SUPPLY CHAIN MANAGEMENT

Unit I

Introduction to supply chain management (SCM) – concept of SCM – components of SCM, an overview – features of supply chain management, strategic issues in SCM, SCM current scenario – value chain management and customers relations management.

Unit II

Customers focus in SCM demand planning. Purchase planning – make or buy decisions – Indigenous and global sourcing – Development and Management of suppliers – legal aspects of buying – cost Management Negotiating for purchasing, subscontracting – purchase insurance – Evaluation of purchase performance (Performance indices) inventory management – Financial impact of inventory.

Unit III

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Unit IV

Logistics management – Role of logistics in SCM – integrated logistics management – transportation design and decision multimodalism – Third Party logistics Services and providers – facilities management (Port / Airport / ICD's) channels of distribution logistics and customer service.

Unit V

Information technology and SCM – EDI, ERF, Internet and intranet, e – Commerce, Advance Planning Systems. Bar coding, Telecommunication Network, Video Conference and Artificial Intelligence. Best practice in Supply chain management – Organisational issues to implement SCM.

Reference:

1. Supply chain management - For global competitiveness – B.S. Sahay – Mac Millan India Ltd., 1999.

UNIT - I

Introduction to supply chain management (SCM) – concept of SCM – components of SCM, an overview – features of supply chain management, strategic issues in SCM, SCM current scenario – value chain management and customers relations management.

1.1 Introduction to supply chain management (SCM)

The concept of Supply Chain Management is based on two core ideas. The first is that practically every product that reaches an end user represents the cumulative effort of multiple organizations. These organizations are referred to collectively as the supply chain. The second idea is that while supply chains have existed for a long time, most organizations have only paid attention to what was happening within their "four walls." Few businesses understood, much less managed, the entire chain of activities that ultimately delivered products to the final customer. The result was disjointed and often ineffective supply chains. Supply chain management, then, is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective & efficient ways possible. Supply chain activities cover everything from product development, sourcing, production, and logistics, as well as the information systems needed to coordinate these activities.

The organizations that make up the supply chain are "linked" together through physical flows and information flows. Physical flows involve the transformation, movement, and storage of goods and materials. They are the most visible piece of the supply chain. But just as important are information flows. Information flows allow the various supply chain partners to coordinate their longterm plans, and to control the day-to-day flow of goods.

Fig.No.1 Supply Chain Management-Process

A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

Below is an example of a very simple supply chain for a single product, where raw material is procured from vendors, transformed into finished goods in a single step, and then transported to distribution centers, and ultimately, customers. Realistic supply chains have multiple end products with shared components, facilities and capacities. The flow of materials is not always along an arborescent network, various modes of transportation may be considered, and the bill of materials for the end items may be both deep and large.

Traditionally, marketing, distribution, planning, manufacturing, and the purchasing organizations along the supply chain operated independently. These organizations have their own objectives and these are often conflicting. Marketing's objective of high customer service and maximum sales dollars conflict with manufacturing and distribution goals. Many manufacturing operations are designed to maximize throughput and lower costs with little

consideration for the impact on inventory levels and distribution capabilities. Purchasing contracts are often negotiated with very little information beyond historical buying patterns. The result of these factors is that there is not a single, integrated plan for the organization---there were as many plans as businesses. Clearly, there is a need for a mechanism through which these different functions can be integrated together. Supply chain management is a strategy through which such integration can be achieved.

Supply chain management is typically viewed to lie between fully vertically integrated firms, where the entire material flow is owned by a single firm and those where each channel member operates independently. Therefore, coordination between the various players in the chain is key in its effective management. Cooper and Ellram [1993] compare supply chain management to a well-balanced and well-practiced relay team. Such a team is more competitive when each player knows how to be positioned for the hand-off. The relationships are the strongest between players who directly pass the baton, but the entire team needs to make a coordinated effort to win the race.

1.2 Concept of SCM:

Supply Chain Concepts:

Before an organization tries to focus on supply chain management, its leaders must determine what the supply chain encompasses. Just as you can't manage what you don't measure, you can't plan and execute what you haven't clearly defined. Hence, it is important to articulate the overall purpose, scope, and components of a supply chain. Following are useful supply chain definitions that highlight critical aspects of a supply chain.

- From the Council of Supply Chain Management Professionals (2010) —the material and informational interchanges in the logistical process, stretching from acquisition of raw materials to delivery of finished products to the end user. All vendors, service providers, and customers are links in the supply chain.

- From Christopher Martin L. (1992) —the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer.
- From Coyle, Langley, Novak, and Gibson (2013)—A series of integrated enterprises that must share information and coordinate physical execution to ensure a smooth, integrated flow of goods, services, information, and cash through the pipeline.

One important feature of these definitions is the concept of an integrated network or system. A simplistic depiction of a supply chain, as featured in Figure 1-1, suggests that a supply chain is linear with organizations linked only to their immediate upstream suppliers and downstream customers. It also focuses on only one-way material flow, which fails to consider vital information, and financial flows, as well as reverse material flows. Such misconceptions oversimplify reality and fail to reveal the dynamic nature of a supply chain network.

Linear representation of a supply line:

In truth, supply chains require a multiplicity of relationships and numerous paths through which products and information travel. This is better reflected by the conceptual diagram of a supply chain in Figure, in which the supply chain is a web or network of participants and resources. To gain maximum benefit from the supply chain, a company must dynamically draw upon its available internal capabilities and the external resources of its supply chain network to fulfill customer requirements. This network of organizations, their facilities, and transportation linkages facilitate the procurement of materials, transformation of materials into desired products, and distribution of the products to customers.

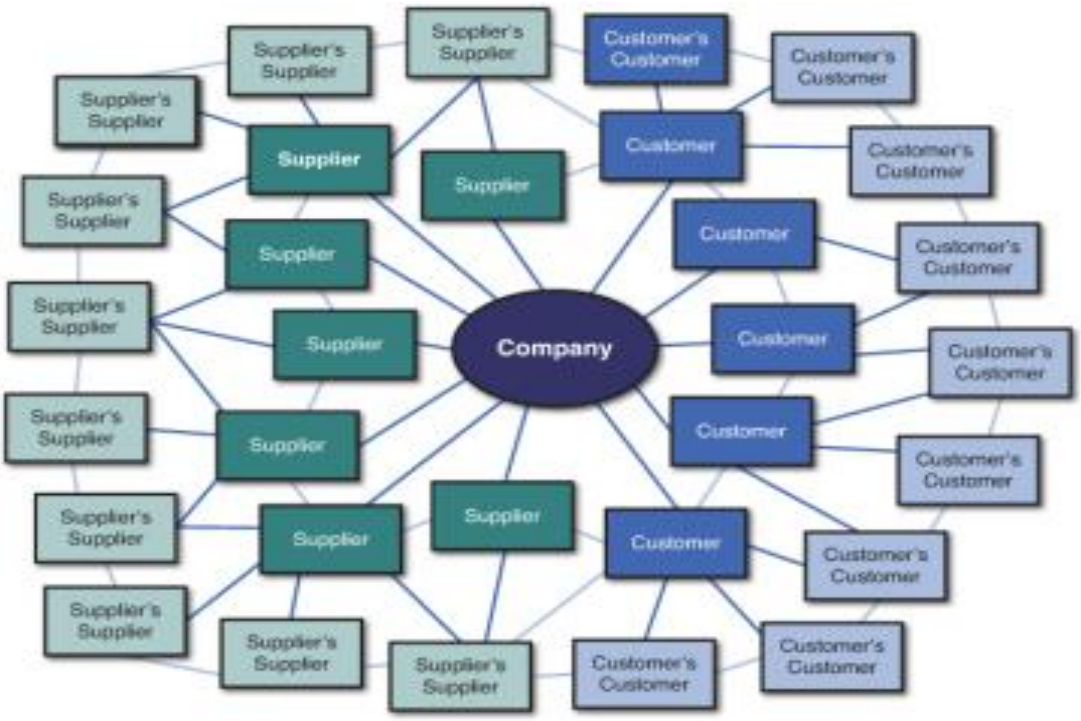


Fig No.2Network representation of a supply chain

Simple representations aside, it is critical to understand that no two supply chains are exactly alike. An organization's supply chain structure and relationships will be influenced by its industry, geographic scope of activity, supply base, product variety, fulfillment methods, and demand patterns. Consider, for example, a multinational manufacturer and a local farm-to-table restaurant. Both organizations would benefit from strong and stable supply chains. However, the manufacturer's network is at greater risk of disruption and must integrate geographically diverse suppliers with multiple selling channels.

Supply Chain Management Perspectives:

Introduced in the early 1980s, the term supply chain management began to take hold in the mid-1990s and is now part of the everyday business lexicon. Whereas a supply chain is an entity that exists for the fulfillment of customer demand, supply chain management involves overt managerial efforts by the organizations within the supply chain to achieve results (Mentzer et al., 2001). These efforts can be strategic or operational in nature, though the vast majority of respondents to a Council of Supply Chain Management Professionals

survey indicate that the primary role of supply chain management within an organization is a combination of strategy and activity (Gibson, Mentzer, & Cook, 2005).

Defining supply chain management would seem to be a straightforward task, yet it has been a vexing challenge with the introduction of many alternatives. A Google search for "supply chain management definition" quickly yields about 12,000 results. Among this plethora of descriptions, you will find professional associations, consultants, and academicians addressing similar issues but providing their own interpretations and areas of emphasis. Following is a sampling of relevant definitions:

- From the Council of Supply Chain Management Professionals (2011)—The planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. More important, 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.
- From Gartner (2013b)—The processes of creating and fulfilling demands for goods and services. It encompasses a trading partner community engaged in the common goal of satisfying end customers.
- From LaLonde (1997)—The delivery of enhanced customer and economic value through synchronized management of the flow of physical goods and associated information from sourcing to consumption.
- From Stock and Boyer (2009)—The management of a network of relationships within a firm and between interdependent organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances, and information

from the original producer to the final customer with the benefits of adding value, maximizing profitability through efficiencies, and achieving customer satisfaction.

Although the definitions vary in length and complexity, they collectively focus on three themes: activities, participants, and benefits (Stock & Boyer, 2009). That is, organizations must plan and coordinate supply chain activities among their network of suppliers and customers to ensure that the end product is available to fulfill demand in a timely, safe, and cost-efficient manner. When this is accomplished, the benefits of enhanced customer satisfaction and retention will be achieved.

Related Terms and Concepts:

Supply chain management encompasses a number of business processes, activities, and goals that are discussed throughout this book. Before moving forward, it is valuable to clarify their meanings and relevance to supply chain management.

Logistics Management:

Logistics is a fundamental set of supply chain processes that facilitates fulfillment of demand. The goal is to supply the right product or service, at the right place, at the right time. The Council of Supply Chain Management defines logistics management as "that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements." Whether provided internally, by a supplier, by the customer, or by an external logistics services provider, these capabilities are essential for achieving supply chain success.

Supply Management:

Supply management focuses on the identification, acquisition, access, positioning, management of resources, and related capabilities the organization needs or potentially needs

in the attainment of its strategic objectives (Institute for Supply Management, 2010). For most organizations, logistics controls the distribution of products; whereas supply management controls the strategic sourcing of direct materials, finished goods, services, capital equipment, and indirect materials. Both are needed to ensure optimal performance of the supply chain.

Value Chain:

The concept of a value chain was developed as a tool for competitive analysis and strategy. It is composed of primary activities (inbound logistics, operations, outbound logistics, marketing and sales, and service) and support activities (infrastructure, human resource management, technology development, and procurement) that work together to provide value to customers and generate profits for the organization (Porter, 1985). A value chain and a supply chain are complementary views of an extended enterprise, with integrated supply chain processes enabling the flows of products and services in one direction, and the value chain generating demand and cash flows from customers (Ramsey, 2005).

Distribution Channel:

Distribution channels support the flow of goods and services from the manufacturer to the final user or consumer (Council of Supply Chain Management Professionals, 2010). An organization can establish direct channels to consumers or rely upon traditional intermediaries such as wholesalers and retailers to facilitate transactions with final users. The rapid expansion of the Internet as a key selling platform is forcing manufacturers and retailers to develop innovative and flexible “Omni channel” capabilities in their supply chains to fulfill customer demand from stores, distribution centers, and production locations.

Supply Chain Management Concepts:

Shortly after your alarm clock goes off and the coffee maker kicks on, the aroma of your favorite coffee fills the air. The supply chain is responsible for getting those coffee beans across the world and to your kitchen. Something so common in every household, takes a great deal of planning, demand forecasting, procurement, and logistical expertise to move those beans to local sellers while still fresh. Without a strong supply chain in place, your caffeine-fix options would be severely limited. SCM involves a series of key activities and processes that must be completed in an efficient (fuel-conserving, cost-reducing, etc.) and timely manner. Otherwise, product will not be available when needed by consumers like you.

The Seven Rights of Fulfillment:

The ability to meet customer requirements, for everything from coffee beans to Crocs, is built upon the expectation that everything is done correctly in the supply chain. And that means doing it right the first time – no mulligans, no mistakes are allowed. In the quest to provide quality service and satisfy customers, world-class companies along the supply chain are guided by the Seven Rights of Fulfillment.

If you think about it, every order needs to be executed according to these seven goals. You must attempt to deliver a “perfect order” to every customer every time. Doing it right the first time makes the customer happy, saves the cost of fixing errors, and doesn't require extra use of assets. Thus, every part of the organization has a vested interest in pursuing perfection.

A “perfect order” delivery is only attained when all Seven Rights of Fulfillment are achieved. To accomplish a perfect order fulfillment, the seller has to have your preferred product available for order, process your order correctly, ship the entire order via the means that you request, provide you with an advanced shipping notification and tracking number, deliver the complete order on time and without damage, and bill you correctly. A seller’s

ultimate goal is to make the customer happy by doing the job right, which gives them a good reason to use the seller's services again in the future.

SCM Flows:

If the goal of SCM is to provide high product availability through efficient and timely fulfillment of customer demand, then how is the goal accomplished? Obviously, you need effective flows of products from the point of origin to the point of consumption. But there's more to it. Consider the diagram of the fresh food supply chain. A two-way flow of information and data between the supply chain participants creates visibility of demand and fast detection of problems. Both are needed by supply chain managers to make good decisions regarding what to buy, make, and move.

Other flows are also important. In their roles as suppliers, companies have a vested interest in financial flows; suppliers want to get paid for their products and services as soon as possible and with minimal hassle. Sometimes, it is also necessary to move products back through the supply chain for returns, repairs, recycling, or disposal.

Because of all the processes that have to take place at different types of participating companies, each company needs supply chain managers to help improve their flows of product, information, and money. This opens the door of opportunity to you to a wide variety of SCM career options for you!

