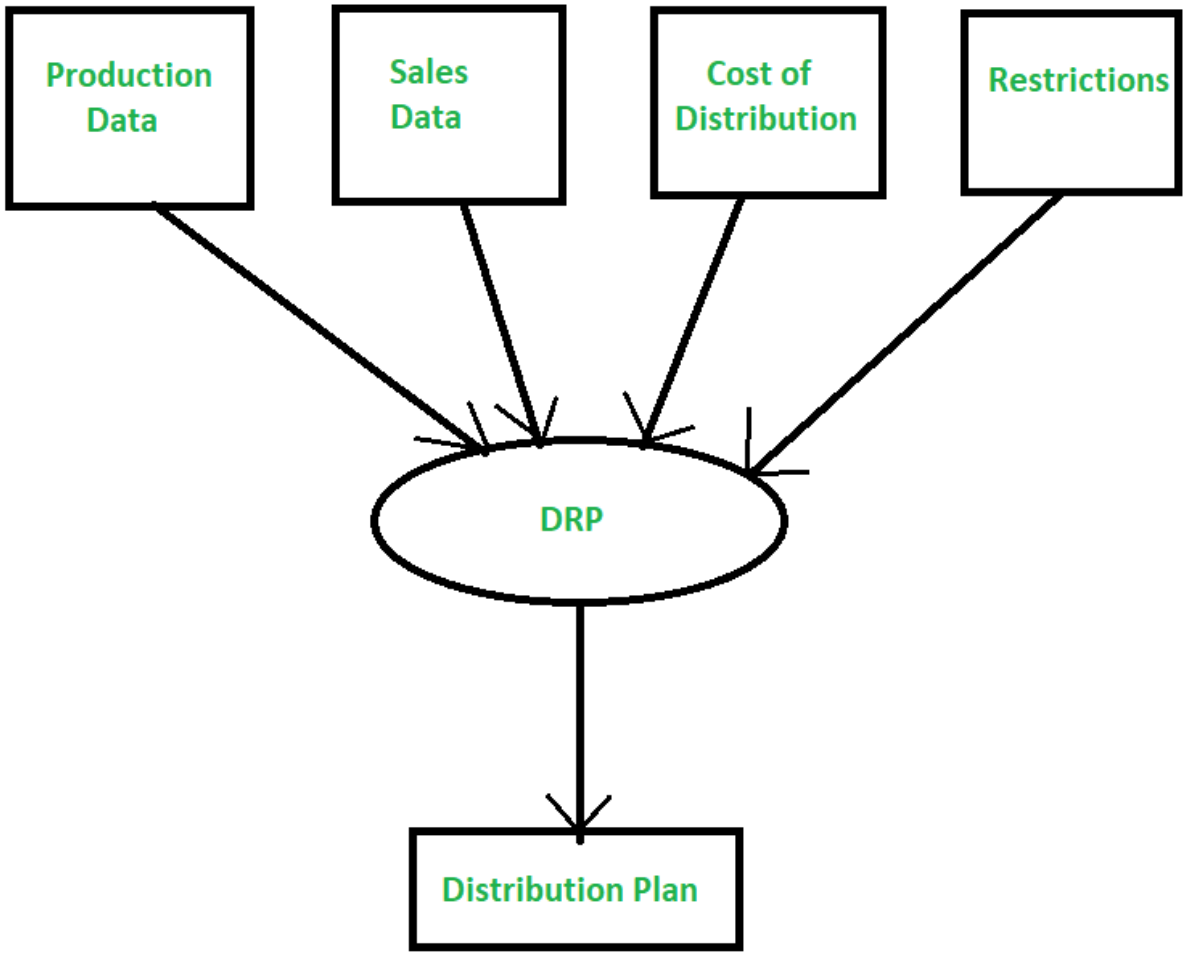
- Distribution Resource Planning
- Advantages of Implementing DRP
- Process of Distribution Requirements Planning
- Key Considerations for Implementing DRP
- Global Supply Chain Management
- Elements of Global Supply Chain Management
- Building World Class Supply Chain

## 18.2 INTRODUCTION

Distribution resource planning (DRP) is a method used in business administration for planning orders within a supply chain. DRP enables the user to set certain inventory control parameters (like a safety stock) and calculate the time-phased inventory requirements. This process is also commonly referred to as distribution requirements planning.

DRP uses several variables:

- the required quantity of product needed at the beginning of a period
- the constrained quantity of product available at the beginning of a period
- the recommended order quantity at the beginning of a period
- the backordered demand at the end of a period
- the on-hand inventory at the end of a period
- DRP needs the following information:
- the demand in a future period
- the scheduled receipts at the beginning of a period
- the on-hand inventory at the beginning of a period
- the safety stock requirement for a period




## 18.3 UNDERSTANDING THE MEANING OF DRP

DRP, also known as distribution resource planning, involves determining the item quantities, location, and timing required to satisfy anticipated demand. Its primary goal is to maximize product availability while minimizing ordering, transportation, and inventory holding costs. DRP enables businesses to make informed production and inventory-level decisions using historical sales data and forecasting techniques.

## 18.4 ADVANTAGES OF IMPLEMENTING DRP

Implementing DRP offers several advantages for businesses. Let's explore some of the key benefits it brings to supply chain management:

**1. Enhanced Inventory Control**: DRP allows businesses to set inventory control parameters, such as safety stock levels, to ensure optimal inventory management. Companies can avoid stockouts and excess inventory by accurately calculating time-phased inventory requirements, improving customer satisfaction, and reducing carrying costs.

**2. Efficient Distribution Network:** DRP facilitates the efficient distribution of products across a network of distribution centers and retail locations. By determining the number of products needed at each point of sale, businesses can optimize the flow of goods, minimize transportation costs, and ensure timely delivery to meet customer demand.

**3. Quick Response to Changing Demand**: In today's dynamic market, demand can fluctuate rapidly. DRP enables businesses to respond quickly to changes in demand by adjusting production levels and distribution plans accordingly. This agility helps businesses avoid stockouts during periods of high demand and prevent overproduction during periods of low demand.

**4. Cost Saving**: By optimizing stock levels, minimizing transportation costs, and reducing order quantities, DRP helps businesses achieve cost savings. Effective DRP implementation leads to better utilization of resources, improved operational efficiency, and reduced carrying costs, ultimately enhancing the company's profitability.

**5. Improved Collaboration and Communication:** DRP fosters collaboration and communication among different organizational departments, including sales, production, and logistics. By aligning these departments through accurate demand forecasting and inventory planning, businesses can streamline their operations and achieve better coordination across the supply chain.

## 18.5 PROCESS OF DISTRIBUTION REQUIREMENTS PLANNING

Now that we understand the meaning and advantages of DRP let's delve into the process of implementing DRP within a supply chain:

**1. Demand Forecasting**

The first step in DRP is to accurately forecast future demand. Historical sales data, market trends, and customer insights are analyzed for reliable demand forecasts. These forecasts are the foundation for determining the quantities of products needed at different locations within the distribution network.

**2. Inventory Analysis**

Next, businesses conduct a comprehensive analysis of their current inventory levels. This includes assessing on-hand inventory balances, safety stock requirements, and back-ordered demand. By understanding the inventory situation, businesses can identify gaps and determine the replenishment needs.

**3. Replenishment Planning**

Based on the demand forecasts and inventory analysis, DRP generates time-phased requirements for replenishing inventory. It recommends the optimal order quantities and timing to ensure that the right amount of products is available when and where needed. This helps businesses avoid stockouts and excess inventory, balancing demand and supply.

**4. Distribution Network Optimization**

DRP considers the distribution network's structure, including the central facility, regional facilities, and other nodes in the network. It aims to optimize the flow of goods by ensuring efficient distribution from the central facility to regional facilities and ultimately to retail locations or end customers. This optimization minimizes transportation costs and reduces lead times.

**5. Collaboration and Execution**

Successful implementation of DRP relies on effective collaboration and execution across the supply chain. Sales, production, and logistics teams must collaborate to ensure seamless coordination and communication. Real-time data sharing, automated systems, and streamlined processes are essential for executing the DRP plan and making necessary adjustments when required.

## 18.6 KEY CONSIDERATIONS FOR IMPLEMENTING DRP

While DRP offers significant benefits, its successful implementation requires careful planning and consideration. Here are some key factors to keep in mind:

**1. Accurate Data and Forecasting**

Reliable data and accurate demand forecasting are crucial for the effectiveness of DRP. Investing in advanced forecasting tools and technologies and continuously improving data collection and analysis capabilities can enhance the accuracy of demand forecasts and improve the overall performance of DRP.