SCM Processes:

Supply chain activities aren't the responsibility of one person or one company. Multiple people need to be actively involved in a number of different processes to make it work. It's kind of like baseball. While all the participants are called baseball players, they don't do whatever they want. Each person has a role – pitcher, catcher, shortstop, etc. – and must perform well at their assigned duties – fielding, throwing, and/or hitting – for the team

to be successful. Of course, these players need to work well together. A hit-and-run play will only be successful if the base runner gets the signal and takes off running, while the batter makes solid contact with the ball. The team also needs a manager to develop a game plan, put people in the right positions, and monitor success.

Winning the SCM "game" requires supply chain professionals to play similar roles. Each supply chain player must understand his or her role, develop winning strategies, and collaborate with their supply chain teammates. By doing so, the SCM team can flawlessly execute the following processes:

- **Planning** – the plan process seeks to create effective long- and short-range supply chain strategies. From the design of the supply chain network to the prediction of customer demand, supply chain leaders need to develop integrated supply chain strategies.
- **Procurement** – the buy process focuses on the purchase of required raw materials, components, and goods. As a consumer, you're pretty familiar with buying stuff!
- **Production** – the make process involves the manufacture, conversion, or assembly of materials into finished goods or parts for other products. Supply chain managers provide production support and ensure that key materials are available when needed.
- **Distribution** – the move process manages the logistical flow of goods across the supply chain. Transportation companies, third party logistics firms, and others ensure that goods are flowing quickly and safely toward the point of demand.
- **Customer Interface** – the demand process revolves around all the issues that are related to planning customer interactions, satisfying their needs, and fulfilling orders perfectly.

1.3 Components of SCM:

Supply chain management (SCM) is the process of converting the raw materials in to a product or service and delivers it to customers. The following are five basic components of SCM.

Planning:

It is the strategic activity of SCM and the companies need a perfect planning for managing all the resources that meet the customers demand for their product or service and satisfies the customer. SCM planning is to be developed in such a way that it costs effective and delivers high quality and value to customers.

Sourcing:

Companies need to choose reliable suppliers or vendors to deliver the goods and services with which the company creates the product. Therefore, supply chain managers must develop a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships. The vendors should supply the inventory as per the demand and the SCM managers should also take care of the quality of the material supplied, and verify shipments, transfer them to the manufacturing facilities and authorizing supplier payments.

Making:

This is the manufacturing step in the SCM and the supply chain managers schedule the activities necessary for production, testing, packaging and preparation for delivery. In this step companies can measure quality levels, production output and worker productivity.

Delivering:

This is the step where the goods stored in the warehouses are delivered to the customers through an efficient distribution system as soon as the company receives the order

from the customers and it is referred as logistics. This also includes an invoicing system to receive payments.

Return:

This is the step in the supply chain where the company receives back a defective and excess product from the customers. To effectively implement this process supply chain planners, have to create a responsive and flexible network as it can be a problematic part of the supply chain for many companies. According to Lambert and Cooper (2000) the following are the components of supply chain management:

- Planning and control
- Work structure
- Organization structure
- Product flow facility structure
- Information flow facility structure
- Management methods
- Power and leadership structure
- Risk and reward structure
- Culture and attitude

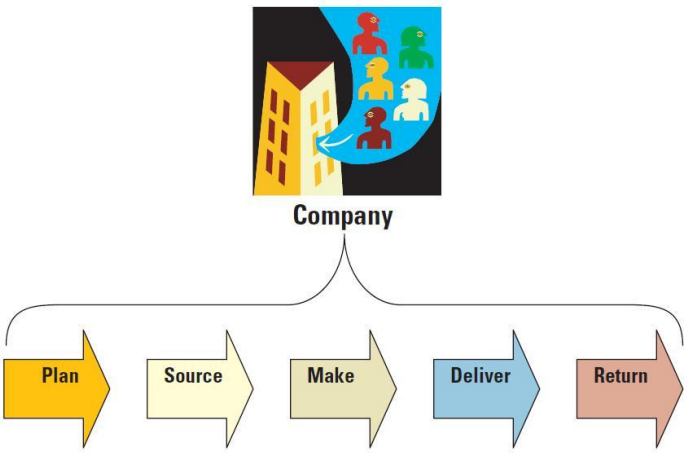


Fig No:3 Components of SCM

1.4.1Features of SCM:

Top Six Supply Chain Management Features:

Supply chain management features allow companies to run businesses more effectively. Finding the right software that will make your company shine is the key to a great business decision. There are a few key supply chain management features that you want to look for when you are searching for supply chain vendors. If you can find these six features in your software then chances are you are making a great business decision.

Management of Inventory:

One of the supply chain management features that you want to look for is excellent inventory management. The software should be able to maintain stability with tracking of inventory as well as the finished goods. This function should also include the ability to track materials needed for production and eliminate any excess waste that may be costing your company extra money. This will not only help with the reducing of cost spent on materials, but also on the issue of storage.

Managing of Orders:

Another of the key supply chain management features is the ability to manage orders through your company. Your new software should be able to manage an order from the time it is placed until the time it is delivered as a finished product. This helps make everyone accountable for the work they do as well as keeping everyone working efficiently. This will improve your customer service abilities when your customer sees that they are still getting the same quality product but at a quicker rate.

Procurement:

One key supply chain management feature is the ability to create lasting relationships with your clients. In doing this you want to make sure that all tasks associated with a particular order are being tracked properly. This will help you not only in your customer

service area but also in the area of negotiating for sales. If you are able to give a more definite finish date for a product then you are more likely to earn their trust and win the sale.

Logistics:

As your company expands, you want to make sure your software will expand with you. You want to make sure you have a supply chain management feature that will allow your company room to grow; whether locally or globally. This will help to save you money in the long run because no further software will need to be purchased to keep your company running. Downtime can be the biggest cost to a company and by choosing the right software you will not have that worry on your shoulders.

Planning and Forecasting:

If your company produces a product that is popular around holiday times then you want to be able to predict the demand you may have at a certain time of year. The right supply chain management features will help you in this battle by looking at years past data and seeing where you will be at that same time in the year. This is a great asset to have so that your planning and scheduling can be right on target.

Managing of Returns:

Finally, the last supply chain management feature to mention is the return management. If your product is defective or broken when it arrives at your customers' location then chances are you are going to have a very unhappy customer. Let your supply chain management feature handle this for you. The automatic processing of claims is one way that the software will help eliminate this headache.

1.4.2 Issues and challenges in supply chain Management

a. In Supply Chain Integration

Supply chain management (SCM) executives face unique challenges, with respect to integrating supply chainspecific strategies with the overall corporate business strategy. In

recent years, given changing business realities related to globalization, the supply chain has moved up on the chief executive officer‟ s (CEO‟s) list of priorities, but it's not always for the right reasons, in many cases, CEOs only pay attention to the supply chain when they want to cut costs or when something is wrong. Since the supply chain essentially moves the lifeblood of the organization, process efficiency on a global scale is essential to optimized business operations. The importance of global integration to the Multi-National Company (MNC) lies in the differential advantage to be gained from the ability to exploit differences in capital and product markets, to transfer learning and innovation throughout the firm, and manage uncertainty in the economic or political environment in different countries or regions. However, the general understanding of the business environment in most industries is that competition has increased and the conditions under which business is made are more turbulent. Many researches have mentioned a classification of supply chain integration challenges. SC integration challenges can be classified through the challenge of system relationships; the SCM system has two kinds of relationships, which are the relation between sub-systems, and the relationship between SCM system and the business strategies, this classification emphasizes the technical challenges that came from the relation between SCM system and internal business strategy, unfortunately this classification bypass the challenges that the companies may face from external environment.

b. In Information Sharing

Information sharing in a supply chain faces several hurdles. The first and foremost challenge is that of aligning incentives of different partners. It would be naïve of a partner to think that information sharing and cooperation will automatically increase his or her profit. In fact, each partner is wary of the possibility of other partners abusing information and reaping all the benefits from information sharing. For example, supply chain partners seldom share information that relates to sensitive cost data, e.g. production yield data or purchase price of

parts. This is consistent with economists. Finding that a powerful monopolistic or monopolistic partner can extract all economic profit from his or her partner, but one way of defending a positive profit for the weaker party is to keep In Information Sharing Information sharing in a supply chain faces several hurdles. The first and foremost challenge is that of aligning incentives of different partners. It would be naïve of a partner to think that information sharing and cooperation will automatically increase his or her profit. In fact, each partner is wary of the possibility of other partners abusing information and reaping all the benefits from information sharing. For example, supply chain partners seldom share information that relates to sensitive cost data, e.g. production yield data or purchase price of parts. This is consistent with economists. Finding that a powerful monopolistic or monopolistic partner can extract all economic profit from his or her partner, but one way of defending a positive profit for the weaker party is to keep the cost hidden and maintain informational superiority. The profit associated with superior information is often called the informational rent. Even when each partner is guaranteed a positive gain in return for information sharing, each partner can play a non-cooperative game and haggle over how much. This may potentially lead to a failure to share information. Thus, trust and cooperation become critical ingredients in a supply chain partnership. On the other hand, trust needs to be rationalized by a relevant economic return. Cooperative game theory offers a starting point to the resolution of the problem, but reality is much more complicated with many additional factors and special considerations. Another concern associated with information sharing is the confidentiality of information shared. Suppose, for example, that a supplier supplies a critical part to two manufacturers who compete in the final product market. Either manufacturer would not share information (like sales data) with the supplier unless it is guaranteed that the information is not leaked to the other manufacturer. But the situation becomes tricky if the

supplier and one of the two manufacturers are the same company. Note also that information sharing in certain settings can be a subject of antitrust regulations.

Suppose that two retailers regularly share with the supplier their demand projection for the next ten weeks. The projection by one retailer may implicitly signal the plan of a sales/promotion campaign in some future week. When this information is relayed to the other retailer through the supplier, it may be potentially used as a price fixing instrument between the two retailers. For example, the two retailers may take turns lowering the price by the use of forecast signals and avoid cut-throat price competition. This practice may be a subject of scrutiny by the antitrust authorities. Again, but for a different reason now, the supplier must make sure that the shared information will not be used beyond the original intent. Technology is another constraint in information sharing. Implementation of a cross-organizational information system is costly, time-consuming and risky. Partners may not agree on the specifications of the technical system, e.g., EDI standards, or how to split the cost of investing in the system. The timeliness and accuracy of the shared information could be another major hurdle. PC manufacturers often complain about not being able to get accurate sell through data from their resellers. Some resellers share such data on a monthly basis, but then the definition of a month varies by resellers - some from the first day of the month to the first day of the next, some from 15th to l5th, and so on. In addition, some resellers would share the data on a weekly basis. Since the manufacturers are interested in the aggregate sell-through data of their products, significant efforts are needed to ensure consistency of the aggregated data. Finally, we should note that information sharing is only an enabler for better coordination and planning of the supply chain. Hence, companies must develop capabilities to utilize the shared information in an effective way. We have heard that some manufacturers demand POS data from the retailers, but then did not know how to make use of the data to

improve their forecasts. Consequently, the benefits of information sharing were not fully realized.

1.4.3 SCM current scenario:

In the current competitive scenario supply chain management assumes a significant importance and calls for serious research attention, as companies are challenged with finding ways to meet ever-rising customer expectations at a manageable cost. To do so, businesses must search out which parts of their supply-chain process are not competitive, understand which customer needs are not being met, establish improvement goals, and rapidly implement necessary improvements. The term „supply chain management" has not only been used to explain the logistics activities and the planning and control of materials and information flows internally within a company or externally between companies (Christopher 1992, Cooper et al.,1997 and Fisher, 1997). Researchers have also used it to describe strategic, inter organizational issues (Cox, 1997, Harland et al., 1999), to discuss an alternative organizational form to vertical integration (Thorelli ,1986 Hakansson and Snehota, 1995), to identify and describe the relationship a company develops with its suppliers (Helper, 1991and Hines, 1994, Narus and Anderson, 1995), and to address the purchasing and supply perspective (Morgan and Monczka, 1996 and Farmer, 1997).

Supply Chain Management is a reverse of prior practices where manufacturers supplied product to customers. Now customers tell suppliers how and when they want their inventory delivered. The driver behind Supply Chain Management is to remove inefficiencies, excess costs and excess inventories from the supply pipeline which extends from the customer back through his suppliers and through his suppliers' suppliers and so on back. By having the program driven by the customer, it is hoped that inventories, caused by uncertainties and slow response, will be significantly eliminated. While there are sales

incentives to major suppliers with the carrot of category management or similar programs, the success of supply chain management rests with logistics.

Functional areas of Logistics:

1. Network Design
2. Information Technology
3. Transportation
4. Inventory and Storage
5. Warehousing
6. Materials Handling, Loading and unloading
7. Packaging and Re-packaging

It should be noted that supply chain management has both "hard" (i.e., technical) and "soft" (i.e., people) aspects, reflecting the fact that the field is at the intersection of many disciplines, such as marketing, procurement, management, operations research, logistics, and so on. It might be supposed that social network analysis – originating as it does in social psychology – would have its greatest and most natural application on the soft side of SCM, helping to understand how patterns of personal relationships translate to competitive advantage through diffusion of information, social control of opportunism, coordination and aid and so on (Stephen P. and Xunli, 2009). The initial benefits of supply chain management accrue to the customer, the initiator of his supply chain. He earns the reduction in inventories by driving out excesses inventories which he must purchase, store and be responsible for. The impact of supply chain management to the supplier may be more difficult to classify, initially, as benefits. They may vary, but may include:

- Fewer orders initially while the customer draws down excess inventories.
- Small and more frequent orders.
- Vendor carries inventory, not the customer.

- Higher warehousing costs for picking smaller and more orders.
- Higher freight costs for shipping smaller order and more orders.
- Penalties for not meeting the customer's requirements.
- Possible loss of business for not meeting the customer's requirements.

Suppliers play a crucial role because they help Indian firms to improve supply chain cost, responsiveness, reliability and its competitiveness. Therefore, management of sourcing in terms of Supply Risks (i.e., delays in receipt of the material; or mismatch in quantity supplied; or material being of inferior quality or damaged; or the alteration in commercial terms delaying the supply) is very crucial. A solution to this problem is to manage supply delays by managing the supply risks. Supply Risk is defined as, “The potential occurrence of an incident associated with inbound supply from individual supplier failures or the supply market, in which its outcome results in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety”. This means non-availability of the required material at the required time in spite of the order being placed for input materials on time and delivery date / quantity / cost are agreed with the supplier well in advance as per the agreed norms. If a company has one hundred customers, he may have one hundred customer practices. This is the most challenging job for SCM to keep all the customers satisfied rather delighted. Emphasis is presently on the initial customer-supplier link. (Ketkar and Vaidya, 2012) The effects ripple through the supply chain, it is more like a "whisper down the lane" impact, where suppliers are not clear as to their role and what they must do. Customers want more quality, design, innovation, choice, convenience and service, and they want to spend less money, effort, time and risk. The supply chain of a company consists of different departments, ranging from procurement of materials to customer service. Supply Chain Management means transforming a company’s “supply chain” into an optimally efficient, customer-satisfying process, where the effectiveness of the whole supply chain is more

important than effectiveness of each individual department. Previously manufacturers were the drivers of the supply chain - managing the pace at which products were manufactured and distributed. Today, customers are calling the shots, and manufacturers are scrambling to meet customer demands for options/styles/ features, quick order fulfillment, and fast delivery. Manufacturing quality – a long-time competitive differentiator - is approaching parity across the board, so meeting customer's specific demands for product delivery has emerged as the next critical opportunity for competitive advantage. Companies that learn how to improve management of their supply chain will become the new success stories in the global market place. Study on Benchmarking shows significant cost differences between organizations that exhibit best-in class performance and those with average performance. Traditionally, Supply Chain Management (SCM) has been a melting pot of various aspects, with influences from logistics and transportation, operations management and materials and distribution management, marketing, as well as purchasing and information technology (IT). Ideally, the alley compassing philosophy of SCM embraces each of these functions to produce an overall supply chain strategy that ultimately enhances firm performance (Croom et al., 2000 and Wisner and Tan, 2000). In actuality, the literature is still very fragmented and although several studies purport to discuss supply chain issues, most of the existing research only examines one link of the chain, or most importantly only focuses on one ingredient in the supply chain performance mix. 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 These phases are given in Table 1. The six-stage evolutionary era depicts that in a particular era which strategy was emphasized. For instance, in the sixth era information Technology was given priority and IT enabled supply chain was the burning issue.

1.5.1Value Chain Management (VCM)

Definition:

Value chain management (VCM) is a strategic business analysis tool used for the seamless integration and collaboration of value chain components and resources. VCM focuses on minimizing resources and accessing value at each chain level, resulting in optimal process integration, decreased inventories, better products and enhanced customer satisfaction.

VCM was introduced in the mid-1980s by Michael Porter, a business strategy authority and longtime Harvard Business School professor. VCM has evolved into a universally applied business management strategy, and is a powerful strategic planning tool that extends from organizations to distribution and supply networks.

VCM requires the following components:

- Integrated chain strategy, planning and scheduling
- An efficient supply chains
- Full and interdependent chain resource management and optimization
- Integrated customer insight data and information

Value Chain Management:

Value chain management is also concerned with the flow of goods to consumers, but takes a different approach. You might say it's the complementary view of the process. The difference between the two is that in supply chain management, the flow is down – from the source to the consumer. In value chain management, the flow is up – from the consumer to the source.

In value chain management, the consumer is seen as the source of value. Consumers create value for manufacturers when they demand products. The

focus is not on the cost of goods, as in supply chain management, but in creating value in the consumer's eyes.

To properly manage the value chain, companies often split operations into primary activities, such as logistics and production, and support activities, such as human resources, marketing and information technology. Creating a profitable value chain requires a connection between what customers value, or want, and what the company produces.

Value chains are strategic, placing heavy focus on:

- Innovation
- Research and Development
- Product Testing
- Marketing
- Social Trend Analysis
- Economic Conditions

Value chain managers are typically responsible for analyzing issues and opportunities, and providing insight in order to maximize value created for a business. They may use supply modeling to explore options and mitigate shortages. Other duties might include preparing product plans, or collaborating with customer service and marketing departments on activities that add value to the consumer.

1.5.2 Customers relations management:

What is CRM? CRM stands for Customer Relationship Management and was first coined in the 1990s. The literal and original meaning of the expression "Customer Relationship Management" was, simply, managing the relationship with your customer.

Today it is used to describe IT systems and software designed to help you manage this relationship.

Importance of CRM:

Customer Relationship management is the strongest and the most efficient approach in maintaining and creating relationships with customers. Customer relationship management is not only pure business but also ideate strong personal bonding within people. Development of this type of bonding drives the business to new levels of success.

Once this personal and emotional linkage is built, it is very easy for any organization to identify the actual needs of customer and help them to serve them in a better way. It is a belief that more the sophisticated strategies involved in implementing the customer relationship management, the more strong and fruitful is the business. Most of the organizations have dedicated world class tools for maintaining CRM systems into their workplace. Some of the efficient tools used in most of the renowned organization are Batch Book, Salesforce, Buzz stream, Sugar CRM etc. Looking at some broader perspectives given as below we can easily determine why a CRM System is always important for an organization.

1. A CRM system consists of a historical view and analysis of all the acquired or to be acquired customers. This helps in reduced searching and correlating customers and to foresee customer needs effectively and increase business.
2. CRM contains each and every bit of details of a customer, hence it is very easy for track a customer accordingly and can be used to determine which customer can be profitable and which not.
3. In CRM system, customers are grouped according to different aspects according to the type of business they do or according to physical location and are allocated to different customer managers often called as account managers. This helps in focusing and concentrating on each and every customer separately.

4. A CRM system is not only used to deal with the existing customers but is also useful in acquiring new customers. The process first starts with identifying a customer and maintaining all the corresponding details into the CRM system which is also called an 'Opportunity of Business'. The Sales and Field representatives then try getting business out of these customers by sophistically following up with them and converting them into a winning deal. All this is very easily and efficiently done by an integrated CRM system.
5. The strongest aspect of Customer Relationship Management is that it is very cost-effective. The advantage of decently implemented CRM system is that there is very less need of paper and manual work which requires lesser staff to manage and lesser resources to deal with. The technologies used in implementing a CRM system are also very cheap and smooth as compared to the traditional way of business.
6. All the details in CRM system is kept centralized which is available anytime on fingertips. This reduces the process time and increases productivity.
7. Efficiently dealing with all the customers and providing them what they actually need increases the customer satisfaction. This increases the chance of getting more business which ultimately enhances turnover and profit.
8. If the customer is satisfied they will always be loyal to you and will remain in business forever resulting in increasing customer base and ultimately enhancing net growth of business.

In today's commercial world, practice of dealing with existing customers and thriving business by getting more customers into loop is predominant and is mere a dilemma. Installing a CRM system can definitely improve the situation and help in challenging the new ways of marketing and business in an efficient manner. Hence in the era of business every organization should be recommended to have a full-fledged CRM system to cope up with all the business needs.

UNIT – II

Unit II

Customers focus in SCM demand planning. Purchase planning – make or buy decisions – Indigenous and global sourcing – Development and Management of suppliers – legal aspects of buying – cost Management Negotiating for purchasing, subscontracting – purchase insurance – Evaluation of purchase performance (Performance indices) inventory management – Financial impact of inventory.

2.1.1Demand planning:

Demand planning is a multi-step operational supply chain management (SCM) process used to create reliable forecasts. Effective demand planning can guide users to improve the accuracy of revenue forecasts, align inventory levels with peaks and troughs in demand, and enhance profitability for a given channel or product.

The approach begins with a statistical forecast. Data sources for the forecast include planned sales orders, customer contracts and intercompany standing orders. The final forecast is shared with key stakeholders, such as suppliers.

Key steps in demand planning include:

- Importing historical sales data
- Creating statistical forecasts
- Importing customer forecasts
- Collaborating with customers
- Managing forecasts
- Building consensus forecasts
- Supply and demand collaboration
- Securing constrained forecasts

- Confirmation with customers
- Reexamining data and adjusting planning accordingly.

The success of a supply chain is often linked to its efficiency, which can be traced back to the ability of managers to conduct accurate forecasting when it comes revenue and inventory. Those two facets of a business are tied to a crucial process in the world of supply chain: demand planning.

Demand planning uses analytics that examine historical sales data, customer orders, shipments, current sales and market indicators to better predict demand patterns based on market changes, enabling firms to make smart decisions about inventory and production levels.

Good demand planning is highly accurate, based on data and enhances profitability. But the process can be tedious, time consuming and easy to mess up. One area of a supply chain, such as procurement, may improve its ability to forecast future demand, but logistics and manufacturing may lag behind, leading to higher levels of inventory and escalating costs. Getting each player in the supply chain on board with demand planning is often difficult, but it's far from the only hurdle. Examining the correct data is one of the biggest challenges, as the information must be run through a number of filters, such as high variance in the last six months, frequent zero demand periods, month-over-month demand history, frequent shortages and statistical forecasts.

Without proper demand planning, supply chains wind up dealing with production delays, inventory surpluses and strained relationships across the various disciplines that make up an organization. Avoiding such problems would call for professionals that possess two important skill sets:

- Applying the data to the company's business model

- Communicating what the data means to departments across a given company, such as marketing, sales, executive teams, distribution or manufacturing

A common way to achieve collaboration across functions is through the implementation of a centralized demand planner for all groups to report their respective data. The challenge for this centralized cross-functional analytics group is to understand the needs of the various departments and how consumer behaviors drive demand.

Modern supply chains are global and complex, often comprised of regional teams relaying information to demand planners and teams at the corporate level that are also gathering data from a global perspective. The two have to work together in order to plan globally while executing regionally.

How to See into the Future

Traditionally, supply chains are more reactive than proactive. In today's market, the ability of your supply chain to adapt to demand changes is more complicated than responding to latent order data. The reactive model does not work for demand volatility, which is on the rise in the current market. Consumers' wants and needs shift faster in the modern marketplace and supply chains that cannot shift with them will struggle to survive.

Successful supply chains are able to adapt by eliminating bias and building systems that can sense and respond to demand volatility. Such a system needs to be designed from the outside-in and include sensing channel demand, using optimization to actively shape demand and applying advanced analytics to drive an intelligent response, according to Lora Cecere, founder and CEO of Supply Chain Insights.

Some of the important to-dos in overhauling the demand planning process.

- Get the right software – There are a plethora of options when it comes to enterprise resource planning (ERP) systems, but choosing the right one can be tricky. In looking at

ERP software, it's important to examine the ability of the tool to handle forecasting nuances as well as the provider's reputation, reporting capabilities, and the transparency and reliability of the forecasts it produces.

- Track the right metrics and use the right data – Metrics need to reduce error and paint a clearer picture, while data needs to simply identify areas where improvement is needed and drive accountability.
- Define process models – Lacking a defined process for a demand planning cycle leads to chaos. Confusing process with information that is simply a set of widely known facts around an organization is all too common, making it difficult to hold anyone accountable and thus hurting overall performance. For most top supply chain companies, the demand planning process goes something like: preparation of data, initial forecasting, incorporation of market intelligence, meet with sales and finance teams to reconcile bottom-up forecasts with top-down finances and sales forecasts, refine a final forecast and finally, performance monitoring.
- Careful implementation – Successful demand planners usually design a pilot version of the plan using historical data as a basis. They also make regular adjustments and have a team of people dedicated solely to the devising the plan, implementing it, reducing error and bias, and designing processes for execution.

2.1.2 Purchase planning:

For complex purchases, the purchasing organization, guided by the purchase team, usually prepares the plan. Plans are developed when the purchasing organization becomes aware of a customer's requirement, or receives a purchase request, statement of work, or other information sufficient to begin the planning process.

Basics of Purchase Planning:

Purchase planning for a wholesale distribution operation is a critical issue. Since purchasing is linked directly to stocking levels, it can mean the difference between profit and loss. In wholesale distribution, stock is sold at a unit cost very close to the purchase price, so overstocking will immediately have a negative effect on profits.

When purchasing, order points are critical: it is essential to order enough stock with each order to reduce carriage costs and take advantage of bulk discounts, but over-ordering can result in overstocking, so a balance should be struck to maximize profits. Purchasing managers need to consider whether to take a reactive or proactive approach to purchase planning by weighing the different advantages and disadvantages of each.

A reactive approach to purchasing, such as a "just in time" (JIT) approach, means that the business only purchases stock as and when needed. This approach reduces working capital tied up in stock. However, delays by suppliers may result in stock outages and reduced customer confidence, leading to reduced sales and revenue. A proactive approach to procurement means that there is always enough stock to meet demand, but stock must be managed effectively to avoid overstocking. In practice, elements of both approaches are used to produce a strategy that serves both customer and business needs effectively.

Importance of Purchase Planning

Effective purchase planning is essential to furthering the business and competitive interests of the Postal Service. As such, it requires the coordination and cooperation of a number of organizations and must address a number of topics. As stated in 2.1.2, early involvement among all of the stakeholders often proves critical to successful planning and successful purchasing. The extent of the planning will depend on the nature of the purchase and its effect on the business and competitive objectives of the Postal Service. The success of major purchases, which are those with the potential to impact these objectives, should be

planned for by a purchase team that fully reflects the strategic importance of the purchase, and should involve the team's use of a wide range of supply chain business practices (such as strategic sourcing, demand analysis, prequalification, supplier selection strategy, and resource planning). The success of other purchases will not require the same level of investment, but will require some degree of planning. In all cases, the effectiveness of the purchase planning will directly affect the success of the purchase.

Preliminary Planning

Organizations normally plan their purchasing needs during the budget process. Because purchase planning should involve everyone with a stake in the outcome, coordination between internal postal business partners should begin as early as possible. Planning for high-dollar purchases should begin in the concept-development phase and consider best value in relation to business strategy and total cost of ownership. The goal of this preliminary planning is to define the Postal Service requirement to be purchased.

Purchase Planning

Purchase planning is the process of establishing objectives and tactics to obtain the best value in a specific purchase. It is done by a purchase team made up of the Postal Service business partners with an interest in the purchase, including the organization requesting the purchase, the purchasing organization, and other organizations needed to help determine best value. The contracting officer responsible for the purchase is the business leader of the purchase team, and it is his or her responsibility to ensure that the team concentrates on purchase planning as part of an overall business strategy. As business leader, the contracting officer should also ensure that the team takes advantage of the most effective supply chain management business practices for a given purchase. Customer satisfaction and business

success should be the primary focus of purchase planning as they will ultimately define best value in a purchase.

Purchase team members have specific roles in purchase planning.

1. The organization requesting the purchase:
   (a) Determines the supply or service required.
   (b) Helps to identify potential suppliers.
   (c) Ensures that funds are available and authorized.
   (d) Provides a purchase description.
   (e) Prepares a price or cost estimate.
   (f) Defines the period of performance or delivery.
   (g) Establishes any supplier reporting requirements.
   (h) Assists in developing the supplier-selection strategy and the proposal-specific performance evaluation factors.
2. The purchasing organization:
   (a) Through the contracting officer, serves as business leader of the purchase team.
   (b) Gathers and analyzes relevant spend and demand data to identify opportunities for strategic sourcing and consolidated purchases.
   (c) Provides advice and assistance.
   (d) Identifies new or competitive sources, including small, minority, and woman-owned businesses and, when appropriate, ensures that enough suppliers are available to ensure adequate competition.
   (e) Prequalifies suppliers and maintains source lists.
   (f) Maintains and applies cost and pricing models to optimize total cost of ownership.

3. For many purchases, the materials organization may provide specific expertise, including:

   (a) Transportation planning, including FOB origin/destination price evaluation.

   (b) Identifying the total cost of ownership related to logistics activities (movement, storage, redistribution, and disposal).

   (c) Providing alternatives and recommendations for the ordering and delivery of supplies and services.

   (d) Develops a freight transportation plan which considers alternatives and recommendations.

4. The purchase team may include other members whose specialized support (for example, legal or technical) will ensure that business considerations outside the purchasing process are included (for example, maintenance or training).