**2. Integration with ERP Systems**

Integration between DRP and Enterprise Resource Planning (ERP) systems is vital for seamless information flow and process synchronization. The integration allows for real-time data updates, automated order generation, and improved visibility across the supply chain.

**3. Continuous Monitoring and Evaluation**

DRP is not a one-time implementation; it requires ongoing monitoring and evaluation. Regularly reviewing key performance indicators, such as fill rates, inventory turnover, and order cycle times, helps identify areas for improvement and ensures that DRP remains aligned with changing business needs.

**4. Collaborative Relationships with Suppliers**

Strong relationships with suppliers are integral to efficient DRP implementation. Collaborating closely with suppliers, sharing demand forecasts, and aligning production schedules can help optimize the supply chain and reduce lead times.

**5. Scalability and Flexibility**

DRP should be designed to accommodate changes in the business environment. Scalability and flexibility are essential to adapt to fluctuations in demand, market trends, and expansion plans. Regularly reassessing the distribution network and adjusting DRP parameters ensure its effectiveness in supporting business growth.

## 18.7 GLOBAL SUPPLY CHAIN MANAGEMENT

Supply chain turns raw materials into finished products that meet customer expectations. It takes a whole network of people, from suppliers and manufacturers to distributors and partners, working together to produce the best quality products on the market.

Fortunately, the idea of a supply chain being world class goes hand in hand with world class manufacturing, and there is a set of guiding principles to follow. Following them will help you successfully operate and manage a manufacturing firm that can remain competitive in the global marketplace.

There are 5 steps for making your supply chain world class

Step 1: Define clear objectives

Step 2: Gather necessary data

Step 3: Choose a supply chain management system

Step 4: Conduct supply chain network analysis

Step 5: Refine and improve

Making your supply chain world class is about meeting or even exceeding customer expectations and delivering top-notch performance every time.

**Step 1: Define clear objectives**

Start by identifying overarching goals that will create consumer satisfaction. To help define those goals, ask yourself the following questions:

How much inventory needs to be stored, and where should it be?

Which modes of transportation would best balance out cost versus customer service objectives?

Which warehouses should administer which products to people?

How many warehouses are needed and what is the role of each?

What are the best routes to get products to customers the fastest?

**Step 2: Gather necessary data**

It's important to gather the appropriate data to ensure that you're meeting company-specific goals. For example, you may track data so you can keep an eye on product demand, transportation rates, lead times, and warehouse and inventory expenses.

**Step 3: Embrace technology and digitalization**

Leverage technology to automate manual tasks, improve visibility, and enhance decision-making. It's crucial to pick software that addresses all of your production criteria and facilitates your unique business model. Adopt advanced supply chain management systems (SCM), enterprise resource planning (ERP) software, connected worker software, and warehouse management systems (WMS). Explore emerging technologies like blockchain, AI, and robotics to further optimize operations.

**Step 4: Conduct supply chain network analysis**

Once you've picked the perfect supply chain software, it's time to analyze how well your production processes are faring. Consider evaluating if there are any gaps in product development and how long it takes for goods to be delivered.

**Step 5: Refine and continually improve**

Carefully examining your supply chain network and processes is a great starting point for becoming world class. But if you don't make steady strides toward improvement, you're left at a standstill. Things are constantly evolving in the manufacturing industry, so it's helpful to check some of the following: production capacity, price fluctuations in raw materials, and any new large customer orders (especially if they were added in a different location).