Fig No:4 Purchase Planning

2.2 'Make-Or-Buy Decision'

A make-or-buy decision is the act of choosing between manufacturing a product in-house or purchasing it from an external supplier.

In a make-or-buy decision, the most important factors to consider are part of quantitative analysis, such as the associated costs of production and whether the business has the capacity to produce at required levels.

'Make-Or-Buy Decision'

Also referred to as the outsourcing decision, the make-or-buy decision compares the costs and benefits associated with producing a necessary good or service internally to the costs and benefits involved in hiring an outside supplier for the resources in question. To compare costs accurately, all aspects regarding the acquisition and storage of the items must be considered.

Make Costs:

In regards to in-house production, a business must include expenses related to the purchase and maintenance of any production equipment as well as the cost of production materials. Further costs can include the additional labor required to produce the items, storage requirements within the facility or if additional storage space must be purchased, and the proper disposal of any remnants or byproducts from the production process.

Buy Costs:

Costs relating to purchasing the products from an outside source must include the price of the good itself, any shipping or importing fees, and applicable sales tax charges. Additionally, the expenses relating to the storage of the incoming product and labor costs associated with receiving the products into inventory must be factored into the decision.

Decision-Making Points:

The results of the quantitative analysis may be sufficient to make a determination based on the approach that is more cost-effective. At times, qualitative analysis addresses any concerns that cannot be measured specifically.

Factors that may influence a firm's decision to buy a part rather than produce it internally include a lack of in-house expertise, small volume requirements, a desire for multiple sourcing and the fact that the item may not be critical to the firm's strategy. Additional consideration may be given if the firm has the opportunity to work with a company that has previously provided outsourced services successfully in the past and can sustain a long-term relationship.

Similarly, factors that may tilt a firm towards making an item in-house include existing idle production capacity, better quality control or proprietary technology that needs to be protected. Concerns regarding the reliability of the supplier may also be considered, especially if the product in question is critical to normal business operations. The firm should also consider whether the supplier can offer a long-term arrangement, if that is desired.

Make or buy decision is always a valid concept in business. No organization should attempt to make something by their own, when they stand the opportunity to buy the same for much less price.

This is why most of the electronic items manufactured and software systems developed in the Asia, on behalf of the organizations in the USA and Europe.

Four Numbers You Should Know

When you are supposed to make a make-or-buy decision, there are four numbers you need to be aware of. Your decision will be based on the values of these four numbers. Let's have a look at the numbers now. They are quite self-explanatory.

- The volume
- The fixed cost of making
- Per-unit direct cost when making
- Per-unit cost when buying

Now, there are two formulas that use the above numbers. They are 'Cost to Buy' and 'Cost to Make'. The higher value loses and the decision maker can go ahead with the less costly solution.

Cost to Buy(CTB)=Volume x Per-unit cost when buying

Cost to Make(CTM)=Fixed costs +(Per-unit direct cost x volume)

Reasons for Making

There are number of reasons a company would consider when it comes to making in-house. Following are a few:

- Cost concerns
- Desire to expand the manufacturing focus
- Need of direct control over the product
- Intellectual property concerns
- Quality control concerns
- Supplier unreliability
- Lack of competent suppliers
- Volume too small to get a supplier attracted
- Reduction of logistic costs (shipping etc.)
- To maintain a backup source
- Political and environment reasons
- Organizational pride

Reasons for Buying:

Following are some of the reasons companies may consider when it comes to buying from a supplier:

- Lack of technical experience

- Supplier's expertise on the technical areas and the domain
- Cost considerations
- Need of small volume
- Insufficient capacity to produce in-house
- Brand preferences
- Strategic partnerships

Process:

The make or buy decision can be in many scales. If the decision is small in nature and has less impact on the business, then even one person can make the decision. The person can consider the pros and cons between making and buying and finally arrive at a decision.

When it comes to larger and high impact decisions, usually organizations follow a standard method to arrive at a decision. This method can be divided into four main stages as below.

1.Preparation

- Team creation and appointment of the team leader
- Identifying the product requirements and analysis
- Team briefing and aspect/area destitution

2.Data Collection

- Collecting information on various aspects of make-or-buy decision
- Workshops on weightings, ratings, and cost for both make-or-buy

3.Data Analysis

- Analysis of data gathered

4. Feedback

- Feedback on the decision made

By following the above structured process, the organization can make an informed decision on make-or-buy. Although this is a standard process for making the make-or-buy decision, the organizations can have their own varieties.

Conclusion:

Make-or-buy decision is one of the key techniques for management practice. Due to the global outsourcing, make-or-buy decision making has become popular and frequent. Since the manufacturing and services industries have been diversified across the globe, there are a number of suppliers offering products and services for a fraction of the original price. This has enhanced the global product and service markets by giving the consumer the eventual advantage.

If you make a make-or-buy decision that can create a high impact, always use a process for doing that. When such a process is followed, the activities are transparent and the decisions are made for the best interest of the company.

2.3.1 Indigenous:

Indigenous means Originating or occurring naturally in a particular place.

2.3.2 Global sourcing:

Global sourcing is the practice of sourcing from the global market for goods and services across geopolitical boundaries. Global sourcing often aims to exploit global efficiencies in the delivery of a product or service. These efficiencies include low cost skilled labor, low cost raw material and other economic factors like tax breaks and low trade tariffs. A large number of Information Technology projects and Services, including IS Applications and Mobile Apps and database services are outsourced globally to countries like Pakistan and India for more economical pricing.

Common examples of globally sourced products or services include: labor-intensive manufactured products produced using low-cost Chinese labor, call centers staffed with low-cost English speaking workers in the Philippines and Pakistan and India, and IT work performed by low-cost programmers in India and Pakistan and Eastern Europe. While these examples are examples of Low-cost country sourcing, global sourcing is not limited to low-cost countries.

Majority of companies today strive to harness the potential of global sourcing in reducing cost. Hence it is commonly found that global sourcing initiatives and programs form an integral part of the strategic sourcing plan and procurement strategy of many multinational companies.

Global sourcing is often associated with a centralized procurement strategy for a multinational, wherein a central buying organization seeks economies of scale through corporate-wide standardization and benchmarking. A definition focused on this aspect of global sourcing is: "proactively integrating and coordinating common items and materials, processes, designs, technologies, and suppliers across worldwide purchasing, engineering, and operating locations

The global sourcing of goods and services has advantages and disadvantages that can go beyond low cost. Some advantages of global sourcing, beyond low cost, include: learning how to do business in a potential market, tapping into skills or resources unavailable domestically, developing alternate supplier/vendor sources to stimulate competition, and increasing total supply capacity. Some key disadvantages of global sourcing can include: hidden costs associated with different cultures and time zones, exposure to financial and political risks in countries with (often) emerging economies, increased risk of the loss of intellectual property, and increased monitoring costs relative to domestic supply. For

manufactured goods, some key disadvantages include long lead times, the risk of port shutdowns interrupting supply, and the difficulty of monitoring product quality.

International procurement organizations (or IPOs) may be an element of the global sourcing strategy for a firm. These procurement organizations take primary responsibility for identifying and developing key suppliers across sourcing categories and help satisfy periodic sourcing requirements of the parent organization. Such setups help provide focus in country-based sourcing efforts. Particularly in the case of large and complex countries, such as China, where a range of sub-markets exist and suppliers span the entire value chain of a product/commodity, such IPOs provide essential on-the-ground information.

Over time, these IPOs may grow up to be complete procurement organizations in their own right, with fully engaged category experts and quality assurance teams. It is therefore important for firms to clearly define an integration and scale-up plan for the IPO.

Global product sourcing refers to a procurement strategy through which an enterprise works to identify the most cost-effective location for product manufacturing, even if that location may be in a foreign country.

For instance, a cement manufacturing company may find that the costs of raw materials and manufacturing are lower in some foreign country because manpower is cheaper there. The company would therefore opt to shut down its domestic operations and set up a plant in that foreign country.

The general sourcing process can be divided into the following 5 stages, explained below.

Stage 1: Preliminary Research – Investigation and Tendering

At this stage, the enterprise identifies the core and non-core operational activities, analyzes customer and market requirements and identifies competitors. The idea is to develop the firm's business objectives, prospective markets and brand positioning.

The strategic sourcing scope is also outlined through a business plan developed by the executive and the sourcing specialist, and the preliminary work strategy and baseline for measuring performance is established and documented as a procurement process plan.

Stage 2: Market and Supplier Evaluation

At this stage, the enterprise develops a detailed list of suppliers selection benchmarks, which is used to select the most appropriate suppliers that fit the requirements. Based on the findings of the process, the sourcing strategy may be tweaked further and a final costing model is released. The operational and economic benefits of the project will then be estimated. RFIs will then be sent out to the shortlisted suppliers.

Stage 3: Selection of the Supplier (Sourcing Event)

Based on the results of the RFI dispatch, a final list of suppliers is selected and negotiation for products is carried out, culminating in a supply agreement. Technical assessment of final supply candidates is conducted to come up with the savings estimates for each. Finally, an implementation schedule outlining timeline for various suppliers is developed.

Stage 4: Implementation

A performance analysis schedule should be developed, outlining all activities in the implementation process. The implementation team should be constituted by the procurement agent and the schedule and strategy should be published. Agreements related to shared supply, resources and logistical arrangements are developed.

At this stage, expected internal and external results from the suppliers should be documented. Periodic measurement and reporting of actual performance should be carried out.

Stage 5: Performance Monitoring

Performance of suppliers is measured, both independently and in relation to the resources and processes applied by supply partners. This should be carried out routinely and reported accordingly. In-depth evaluation of the efficacy of collaborative efforts with each supplier is obtained, and the partners involved continuously isolate problems and find out ways these can be solved for improved performance.

The objective of performance monitoring is to maintain the most efficient procurement process, one that is flexible and dynamic, easily adapting to a changing market environment. A Good Global Sourcing Strategy Addresses:

- **Cost** – the main purpose of product sourcing strategy is to take advantage of lower labor costs in foreign countries. However, the procuring organization will face additional costs that don't factor into domestic transactional costs. These include broker fees, freight charges, taxes called, insurance, duties and bank fees.
- **Laws** – the sourcing specialist together with the supplier should consider what body of law shall be applied to their contractual agreement, i.e., the buyer's country's law, the supplier's country's law or the law applicable through a signed treaty between the 2 countries.
- **Currency** – some buyers may insist on transactions in their own currency for the sake of simplicity. However, a prudent buyer will consider the possibility of using the supplier's currency where the buying country's currency may become stronger in the period between agreement and supply and eventual payment.
- **Lead time** – global purchases have a significantly longer lead time than domestic sources. The reason is that overseas travel is slower, unless air travel is used. In addition, there is time taken in the custom clearance process, which does not apply for domestic sources.

- **Culture and language** – where the procurement agent is unfamiliar with the culture and language of the supplier, the risks of misunderstanding, miscommunication and offensive/awkward encounters significantly increases.
- **Transportation** – whereas domestic sourcing necessitates the use of a single mode of transportation, global sourcing frequently includes multiple modes of transport, e.g., combining air or water transportation with road transport to bring goods from the supplier to the supplier's port, to your own port and finally to your place of business.
- **Methods of payment** – in global sourcing, a letter of credit is used for payment, which necessitates the cooperation of the banks of the supplier and buyer.

2.4 Development and management of suppliers

Supplier development

Supplier development is the process of working with certain suppliers on a one-to-one basis to improve their performance for the benefit of the buying organization.

Supplier development (SD) is a kind of collaboration among a buyer and a supplier to seek constant improvement in supplier performance and capabilities to provide better quality, on-time delivery of products and services at lower cost.

What Is Supplier Development?

Supplier development is defined by the Chartered Institute of Procurement & Supply as "the process of working with certain suppliers on a one-to-one basis to improve their performance and expand capabilities for the benefit of the buying organization." Supplier development can come in many different forms, from informal initiatives to a formally structured program. There are numerous examples, use cases, and best practices that show a broad spectrum of supplier development initiatives to fit any size organization or supplier diversity program. In reality, most supplier diversity programs already have some

form of supplier development activities occurring within their procurement organizations. As supplier diversity and procurement professionals interact with diverse suppliers, they are often teaching, guiding, and offering mentoring and development as well as other resources to help foster growth. The idea of supplier development is to help diverse suppliers become more sustainable in service to corporations and the marketplace as a whole.

Why Invest in a Supplier Development Program?

The supplier diversity industry offers many success stories of why investing in supplier development is essential for supplier diversity programs. Through focusing on supplier development, organizations are able to generate many mutually beneficial opportunities, including:

- Expanding the competitive landscape (pricing, service levels, and offerings) between the organization's existing and potential vendors
- Promoting innovation and "out-of-the-box" thought leadership through the entrance of new products, services, and solutions in the business
- Growing the sources and channels from which to procure products and services
- Creating a collaborative environment between suppliers that may see themselves as competitors, when in fact their solutions may be complementary, allowing them to team up on business opportunities on which they could not normally bid
- Showcasing the organization's commitment to the economic growth of the communities in which they operate
- Driving job creation
- Building the capacity of diverse businesses to not only serve the organization more effectively but also increasing their sustainability in the entire marketplace
- Increasing the organization's customer satisfaction, whether it be B2B or B2C

- Integrating supplier diversity into the strategic sourcing process, which will drive corporate-supplier-diversity goal achievement
- Increasing visibility and awareness of executive management to key diverse suppliers
- Fostering engagement of management executives across all parts of the organization, not just Procurement

Supplier development affords corporations an opportunity to bring together teams of suppliers to work in harmony for the benefit of the company, improving the bottom line in the long run. Additionally, these approaches can showcase the organization's commitment to the economic growth of local communities, while building the capacity of diverse businesses to serve the organization more effectively.

Ultimately, supplier development in conjunction with a robust diversity initiative makes good business sense. A company committed to both efforts builds for the future and, perhaps most importantly, becomes a better, stronger company that consumers, workers, and business leaders will seek out and admire.

2.5 Buying a business legal aspects and considerations

Buying a business Legal Aspects and Considerations purchasing an on-going business is an excellent opportunity for an entrepreneur seeking the financial and personal rewards of owning and operating a business. Buying vs. Starting a Business. A chief advantage of purchasing a business (as opposed to starting one "from scratch") is the opportunity to acquire goodwill. In essence, goodwill consists of a business' reputation, patronage and other intangible assets. Typically, a successful business develops these attributes over a period of time. Thus, the buyer can benefit by acquiring a company with some level of "ready-made" business. However, disadvantages of buying an on-going business include: (a) the price "premium" sought by the seller for the additional value associated with goodwill, (b) a greater potential for "hidden" or unknown risks, liabilities and adverse business conditions, and (c)

higher transactional costs (legal, accounting and other professional fees). The following highlights some of the legal aspects and potential pitfalls of various stages of the business purchase process.