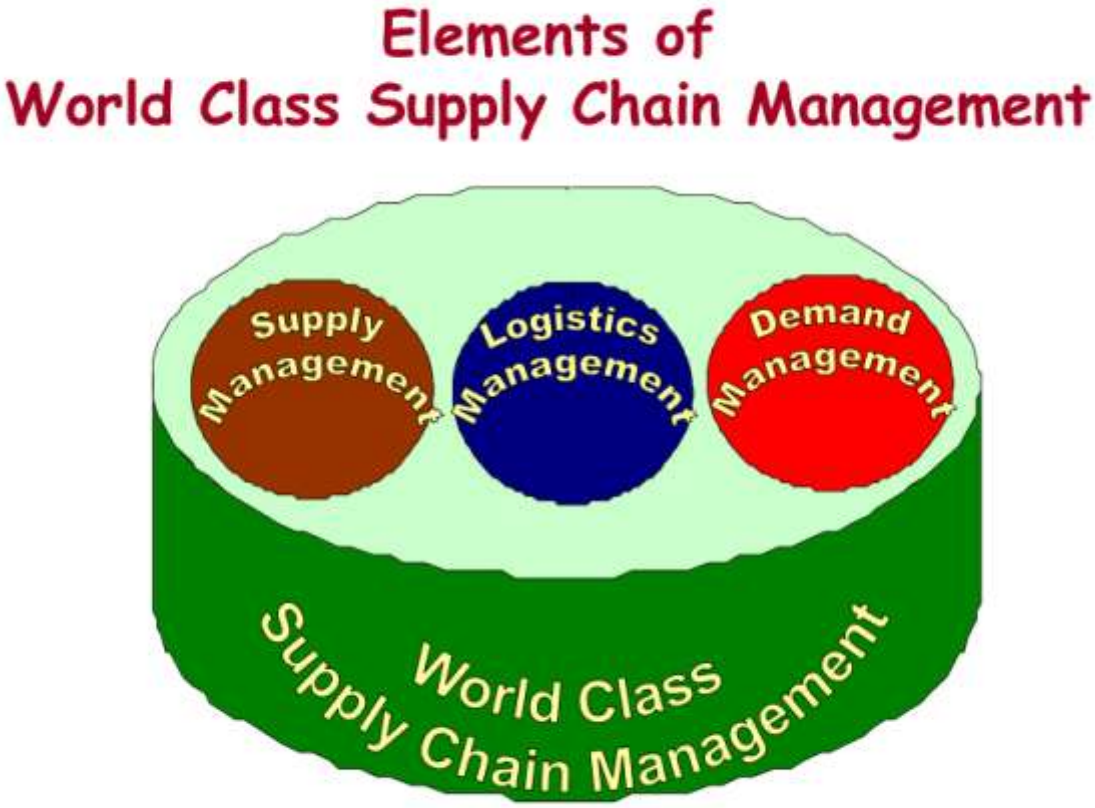
Encourage a culture of learning, innovation, and continuous improvement within the organization. Promote employee engagement, provide training and development opportunities, and empower employees to contribute ideas for process optimization and supply chain innovation.

Continuous improvement is a must. So revisit your processes regularly, whether that's monthly, quarterly, or annually.

## 18.8 ELEMENTS OF GLOBAL SUPPLY CHAIN MANAGEMENT

There are three elements of global supply chain management:

- Supply management
- Logistics management
- Demand management




### 1. SUPPLY MANAGEMENT

The term supply management refers to the act of identifying, acquiring, and managing resources and suppliers that are essential to the operations of an organization. Also known as procurement, supply management includes the purchase of physical goods, information, services, and any other necessary resources that enable a company to continue operating and growing.

The primary goals of supply management are cost control, efficient resource allocation, risk management, and effective collection of information for use in strategic business decisions.

The supply management professionals of an organization or an institution are generally in charge of the following:

- Identifying, sourcing, negotiating and procuring a good or service critical to a firm's continuous operations according to the wishes of the organization's leaders and supervisors.
- Creating and implementing a strategy for developing and maintaining supplier relationships and also holding suppliers accountable
- Utilizing the latest technology and procedures to make the procurement process easier

## 2. Logistics management

Logistics management refers to the acquisition, storage and transportation of inventory from its origin to its destination. It involves maintaining the inventory, resources and related information, and getting the goods to the right location at the right time and to the right customer.

Logistics management is the process of planning, implementing, and controlling the movement of goods, services, and information between the point of origin and the point of consumption. It involves the integration of various activities, including transportation, inventory management, warehousing, material handling, packaging, and security.

The goal of logistics management is to ensure that goods are delivered to the right place, at the right time, and in the right condition, while minimizing costs and maximizing efficiency. This involves optimizing the supply chain to achieve the best balance between customer service and cost-effectiveness.

Logistics management plays a crucial role in business operations, particularly in industries such as manufacturing, retail, and e-commerce, where timely and efficient delivery is critical for customer satisfaction and retention. It helps organizations improve their supply chain efficiency, reduce transportation and warehousing costs, and increase their overall competitiveness.

One of the most important concepts in logistics management is the concept of 7 Rs or 7 "Rights." The Chartered Institute of Logistics & Transport (U.K.) defines the 7 Rs as:

"Getting the right product, in the right quantity, in the right condition, at the right place, at the right time, to the right customer, at the right price."