Preliminary Negotiations:

The early stages of any business acquisition will entail some preliminary negotiations between the proposed buyer and seller. It is this stage where the parties will begin to explore the broad issues and characteristics of the transaction such as price, payment terms, and the legal structure of the sale (e.g. stock sale, asset sale, etc.). The parties typically converse and may exchange correspondence as well as other informal documents. It is here where the parties may unwittingly encounter their first legal land mine. There is a subtle difference between negotiation and words that give rise to a binding contract. Letters of Intent In some cases, a letter of intent (LOI) can facilitate negotiations. LOIs is often misunderstood and can represent significant legal risks. Many times, people wrongly view LOIs as documents that are "somewhat binding." LOIs can have binding and/or nonbinding provisions- but there is no middle ground. LOIs must be drafted with care. If a purportedly "nonbinding" LOI is sufficiently definite as to the essential terms and demonstrates intent to be bound, courts may construe it as a binding contract, despite the document being labeled "Letter of Intent." Primary and Ancillary Transaction Documents A business sale/purchase may be structured in numerous ways. Popular structures include the stock sale, asset sale and merger. The legal structure of the transaction will determine the type of primary transaction contract that creates the legal obligation to transfer ownership of the business in accordance with the stated terms and conditions- for example, Stock Purchase and Sale Agreement, Asset Purchase and Sale Agreement or Merger Agreement. Depending on the nature of the transaction, a variety of other agreements, contracts, documents and instruments may be required- for example, loan agreements and promissory notes, employment/consulting agreements, stock pledges,

security agreements and financing statements, personal guarantees, assignments, bills of sale, "corporate" consents, resolutions and authorizations, deeds, leases and restrictive covenants. The parties should delineate the scope of, and time for, due diligence and establish contingencies based upon the discovery of negative conditions as well as the parties' respective opportunities to cure same. Admittedly, due diligence is time consuming and will increase short-term transactional costs. Thus, the "appropriate" amount of due diligence may be determined by evaluating the nature of the business being sold, the dollar amount and complexity of the transaction, as well as the parties' risk tolerance. In addition, the parties may reduce and allocate the risk of a transaction through appropriate contractual language.

Purchasing a business implicates important commercial and legal issues. Entrepreneurs will be well served by obtaining professional advice regarding such transactions. Please contact the author if you wish to discuss this article or his practice areas.

2.6.1 Cost management negotiating for purchasing

Negotiation in the purchasing process covers the period from when the first communication is made between the purchasing buyer and the supplier through to the final signing of the contract. Negotiation can be as simple as trying to obtain a discount on a case of safety gloves through to the complexities of major capital purchases. A purchasing professional must aim to be successful in their negotiations with suppliers to obtain the best price with the best conditions for every item that is purchased.

Smaller Supplier Base and Long-Term Contracts:

The negotiation process has become a more important sector in the supply chain process as companies look to reduce their expenditure whilst increasing their purchasing power. This means that purchasing professionals have to negotiate increasingly better rates with suppliers whilst maintaining or increasing quality and service.

In the past, companies had a long list of suppliers who they would purchase different items from which required purchasing resources to spend limited time on negotiating the lowest prices. The best solution available was to compare list prices from catalogs and select the vendor based on that information. The trend over the last decade has been to rationalize the supplier base and enter into long-term agreements with single-sourcing. This offers companies the ability to negotiate significantly lower prices for items that they were purchasing from a number of separate vendors.

Vendors Are Partners:

The emphasis in negotiation moved away from lowest price scenario to negotiating with fewer vendors to obtain the lowest price with the best service, quality, and conditions. The aim for companies were to reduce overall spends rather than negotiate the lowest price with a large number of vendors, which did not give the best overall result.

The negotiated long-term contracts with a smaller supplier base have produced more of a partner relationship between buyer and supplier. The relationship can become less adversary which benefits buyer and vendor. In a partner type or relationship, the buyer will encourage the vendor to increase quality and service and the vendor knows that by doing this the partnership will continue with a renewed contract with guaranteed sales.

Negotiation or RFQ:

Non-government purchasing departments continue to offer a range of prequalified vendors a request for quotation (RFQ) for items or services that it wishes to purchase. The competitive bid process can produce a range of bids and conditions that the purchasing department will evaluate and then award the business. This may or may not involve some form of negotiation.

Most negotiated business will involve items or services that are not necessarily definable by an RFQ. The purchasing department and the vendor will negotiate more than a price. The negotiation will usually cover what is to be manufactured or what is the extent of the service to be provided, the warranty, the transportation services, technical assistance, packaging alternative, payment plans, etc.

Purchasing items or services of significant cost will require extended negotiations to arrive at a final contract. Purchasing professionals are required to participate in these types of negotiation to ensure their companies obtain the best price with the most favorable terms, and staff may need to be trained in negotiation methods as it becomes more commonplace in a difficult economic climate.

Negotiation Objectives:

Purchasing staff should enter all negotiations with clearly defined objectives. Without having objectives, the possibility for the purchasing professional to concede on price, quality or service is significantly raised. The negotiator should enter into discussions with the vendor with precise objectives that they wish to achieve for their company.

The objective should not be absolute and should allow for some flexibility. However, the negotiator should also ensure that they do not deviate from the objectives and allow themselves to negotiate on areas that were not part of the discussion. For example, a negotiator may have worked with the vendor on their objectives on price and service, but not quality. When the vendor starts to discuss quality, the negotiator should refrain from any agreement where they are without a set objective.

Negotiation is an important part of the role of the purchasing professional. It is a skill that is learned and training can help purchasing staff in understanding what is needed when negotiating with vendors.

2.6.2 SUBCONTRACTING:

Subcontracting is the practice of assigning part of the obligations and tasks under a contract to another party known as a subcontractor. Subcontracting is especially prevalent in areas where complex projects are the norm, such as construction and information technology. Subcontractors are hired by the project's general contractor, who continues to have overall responsibility for project completion and execution within its stipulated parameters and deadlines.

BREAKING DOWN 'Subcontracting'

Subcontracting is very useful in situations where the range of required capabilities for a project is too diverse to be possessed by a single general contractor. In such cases, subcontracting parts of the project that do not form the general contractor's core competencies may assist in keeping costs under control and mitigate overall project risk.

2.7 Purchasing insurance:

Purchasing insurance - overview:

We all have different reasons for purchasing insurance. We also make different decisions about our insurance at different times in our lives. Whatever your reason, you have many options available to help protect your lifestyle and the things you value from the risks that concern you most.

When deciding on a policy it's important to read the fine print, ask lots of questions and find the right policy for your needs. In this section, we'll make buying insurance and understanding your insurance contract easy. Read on for some of the steps you can take when making a decision, ensuring you have enough cover, and how you can identify those things that may require extra attention.

If you buy insurance, you are making a personal decision about how you want to manage your risk if things go wrong. There are a large number of insurers available to consumers and businesses in Australia, which means you, have a wide choice of providers and products. When purchasing insurance, make sure you come prepared with the information you need to get an accurate quote. If you buy insurance, you are making a personal decision about how you want to manage your risk if things go wrong.

There are a large number of insurers available to consumers and businesses in Australia, which means you, have a wide choice of providers and products.

When purchasing insurance, make sure you come prepared with the information you need to get an accurate quote.

Before you purchase a policy

Before you buy an insurance, policy make sure you:

- Consider what things you might wish to insure, and the risks you may face
- Familiarize yourself with the range of products and providers available
- Determine if you are already covered
- Ask questions. When comparing policies, ask insurers about the features you need, and any exclusions or applicable excesses
- Understand the value of the item you are insuring and the financial impact of paying for the loss you are insuring against
- Consider any additional cover you may need
- Check cover limits

2.8.1 Evaluation of purchase performance:

A simple yet effective method of evaluation a business purchasing performance is to assess the savings made by the department as the business grows. The economy of scale

states a larger production should bring savings throughout the production process, including the cost of raw materials and services.

Measuring the performance of the purchasing department is a basic and crucial task for any management team. The purchase of raw materials and equipment is the lifeline of a business, and savings in the cost of raw materials and services can mean the difference between a business making a profit or not. However, you need a systematic approach if you want to efficiently evaluate the purchasing performance of an operation.

True Cost:

Assessing the cost of the products acquired by a purchasing department is the most basic evaluation method available to a manager. However, buying cheaper products is not always a useful measure of performance. If raw materials do not meet quality standards or services do not meet expectations, they are costly to a company whatever their original price. If you calculate the true cost of services and raw materials by assessing related costs, such as returns, higher transportation costs, complaints and liability claims, you will get a more accurate view of your purchasing performance.

Savings:

A simple yet effective method of evaluation a business purchasing performance is to assess the savings made by the department as the business grows. The economy of scale states a larger production should bring savings throughout the production process, including the cost of raw materials and services.

Inventory Flow:

The price you pay for a product is not always a reflection of the performance of a purchasing department. Some raw materials, such as steel and gas, fluctuate due to market forces, which are out of the control of purchasing executives. Another method to evaluate

their efficiency is to measure the turnover rate of your stock. The numbers of times your stock turns over during an evaluation period will help you determine how agile and effective your business is.

Transportation:

Although a purchasing department may not always have control over the price of products, the cost and quality of transportation is something efficient purchasing departments can negotiate with providers. If your assessment shows little or no progress in the quality and savings in transportation despite entering into large contracts with providers, you may want to look closer into your purchasing negotiation methods.

2.8.2 Inventory management:

Inventory management is the supervision of non-capitalized assets (inventory) and stock items. A component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to point of sale. In any business or organization, all functions are interlinked and connected to each other and are often overlapping. Some key aspects like supply chain management, logistics and inventory form the backbone of the business delivery function. Therefore, these functions are extremely important to marketing managers as well as finance controllers.

Inventory management is a very important function that determines the health of the supply chain as well as the impacts the financial health of the balance sheet. Every organization constantly strives to maintain optimum inventory to be able to meet its requirements and avoid over or under inventory that can impact the financial figures.

Inventory is always dynamic. Inventory management requires constant and careful evaluation of external and internal factors and control through planning and review. Most of the organizations have a separate department or job function called inventory planners who

continuously monitor, control and review inventory and interface with production, procurement and finance departments.

Defining Inventory:

Inventory is an idle stock of physical goods that contain economic value, and are held in various forms by an organization in its custody awaiting packing, processing, transformation, use or sale in a future point of time.

Any organization which is into production, trading, sale and service of a product will necessarily hold stock of various physical resources to aid in future consumption and sale. While inventory is a necessary evil of any such business, it may be noted that the organizations hold inventories for various reasons, which include speculative purposes, functional purposes, physical necessities etc.

From the above definition, the following points stand out with reference to inventory:

- All organizations engaged in production or sale of products hold inventory in one form or other.
- Inventory can be in complete state or incomplete state.
- Inventory is held to facilitate future consumption, sale or further processing/value addition.
- All inventoried resources have economic value and can be considered as assets of the organization.

Different Types of Inventory:

Inventory of materials occurs at various stages and departments of an organization. A manufacturing organization holds inventory of raw materials and consumables required for production. It also holds inventory of semi-finished goods at various stages in the plant with various departments. Finished goods inventory is held at plant, FG Stores, distribution centers

etc. Further both raw materials and finished goods those that are in transit at various locations also form a part of inventory depending upon who owns the inventory at the particular juncture. Finished goods inventory is held by the organization at various stocking points or with dealers and stockiest until it reaches the market and end customers.

Besides Raw materials and finished goods, organizations also hold inventories of spare parts to service the products. Defective products, defective parts and scrap also forms a part of inventory as long as these items are inventoried in the books of the company and have economic value.

Inventory management and supply chain management are the backbone of any business operations. With the development of technology and availability of process driven software applications, inventory management has undergone revolutionary changes. In the last decade or so we have seen adaptation of enhanced customer service concept on the part of the manufacturers agreeing to manage and hold inventories at their customers end and thereby affect Just in Time deliveries. Though this concept is the same in essence different industries have named the models differently. Manufacturing companies like computer manufacturing or mobile phone manufacturers call the model by name VMI - Vendor Managed Industry while Automobile industry uses the term JIT - Just in Time whereas apparel industry calls such a model by name - ECR - Efficient consumer response. The basic underlying model of inventory management remains the same.

Let us take the example of DELL, which has manufacturing facilities all over the world. They follow a concept of Build to Order where in the manufacturing or assembly of laptop is done only when the customer places a firm order on the web and confirms payment. Dell buys parts and accessories from various vendors. DELL has taken the initiative to work with third party service providers to set up warehouses adjacent to their plants and manage

the inventories on behalf of DELL's suppliers. The 3PL - third party service provider receives the consignments and holds inventory of parts on behalf of Dell's suppliers.

Types of Inventory by Function

INPUT	**PROCESS**	**OUTPUT**
Raw Materials	Work in Process	Finished Goods
Consumables required for processing. Eg: Fuel, Stationary, Bolts & Nuts etc. required in manufacturing	Semi-Finished Production in various stages, lying with various departments like Production, WIP Stores, QC, Final Assembly, Paint Shop, Packing, Outbound Store etc.	Finished Goods at Distribution Centers throughout Supply Chain
Maintenance Items/Consumables	Production Waste and Scrap	Finished Goods in transit
Packing Materials	Rejections and Defectives	Finished Goods with Stockiest and Dealers
Local purchased Items required for production		Spare Parts Stocks & Bought Out items
		Defectives, Rejects and Sales Returns
		Repaired Stock and Parts
		Sales Promotion & Sample Stocks

Let us look at the benefits of this model for both Dell as well as Its Suppliers:

1. With VMI model, Dell has reduced its inbound supply chain and thereby gets to reduce its logistics and inventory management costs considerably.

2. DELL gets to postpone owning inventory until at the time of actual consumption. Thereby with no inventories DELL has no need for working capital to be invested into holding inventories.
3. DELL does not have to set up inventory operations and employ teams for operations as well as management of inventory functions.

Supplier Benefits:

1. Supplier gets to establish better relationship and collaboration with DELL with long-term business prospect.
2. By agreeing to hold inventories and effect JIT supplies at the door to DELL, supplier will be in a better position to bargain and get more business from DELL.
3. With VMI model, supplier gets an opportunity to engage in better value proposition with his customer DELL.
4. Supplier gets confirmed forecast for the entire year with commitments from DELL for the quantity off take.
5. VMI managed is managed by 3PL and supplier does not have to engage himself in having to set up and manage inventory operations at DELL's premise.
6. 3PL Managed VMI holds inventories of all suppliers thereby charges each supplier on per pallet basis or per sq. ft basis. Supplier thereby gets to pay on transaction basis without having to marry fixed costs of inventory operations.

Today most of the Multi-National companies have successfully managed to get their suppliers and 3PL service providers to setup VMI throughout their plants all over the world and this model has become the order of the day.

Need for inventory management:

Inventory is a necessary evil that every organization would have to maintain for various purposes. Optimum inventory management is the goal of every inventory planner. Over inventory or under inventory both cause financial impact and health of the business as well as effect business opportunities.

Inventory holding is resorted to by organizations as hedge against various external and internal factors, as precaution, as opportunity, as a need and for speculative purposes.