### 3. Demand Management

Demand management is a planning methodology. Companies use it to forecast and plan how to meet demand for services and products. Demand management improves connections between operations and marketing. The result is tighter coordination of strategy, capacity and customer needs.

In 2014, the Global Journal of Management and Business published research that concluded that demand management "provides an important bridge between the marketplace and a company's internal operations." The study also clarified the concept of demand management as "the creation of interactions between operations and marketing with the goal of understanding the market and developing actions in sync with company strategy, production capacity and end-customer needs."

Those conclusions remain valid today. Modern demand management identifies and captures all potential demands, interprets them and communicates them to relevant departments within the organization. An example of external demand is an assessment based on customer inquiries or booked orders, while an internal demand assessment may calculate the raw materials needed to produce a new product and the promotional activities required to support the launch of that same product.

## 18.9 BUILDING WORLD CLASS SUPPLY CHAIN

Supply chains are complex. Companies have split them up into manufacturing, planning, inbound logistics, outbound logistics, global air and sea freight, warehouse management, customer service, order management, etc… depending on the industry, the list could go on. The segregation of duty is of course required, but based on our experience and research, leading companies get 5 things right to make collaboration across the supply chain happen and thereby reduce costs while increasing sales:

### 1) Put a Person in Charge, end-to-end (for a product, product group)

Well-oiled supply chains are managed by one person from start to end. They are in charge for demand and supply planning for an entire product or product line, globally or for a region. It all depends on the nature of the supply chain

### 2) Measure the Performance

You only get what you measure, they say! Put in measures that represent the end-to-end nature, such as order cycle times, overall inventory levels, customer satisfaction. Measure them based on a common set of KPIs and regularly review them and take immediate action to remedy issues.

### 3) Implement a Central Data-Brain

A single point of truth (SPOT). A database, hosted in the cloud, that collects all activities along the supply chain, from planning to order management and logistics execution including milestones along the route from production to finale warehouse. This SPOT serves all supply chain participants as source for the same, up-to-date information.

### 4) Create a Fit-for-purpose Organization

Create order in the organization. Create a consistent structure with clear responsibilities and end-to-end transparency. Cleary define what to make and what to buy. Define consistently which activities to perform locally, regionally, or globally. There is no silver bullet on how to do this, but certain topics such as data analytics, forecasting services or inventory analysis have been proven to work well regionally or even globally.

### 5) Work on the Culture and Capabilities

World-class supply chains excel in collaboration which requires a strong understanding of each participant, what they are doing and what their objectives are. Such a culture can for example be achieved by career rotations where a planner goes on to become a customer service manager. Train all staff the basic concepts along the-end-to-end supply chain and form community of practices, who frequently interact and share leading practices.

## 18.10 SUMMARY

Distribution Resource Planning (DRP) is critical in optimizing supply chain management. By accurately forecasting demand, optimizing inventory levels, and ensuring efficient distribution, businesses can achieve cost savings, enhance customer satisfaction, and improve operational efficiency.Successful implementation of DRP requires accurate data, integration with ERP systems, continuous monitoring, collaborative supplier relationships, and scalability. With DRP, businesses can navigate the complexities of the supply chain and stay competitive in today's dynamic marketplace.

World Class Supply Management is the philosophy responsible for continuously improving the process of design, development, and management of an organization's supply system, with the objective of improving the bottom line. The terminology of "world class" recognizes that companies compete in an existing or impending global environment. As a philosophy, World Class Supply Management pans functional boundaries and company borders. The philosophy of World Class Supply Management requires change driven by upper management to shift decision-making processes from an intemal department or single company focus toward optimization of the supply chain. Through continuous improvement, World Class Supply Management is an ever-moving target that focuses on supply chain process improvement. World Class Supply Management involves purchasing, but is far more strategic. A world-class supply manager is not departmentally or intemally focused, but concentrates on proactively improving processes with the long-term goal of improving the competitive capability of the firm and the firm's supply chain.

## 18.11 SELF-ASSESSMENT QUESTIONS

**Q1.** What is Distribution Resource Planning?

**Q2.** What are the key considerations in implementing Distribution Resource Planning?

**Q3.** Discuss the elements of world supply chain management.

**Q4.** How to build world class supply chain?

## 18.12 TEXT AND REFERENCES

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