Reasons why organizations maintain Raw Material Inventory:

Most of the organizations have raw material inventory warehouses attached to the production facilities where raw materials, consumables and packing materials are stored and issue for production on JIT basis. The reasons for holding inventories can vary from case to case basis.

1. Meet variation in Production Demand

   Production plan changes in response to the sales, estimates, orders and stocking patterns. Accordingly, the demand for raw material supply for production varies with the product plan in terms of specific SKU as well as batch quantities.

   Holding inventories at a nearby warehouse helps issue the required quantity and item to production just in time.

2. Cater to Cyclical and Seasonal Demand

   Market demand and supplies are seasonal depending upon various factors like seasons; festivals etc and past sales data help companies to anticipate a huge surge of demand in the market well in advance. Accordingly, they stock up raw materials and hold inventories to be able to increase production and rush supplies to the market to meet the increased demand.

3. Economies of Scale in Procurement

   Buying raw materials in larger lot and holding inventory is found to be cheaper for the company than buying frequent small lots. In such cases one buys in bulk and holds inventories at the plant warehouse.

4. Take advantage of Price Increase and Quantity Discounts

   If there is a price increase expected few months down the line due to changes in demand and supply in the national or international market, impact of taxes and budgets etc., the companies tend to buy raw materials in advance and hold stocks as a hedge against increased costs.

   Companies resort to buying in bulk and holding raw material inventories to take advantage of the quantity discounts offered by the supplier. In such cases the savings on account of the discount enjoyed would be substantially higher that of inventory carrying cost.

5. Reduce Transit Cost and Transit Times

   In case of raw materials being imported from a foreign country or from a far away vendor within the country, one can save a lot in terms of transportation cost buy buying in bulk and transporting as a container load or a full truck load. Part shipments can be costlier.

   In terms of transit time too, transit time for full container shipment or a full truck load is direct and faster unlike part shipment load where the freight forwarder waits for other loads to fill the container which can take several weeks.

   There could be a lot of factors resulting in shipping delays and transportation too, which can hamper the supply chain forcing companies to hold safety stock of raw material inventories.

6. Long Lead and High demand items need to be held in Inventory

   Often raw material supplies from vendors have long lead running into several months. Coupled with this if the particular item is in high demand and short supply one can expect disruption of supplies. In such cases it is safer to hold inventories and have control.

Holding inventories help the companies remain independent and free from vendor dependencies.

Finished goods inventory

All Manufacturing and Marketing Companies hold Finished Goods inventories in various locations and all through FG Supply Chain. While finished Goods move through the supply chain from the point of manufacturing until it reaches the end customer, depending upon the sales and delivery model, the inventories may be owned and held by the company or by intermediaries associated with the sales channels such as traders, trading partners, stockiest, distributors and dealers, C & F Agents etc.

Why and when do Organizations hold Finished Goods Inventories?

1. **Markets and Supply Chain Design**

   Organizations carry out detailed analysis of the markets both at national as well as international / global levels and work out the Supply Chain strategy with the help of SCM strategists as to the ideal location for setting up production facilities, the network of and number of warehouses required to reach products to the markets within and outside the country as well as the mode of transportation, inventory holding plan, transit times and order management lead times etc, keeping in mind the most important parameter being, to achieve Customer Satisfaction and Demand Fulfillment.

2. **Production Strategy necessitates Inventory holding**

The blue print of the entire Production strategy is dependent upon the marketing strategy. Accordingly, organizations produce based on marketing orders. The production is planned based on Build to stock or Build to Order strategies.

While Build to Order strategy is manufactured against specific orders and does not warrant holding of stocks other than in transit stocking, Build to Stock production gets inventoried at various central and forward locations to be able to cater to the market demands.

3. **Market penetration**

Marketing departments of companies frequently run branding and sales promotion campaigns to increase brand awareness and demand generation. Aggressive market penetration strategy depends upon ready availability of inventory of all products at nearest warehousing location so that product can be made available at short notice - in terms of number of hours lead time, at all sales locations throughout the state and city. Any non-availability of stock at the point of sale counter will lead to dip in market demand and sales. Hence holding inventories becomes a necessity.

4. **Market Size, location and supply design**

Supply chain design takes into account the location of market, market size, demand pattern and the transit lead time required to reach stocks to the market and determine optimum inventory holding locations and network to be able to hold inventories at national, regional and local levels and achieve two major objectives. The first objective would be to ensure correct product stock is available to service the market. Secondly stocks are held in places where it is required and avoid unwanted stock build up.

5. **Transportation and Physical Barriers**

Market location and the physical terrain of the market coupled with the local trucking and transportation network often demand inventory holding at nearest locations. Hilly regions for example may require longer lead-time to service. All kinds of vehicles may not be available and one may have to hire dedicated containerized vehicles of huge capacities. In such cases the will have to have an inventory holding plan for such markets.

Far away market locations mean longer lead times and transportation delays. Inventory holding policy will take into account these factors to work out the plan.

6. **Local tax and other Govt. Rules**

In many countries where GST is not implemented, regional state tax rules apply and vary from state to state. Accordingly, while one state may offer a tax rebate for a particular set of product category, another state may charge higher local taxes and lower interstate taxes. In such cases the demand for product from the neighboring state may increase than from the local state. Accordingly inventory holding would have to be planned to cater to the market fluctuation.

While in case of exports from the country of origin into another market situated in another country, one needs to take into account the rules regarding import and customs duties to decide optimum inventories to be held en route or at destination.

7. **Production lead times**

FG inventory holding becomes necessary in cases where the lead-time for production is long. Sudden market demand or opportunities in such cases require FG inventories to be built up and supplies to be effected.

8. **Speculative gain**

   Companies always keep a watch on the economy, annual state budget, financial environment and international environment and are able to foresee and estimate situations, which can have an impact on their business and sales.

   In cases where they are able to estimate an increase in industry prices, taxes or other levies which will result in an overall price increase, they tend to buy and hold huge stocks of raw materials at current prices. They also hold up finished stock in warehouses in anticipation of an impending sale price increase. All such moves cause companies to hold inventories at various stages.

9. **Avoid Certain Costs**

   Finally, organizations hold FG inventories to satisfy customer demand, to reduce sales management and ordering costs, stock out costs and reduce transportation costs and lead times.

2.9 Financial impact of inventory:

Inventory procurement, storage and management is associated with huge costs associated with each these functions.

Inventory costs are basically categorized into three headings:

1. Ordering Cost
2. Carrying Cost
3. Shortage or stock out Cost & Cost of Replenishment
    a. Cost of Loss, pilferage, shrinkage and obsolescence etc.
    b. Cost of Logistics
    c. Sales Discounts, Volume discounts and other related costs.

1. Ordering Cost:

Cost of procurement and inbound logistics costs form a part of Ordering Cost. Ordering Cost is dependent and varies based on two factors - The cost of ordering excess and the Cost of ordering too less.

Both these factors move in opposite directions to each other. Ordering excess quantity will result in carrying cost of inventory. Whereas ordering less will result in increase of replenishment cost and ordering costs.

These two above costs together are called Total Stocking Cost. If you plot the order quantity vs the TSC, you will see the graph declining gradually until a certain point after which with every increase in quantity the TSC will proportionately show an increase.

This functional analysis and cost implications form the basis of determining the Inventory Procurement decision by answering the two basic fundamental questions - How Much to Order and When to Order.

How much to order is determined by arriving at the Economic Order Quantity or EOQ.

2. Carrying Cost:

Inventory storage and maintenance involves various types of costs namely:

- Inventory Storage Cost
- Cost of Capital

Inventory carrying involves Inventory storage and management either using in house facilities or external warehouses owned and managed by third party vendors. In both cases, inventory management and process involves extensive use of Building, Material Handling Equipment, IT Software applications and Hardware equipment coupled managed by Operations and Management Staff resources.

I) Inventory Storage Cost:

Inventory storage costs typically include Cost of Building Rental and facility maintenance and related costs. Cost of Material Handling equipment, IT Hardware and applications, including cost of purchase, depreciation or rental or lease as the case may be. Further costs include operational costs, consumables, communication costs and utilities, besides the cost of human resources employed in operations as well as management.

II) Cost of Capital:

Includes the costs of investments, interest on working capital, taxes on inventory paid, insurance costs and other costs associate with legal liabilities.

The inventory storage costs as well as cost of capital independent upon and varies with the decision of the management to manage inventory in house or through outsourced vendors and third-party service providers.

Current times, the trend is increasingly in favor of outsourcing the inventory management to third party service provides. For one thing, the organizations find that managing inventory operations requires certain core competencies, which may not be in line with their business competencies. They would rather outsource to a supplier who has the required competency than build them in house.

Secondly in case of large-scale warehouse operations, the scale of investments may be too huge in terms of cost of building and material handling equipments etc. Besides the project may span over a longer period of several years, thus blocking capital of the company, which can be utilized into more important areas such as R & D, Expansion etc. than by staying invested into the project.

UNIT III

Manufacturing scheduling – manufacturing flow systems – work flow automation – flexibility in manufacturing to achieve dynamic optimization. Material handling system design and decision warehousing, storekeeping – strategies of warehousing and storekeeping space management.

3.1 Manufacturing scheduling

In the manufacturing world, production planning and control features four stages: Routing, Scheduling, Dispatching, and Follow Up. The first two relate to production planning while the second two relate to control. Planning and scheduling are directly associated with time management, a major factor in enhancing shop floor efficiency and the second stage of production planning and control (PPC). Knowing this, let's focus on the scheduling stage specifically and the different methods used to approach it: master production scheduling and manufacturing and operation scheduling.

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process or manufacturing process. Scheduling is used to allocate plant and machinery resources, plan human resources, plan production processes and purchase materials.

It is an important tool for manufacturing and engineering, where it can have a major impact on the productivity of a process. In manufacturing, the purpose of scheduling is to minimize the production time and costs, by telling a production facility when to make, with which staff, and on which equipment. Production scheduling aims to maximize the efficiency of the operation and reduce costs.

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process. Companies use backward and forward scheduling to

allocate plant and machinery resources, plan human resources, plan production processes and purchase materials.

- Forward scheduling is planning the tasks from the date resources become available to determine the shipping date or the due date.
- Backward scheduling is planning the tasks from the due date or required-by date to determine the start date and/or any changes in capacity required.

The benefits of production scheduling include:

- Process change-over reduction
- Inventory reduction, leveling
- Reduced scheduling effort
- Increased production efficiency
- Labor load leveling
- Accurate delivery date quotes
- Real time information

Production scheduling tools greatly outperform older manual scheduling methods. These provide the production scheduler with powerful graphical interfaces which can be used to visually optimize real-time workloads in various stages of production, and pattern recognition allows the software to automatically create scheduling opportunities which might not be apparent without this view into the data. For example, an airline might wish to minimize the number of airport gates required for its aircraft, in order to reduce costs, and scheduling software can allow the planners to see how this can be done, by analyzing time tables, aircraft usage, or the flow of passengers.

Key concepts in scheduling:

A key character of scheduling is the productivity, the relation between quantity of inputs and quantity of output. Key concepts here are:

- Inputs: Inputs are plant, labor, materials, tooling, energy and a clean environment.
- Outputs: Outputs are the products produced in factories either for other factories or for the end buyer. The extent to which any one product is produced within any one factory is governed by transaction cost.
- Output within the factory: The output of any one work area within the factory is an input to the next work area in that factory according to the manufacturing process. For example, the output of cutting is an input to the bending room.
- Output for the next factory: By way of example, the output of a paper mill is an input to a print factory. The output of a petrochemicals plant is an input to an asphalt plant, a cosmetics factory and a plastics factory.
- Output for the end buyer: Factory output goes to the consumer via a service business such as a retailer or an asphalt paving company.
- Resource allocation: Resource allocation is assigning inputs to produce output. The aim is to maximize output with given inputs or to minimize quantity of inputs to produce required output.

Batch production scheduling:

Background:

Batch production scheduling is the practice of planning and scheduling of batch manufacturing processes. See Batch production. Although scheduling may apply to traditionally continuous processes such as refining, it is especially important for batch processes such as those for pharmaceutical active ingredients, biotechnology processes and many specialty chemical processes. Batch production scheduling shares some concepts and

techniques with finite capacity scheduling which has been applied to many manufacturing problems. The specific issues of scheduling batch manufacturing processes have generated considerable industrial and academic interest.

Scheduling in the batch processing environment:

A batch process can be described in terms of a recipe which comprises a bill of materials and operating instructions which describe how to make the product. The ISA S88 batch process control standard provides a framework for describing a batch process recipe. The standard provides a procedural hierarchy for a recipe. A recipe may be organized into a series of unit-procedures or major steps. Unit-procedures are organized into operations, and operations may be further organized into phases.

SCHEDULING:

Scheduling fixes a time and date to each operation and outlines the commencement and completion time-frame for each process. Both subsequent stages of PPC depend on this timeline which makes it a very valuable asset in the production process. Scheduling looks to optimize the use of time; from each piece of work involved to project planning to customer delivery. The goal is to eliminate idle machines and laborers while enhancing efficiency. In order to schedule more efficiently, there are a variety of methodologies planners can apply. Let's discuss two common scheduling processes that planners use in order to enhance their manufacturing schedules:

Master Production Scheduling:

Master Production Scheduling (MPS), otherwise known as an over-all schedule, focuses on a specific time period. It includes a plan for the production of individual commodities such as staffing, inventory, etc for the allotted time period. A MPS usually

dictates when and how much of each product is demanded, in addition to a statement of what they expect to produce and purchase.

MPS aids in decision making by generating a set of output data based on forecast demand, production costs, inventory money, customer needs, production lead time, and capacity. The resulting output information includes the amounts to produce, staffing requirements, quantity of product available to promise, and projected available funds for production.

Manufacturing and Operation Scheduling:

Different from MPS, this type of scheduling focuses around the production of uniform products of the same size, color, and design in mass quantities. Found within a manufacturing process that produces the same products regularly, manufacturing and operation scheduling is easily prepared for manufacturers that fit the above criteria. However, the system flounders where variables arise in production and there are multiple permutations of a single product.

THE TAKEAWAY:

From these two options, we can infer that MPS offers a more effective solution for operations managers industry wide. The process delivers a manufacturing plan that targets the needs of customers and the capabilities of the entire manufacturing organization. Other benefits include:

- Smoothing the customer demand signal by decoupling it from the manufacturing process
- Projecting accurate lead time and future deliveries
- Enabling the supply chain to communicate priorities and requirements effectively thanks to a fixed schedule- stabilizing overall production

Proper use of any scheduling method results in enormous benefits for manufacturing, usually overshadowing any challenges associated with schedule deployment. In other words, the benefits from using the right type of scheduling are more important than the challenges that come with implementing it. Too often, manufacturing plants get themselves in trouble by not administering some sort of scheduling mechanism. Production planning and control assist in preventing such chaos.

3.2 Manufacturing flow system

Continuous-flow manufacturing, or Repetitive-Flow Manufacturing, is an approach to discrete manufacturing that contrasts with batch production. It is associated with a just-in-time and kanban production approach, and calls for an ongoing examination and improvement efforts which ultimately requires integration of all elements of the production system. The goal is an optimally balanced production line with little waste, the lowest possible cost, on-time and defect-free production.

This strategy is typically applied in discrete manufacturing as an attempt to handle production volumes comprising discrete units of product in a flow which is more naturally found in process manufacturing. The basic fact is that in most cases, discrete units of a solid product cannot be handled in the same way as continuous quantities of liquid, gas or powder. Discrete manufacturing is more likely to be performed in batches of product units that are routed from process to process in the factory. Each process may add value to the batch during a run-time or work-time. There is usually some time spent waiting for the process during a queue-time or wait-time. The larger the batch, the longer each unit has to wait for the rest of the batch to be completed, before it can go forward to the next process. This queue-time is waste, Muda (Japanese term), and represents time lost that is not value-added in the eyes of the customer. This waste is one of the most important elements targeted for reduction and elimination in lean manufacturing.

Reducing the batch size in discrete manufacturing is therefore a desirable goal: it improves the speed of response to the customer, whilst improving the ratio of value-added to non-value-added work. However, it should be balanced against the finite capacity of resources at the value-adding processes. Capacity is consumed by changeover whenever a process is required to perform work on a different part or product model than the preceding one. Time consumed in changeover is also considered waste, and it reduces the amount of resource capacity that is available to perform value-adding work. Reducing batch sizes can also increase handling time, risk and complexity in planning and controlling production.

The paradigm aim is to achieve single-piece flow where a single discrete unit of product flows from process to process. In effect, the batch quantity is one. If there is no change in part or product model, then this objective needs to be balanced against the additional handling time, and the work-centers that perform the process will typically have to be arranged in close proximity to one another in a flow-line. This is often a characteristic of Repetitive-flow manufacturing and most manual assembly work is performed this way in the modern factory.

If there is a change in part or product model, then the process engineer should also consider balancing the changeover time with run-time. If the changeover time is long, as it might be on a machine, batch size reduction is typically preceded with setup reduction techniques such as Single-Minute Exchange of Die.

One methodology for Repetitive-flow manufacturing is Demand Flow Technology which combines the principles of Repetitive-flow and demand-driven manufacturing. The production planning and control is linked to a pull signal that is triggered from a customer order or consumption of finished goods stock. A pull signal can also link a process to the down-stream, and synchronize the flow to the demand of the customer.

3.3 Workflow automation:

Workflow automation is an easy way to streamline manual and paper-based processes often comprised of unstructured tasks involving people, processes, and content. Workflow and Content Automation (WCA) represents the consolidation of traditional workflow and content generation into a new category to support the needs of a digital business. It's about improving processes – from the everyday to the elaborate. It's about working with content no matter what or where it is, and routing it to the right recipients in the best way for them to use it. It's about straightforward processes. Workflow and content automation is a category unto itself.

Benefits of Workflow Automation:

In order to stay competitive and grow, a business must optimize its processes to minimize inefficiencies, preserve resources and ultimately increase revenue. Today I want to highlight how Workflow Automation can improve your business process and deliver benefits to your entire organization.

Business Workflow Automation is a concept that transforms existing business activities, roles and tasks from legacy and manual systems into a centralized, automated structure. Actions, such as approvals, requests, assignments and claims, once handled manually and on paper, can now be executed digitally and through an organized workflow.

Reasons to adopt a Workflow Automation Solution

The benefits of your organization implementing the right Workflow Management Platform are endless. Here are 6 great reasons to adopt a Workflow Automation solution:

1. **Reducing Errors** - The Right Workflow Automation solution will eliminate all manual and human error that would otherwise cost precious time and resources to address. The system will notify late actions, non-approvals, overlooked tasks and more.

2. **Improved Communication** – Employees no longer need to manually notify each other when a process is complete or moves from one role to another. Notifications and status updates keep all team members involved and informed.
3. **Employee Success** – A Workflow Automation Platform should set employees up for success. Eliminating repetitive and manual processes motivates employees and allows them to focus on more important tasks which, in turn, can boost morale and enhance product innovation.
4. **Reduce Costs** – The cost associated with human error and time-to-market is significantly reduced if not eliminated altogether. Overall, a streamlined process will optimize use of valuable time and resources.
5. **Visibility and Status** – Management visibility and internal status reporting is made easy when a workflow is automated correctly. Employee approval hierarchy and accountability can now be clearly stated for all to see. This eliminates finger-pointing and promotes complete transparency.
6. **Scalability** – When mundane and manual tasks are automated, resources open up for an organization's ability to grow. With the right Workflow Automation solution, a company can eliminate bottlenecks and meet new demands.
7. **Organization** – Notifications play an important role in keeping all tasks organized and in view. These notifications can be set through easily identifiable email, text message and platform pop-ups and can replace unorganized post-it notes, white board jotting and employee memory error.
8. **Integration** – With the right platform, an Automated Workflow can integrate 3rd party SaaS applications, ERP systems, and legacy databases where applicable. Now, all disparate data and systems can play appropriate roles in one process.

9. **Real-Time Reports** – Real-Time insight and reporting available to management can improve the decision-making process and help an organization learn from inefficiencies.

3.4 FLEXIBILITY IN MANUFACTURING TO ACHIEVE DYNAMIC OPTIMISATION

Flexible manufacturing systems (FMS)-Introduction

In the middle of the 1960s, market competition became more intense. During 1960 to 1970 cost was the primary concern. Later quality became a priority. As the market became more and more complex, speed of delivery became something customer also needed.

A new strategy was formulated: Customizability. The companies have to adapt to the environment in which they operate, to be more flexible in their operations and to satisfy different market segments (customizability). Thus, the innovation of FMS became related to the effort of gaining competitive advantage.

First of all, FMS is a manufacturing technology. Secondly, FMS is a philosophy. "System" is the key word. Philosophically, FMS incorporates a system view of manufacturing. The buzz word for today's manufacturer is "agility". An agile manufacturer is one who is the fastest to the market, operates with the lowest total cost and has the greatest ability to "delight" its customers. FMS is simply one way that manufacturers are able to achieve this agility.

An MIT study on competitiveness pointed out that American companies spent twice as much on product innovation as they did on process innovation. Germans and Japanese did just the opposite.

In studying FMS, we need to keep in mind what Peter Drucker said: "We must become managers of technology not merely users of technology". Since FMS is a technology, well-adjusted to the environmental needs, we have to manage it successfully.

1. Flexibility concept. Different approaches

Today flexibility means to produce reasonably priced customized products of high quality that can be quickly delivered to customers. Different approaches to flexibility and their meanings are shown Table 1.

Table 1

Approach	**Flexibility meaning**
Manufacturing	• The capability of producing different parts without major retooling • A measure of how fast the company converts its process (es) from making an old line of products to produce a new product • The ability to change a production schedule, to modify a part, or to handle multiple parts
Operational	• The ability to efficiently produce highly customized and unique products
Customer	• The ability to exploit various dimension of speed of delivery
Strategic	• The ability of a company to offer a wide variety of products to its customers
Capacity	• The ability to rapidly increase or decrease production levels or to shift capacity quickly from one product or service to another

So, what is flexibility in manufacturing?

While variations abound in what specifically constitutes flexibility, there is a general consensus about the core elements. There are three levels of manufacturing flexibility.

(a) Basic flexibilities

- Machine flexibility - the ease with which a machine can process various operations
- Material handling flexibility - a measure of the ease with which different part types can be transported and properly positioned at the various machine tools in a system
- Operation flexibility - a measure of the ease with which alternative operation sequences can be used for processing a part type

(b) System flexibilities

- Volume flexibility - a measure of a system's capability to be operated profitably at different volumes of the existing part types
- Expansion flexibility - the ability to build a system and expand it incrementally
- Routing flexibility - a measure of the alternative paths that a part can effectively follow through a system for a given process plan
- Process flexibility - a measure of the volume of the set of part types that a system can produce without incurring any setup
- Product flexibility - the volume of the set of part types that can be manufactured in a system with minor setup

(c) Aggregate flexibilities

- Program flexibility - the ability of a system to run for reasonably long periods without external intervention
- Production flexibility - the volume of the set of part types that a system can produce without major investment in capital equipment
- Market flexibility - the ability of a system to efficiently adapt to changing market conditions

2. Seeking benefits on flexibility

Today's manufacturing strategy is to seek benefits from flexibility. This is only feasible when a production system is under complete control of FMS technology. Having in mind the Process- Product Matrix you may realize that for an industry it is possible to reach for high flexibility by making innovative technical and organizational efforts. See the Volvo's process structure that makes cars on movable pallets, rather than an assembly line. The process gains in flexibility. Also, the Volvo system has more flexibility because it uses multi-skill operators who are not paced by a mechanical line.

So, we may search for benefits from flexibility on moving to the job shop structures. Actually, the need is for flexible processes to permit rapid low cost switching from one product line to another. This is possible with flexible workers whose multiple skills would develop the ability to switch easily from one kind of task to another.

As main resources, flexible processes and flexible workers would create flexible plants as plants which can adapt to changes in real time, using movable equipment, knockdown walls and easily accessible and re-routable utilities.

3. FMS- an example of technology and an alternative layout

The idea of an FMS was proposed in England (1960s) under the name "System 24", a flexible machining system that could operate without human operators 24 hours a day under computer control. From the beginning the emphasis was on automation rather than the "reorganization of workflow".

Early FMSs were large and very complex, consisting of dozens of Computer Numerical Controlled machines (CNC) and sophisticate material handling systems. They were very automated, very expensive and controlled by incredibly complex software. There were only a limited number of industries that could afford investing in a traditional FMS as described above.

Currently, the trend in FMS is toward small versions of the traditional FMS, called flexible manufacturing cells (FMC). Today two or more CNC machines are considered a flexible cell and two or more cells are considered a flexible manufacturing system. Thus, a Flexible Manufacturing System (FMS) consists of several machine tools along with part and tool handling devices such as robots, arranged so that it can handle any family of parts for which it has been designed and developed.

Different FMSs levels:

Flexible Manufacturing Module (FMM). Example: a NC machine, a pallet changer and a part buffer; Flexible Manufacturing (Assembly) Cell (F(M/A) C). Example: Four FMMs and an AGV (automated guided vehicle); Flexible Manufacturing Group (FMG). Example: Two FMCs, a FMM and two AGVs which will transport parts from a Part Loading area, through machines, to a Part Unloading Area; Flexible Production Systems (FPS). Example: A FMG and a FAC, two AGVs, an Automated Tool Storage, and an Automated Part/assembly Storage; Flexible Manufacturing Line (FML). Example: multiple stations in a line layout and AGVs.

4. **Advantages and disadvantages of FMSs implementation**

Advantages

- Faster, lower- cost changes from one part to another which will improve capital utilization
- Lower direct labor cost, due to the reduction in number of workers
- Reduced inventory, due to the planning and programming precision
- Consistent and better quality, due to the automated control
- Lower cost/unit of output, due to the greater productivity using the same number of workers
- Savings from the indirect labor, from reduced errors, rework, repairs and rejects

Disadvantages

- Limited ability to adapt to changes in product or product mix (ex. machines are of limited capacity and the tooling necessary for products, even of the same family, is not always feasible in a given FMS)
- Substantial pre-planning activity
- Expensive, costing millions of dollars
- Technological problems of exact component positioning and precise timing necessary to process a component
- Sophisticated manufacturing systems

FMSs complexity and cost are reasons for their slow acceptance by industry. In most of the cases FMCs are favored.

Flexible manufacturing system:

A flexible manufacturing system (FMS) is a manufacturing system in which there is some amount of flexibility that allows the system to react in case of changes, whether predicted or unpredicted. This flexibility is generally considered to fall into two categories, which both contain numerous subcategories.

The first category, machine flexibility, covers the system's ability to be changed to produce new product types, and ability to change the order of operations executed on a part. The second category is called routing flexibility, which consists of the ability to use multiple machines to perform the same operation on a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity, or capability.

Most FMS consist of three main systems. The work machines which are often automated CNC machines are connected by a material system to optimize parts flow and the central control computer which controls material movements and machine flow.

The main advantage of an FMS is its high flexibility in managing manufacturing resources like time and effort in order to manufacture a new product. The best application of an FMS is found in the production of small sets of products like those from a mass production.

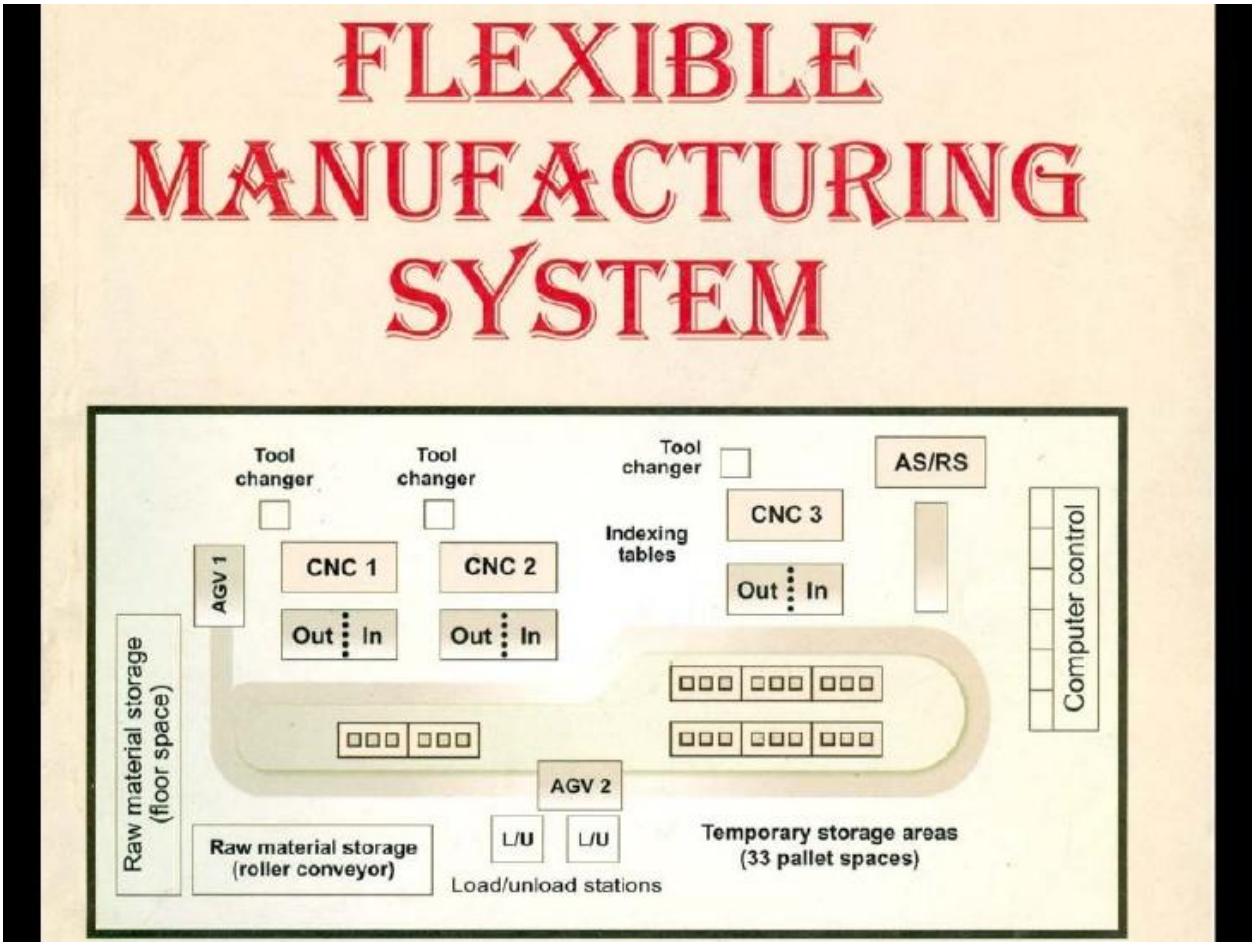


Fig No: 5 Flexible Manufacturing System (FMS)

Industrial Flexible Manufacturing System (FMS)

An Industrial Flexible Manufacturing System (FMS) consists of robots, Computer-controlled Machines, Numerical controlled machines (CNC), instrumentation devices, computers, sensors, and other stand-alone systems such as inspection machines. The use of robots in the production segment of manufacturing industries promises a variety of benefits ranging from high utilization to high volume of productivity. Each Robotic cell or node will be located along a material handling system such as a conveyor or automatic guided vehicle. The production of each part or work-piece will require a different combination of

manufacturing nodes. The movement of parts from one node to another is done through the material handling system. At the end of part processing, the finished parts will be routed to an automatic inspection node, and subsequently unloaded from the Flexible Manufacturing System.

Fig No:6 CNC Machine

3.5.1 Material handling:

Raw materials form a critical part of manufacturing as well as service organization. In any organization, a considerable amount of material handling is done in one form or the other. This movement is either done manually or through an automated process. Throughout material, handling processes significant safety and health; challenges are presented to workers as well as management. Therefore, manual material handing is of prime concern for health and safety professional, and they must determine practical ways of reducing health risk to the workers.

Material Handling

Manual material handling ranges from movement of raw material, work in progress, finished goods, rejected, scraps, packing material, etc. These materials are of different shape and sizes as well as weight. Material handling is a systematic and scientific method of moving, packing and storing of material in appropriate and suitable location. The main objectives of material handling are as follows:

- It should be able determine appropriate distance to be covered.

- Facilitate the reduction in material damage as to improve quality.
- Reducing overall manufacturing time by designing efficient material movement
- Improve material flow control
- Creation and encouragement of safe and hazard-free work condition
- Improve productivity and efficiency
- Better utilization of time and equipment

It is critical for manufacturing organization to identify importance of material handling principle as the critical step in promoting the job improvement process. Manual material handling significantly increases health hazard for the workers in from lower back injuries.

In the current competitive and globalized environment, it is important to control cost and reduce time in material handling. An efficient material handling process promotes:

- Design of proper facility layout
- Promotes development of method which improves and simplifies the work process
- It improves overall production activity.
- Efficient material handling reduces total cost of production.

Principles of Material Handling

- Orientation Principle: It encourages study of all available system relationships before moving towards preliminary planning. The study includes looking at existing methods, problems, etc.
- Planning Principle: It establishes a plan which includes basic requirements, desirable alternates and planning for contingency.
- Systems Principle: It integrates handling and storage activities, which is cost effective into integrated system design.
- Unit Load Principle: Handle product in a unit load as large as possible

- Space Utilization Principle: Encourage effective utilization of all the space available
- Standardization Principle: It encourages standardization of handling methods and equipment.
- Ergonomic Principle: It recognizes human capabilities and limitation by design effective handling equipment.
- Energy Principle: It considers consumption of energy during material handling.
- Ecology Principle: It encourages minimum impact upon the environment during material handling.
- Mechanization Principle: It encourages mechanization of handling process wherever possible as to encourage efficiency.
- Flexibility Principle: Encourages of methods and equipment which are possible to utilize in all types of condition.
- Simplification Principle: Encourage simplification of methods and process by removing unnecessary movements
- Gravity Principle: Encourages usage of gravity principle in movement of goods.
- Safety Principle: Encourages provision for safe handling equipment according to safety rules and regulation
- Computerization Principle: Encourages of computerization of material handling and storage systems
- System Flow Principle: Encourages integration of data flow with physical material flow
- Layout Principle: Encourages preparation of operational sequence of all systems available
- Cost Principle: Encourages cost benefit analysis of all solutions available

- Maintenance Principle: Encourages preparation of plan for preventive maintenance and scheduled repairs
- Obsolescence Principle: Encourage preparation of equipment policy as to enjoy appropriate economic advantage.

Material handling operations are designed based upon principles as discussed above. Material handling equipment consists of cranes, conveyors and industrial trucks.

Material Handling System Design

To analyze an existing MH system is to determine whether it is functioning efficiently without creating any bottlenecks or excessive inventories and is transporting the units when and where needed.

The problems in an existing MH system will be evident if one can observe one or more of the following symptoms in the system:

- Backtracking in material flow path,
- Built-in hindrances to flow,
- Cluttered aisles,
- Confusion at the dock,
- Disorganized storage,
- Excess scrap,
- Excess handling of individual pieces,
- Excess manual effort,
- Excess walking,
- Failure to use gravity,
- Fragmented operations,
- High indirect labor costs,
- Idle machines,
- Inefficient use of skilled worker,
- Lack of cube storage,
- Lack of parts,

- Lack of supplies,
- Long hauls,
- Material piled up on the floor,
- No standardization,
- Overcrowding Poor housekeeping,
- Poor inventory control,
- Product damage,
- Repetitive handling,
- Service areas not conveniently located,
- Truck delayed or tiled up,
- Two-person lifting jobs.

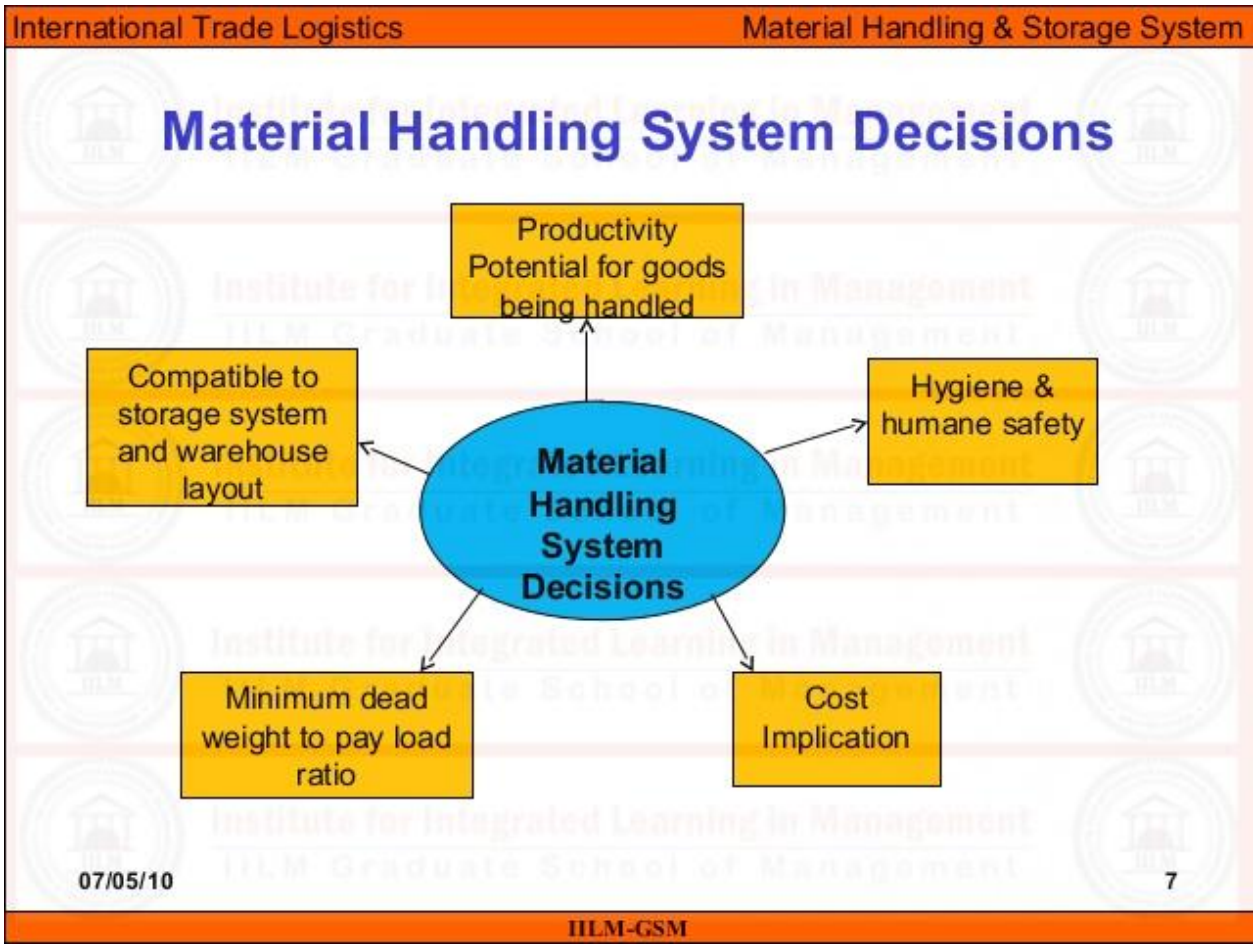


Fig No:7 Material Handling Systems Decisions

3.5.2 Warehouse and materials management

Purchase of raw materials is an integral part of any business, i.e. manufacturing organization or service organization. Purpose of raw material is to be converted into finished goods for selling, but after purchase and before selling, they need to keep in safety and good care. The timeframe of storage can be short period or longer depending upon nature and requirement of materials.

Any damage or theft to the materials is going to increase cost to the organization. So, it becomes important for organization to have a robust and effective warehouse as well as material's management.

Scope of Warehouse Management:

The place where raw material and/or finished goods are stored is referred to as warehouse or store. Generally, warehouse is structure or building design keeping in mind raw material and finished goods it is going to store. Therefore, warehouse management should be able to:

- Receive the purchase goods and entered upon the stock register.
- Inventory Accounting of raw material, work-in-progress or finished goods.
- Preservation of the inventory
- Ability to access goods whenever called upon.
- Appropriate record keeping through coding as to preserve goods and reduce obsolescence.
- Proper stocking of goods as ensure smooth handling.

If above objectives are met, warehouse management significantly increases the overall efficiency of the production and organization. A robust warehouse management would ensure that:

- A smooth flow of production

- Appropriate layout management to reduce material handling and equipment handling
- Reduce to wastage as well as spoilage
- Eliminate the possibility of theft and damage
- Ensure preservation of environment and reduce pollution.
- Encourage cost reduction and driving efficiency.

Warehouse Design

Warehouse design is art in which goods and material can be stored as to reduce wastage, cost of carrying and increase safety. The various factors considered for warehouse design are as follows:

- Easy material handling including receipt, dispatch and storage.
- Easy supervision of materials as well as personnel
- Reduce and control obsolescence of the goods by following appropriate method.
- Optimum utilization of space

Storage Location:

There are three general ways in which goods are stocked as to reduce material handling and increase prompt access. They are as follows:

- Fixed position in which specific area is located where designated goods are stored. If the designated goods are not there, that space will remain empty. Fixed position encourages easy and traceable access to the goods.
- Random Storage in which goods are stored where ever space is available. Here maximum utilization of the space is achieved.
- Categorized fixed location in which particular set of products are placed randomly in the allotted space.

Material Management:

Material management is a sub-set of warehouse management dealing exclusively material which contribute the maximum to completion of the end product. The objectives of material management are as follows:

- Lower the price of the raw materials.
- Reduce the cost of production and ensure the smooth flow of production.
- Maintain quality of raw material as well as finished goods.
- Maintain good relation with the supplier as to ensure a smooth flow of raw materials.
- Continuous improvement of the skill set of the workers thereby increasing overall efficiency within the organization.

Decision warehousing:

Decision Warehouse is a tool of the Rule Execution Server console for monitoring ruleset execution. It stores execution traces in a database.

The execution trace contains information about how a decision was made. It records the rule flow, the path of rule flow tasks, and the rules that were executed. These details are intended to help users, an auditor for example, understand what happened during the execution process. Users can access Decision Warehouse in the Rule Execution Server console.

The following figure shows Decision Warehouse in an operational system that uses an extension point to customize how the trace data is stored. Information is sent over a Data Access Object (DAO) to an existing database. The goal is to provide business users with data from which they can generate reports. You use business reports to measure how well a business is running.

3.5.3 Storekeeping:

Meaning:

After the completion of purchase procedure, the next important aspect of materials management is storekeeping.

A storehouse is a building provided for preserving materials, stores and finished goods. The in-charge of store is called storekeeper or stores manager. The organisation of the stores department depends upon the size and layout of the factory, nature of the materials stored and frequency of purchases and issue of materials.

According to Alford and Beatty "storekeeping is that aspect of material control concerned with the physical storage of goods." In other words, storekeeping relates to art of preserving raw materials, work-in-progress and finished goods in the stores.

Types:

Stores may be centralized or decentralized. Centralized storage means a single store for the whole organization, whereas decentralized storage means independent small stores attached to various departments. Centralized storekeeping ensures better layout and control of stores, economical use of storage space, lesser staff, saving in storage costs and appointment of experts for handling storage problems. It further ensures continuous stock checking.

It suffers from certain drawbacks also. It leads to higher cost of materials handling, delay in issue of materials to respective departments, exposure of materials to risks of fire and accident losses are practical difficulties in managing big stores.

On the other hand, decentralized stores involve lesser costs and time in moving bulky materials to distant departments and are helpful in avoiding overcrowding in central store. However, it too suffers from certain drawbacks viz., uniformity in storage policy of goods cannot be achieved under decentralized storekeeping, more staff is needed and experts may not be appointed.

Objectives of storekeeping:

Following are the main objectives of an efficient system of storekeeping:

1. To ensure uninterrupted supply of materials and stores without delay to various production and service departments of the organisation.
2. To prevent overstocking and understocking of materials,
3. To protect materials from pilferage, theft fire and other risks.
4. To minimize the storage costs.
5. To ensure proper and continuous control over materials.
6. To ensure most effective utilization of available storage space and workers engaged in the process of storekeeping.

Functions of Storekeeping:

In the light of above objects, the functions performed by the stores department are outlined below:

1. Issuing purchase requisitions to Purchase Department as and when necessity for materials in stores arises.
2. Receiving purchased materials from the purchase department and to confirm their quality and quantity with the purchase order.
3. Storing and preserving materials at proper and convenient places so that items could be easily located.
4. Storing the materials in such a manner so as to minimize the occurrence of risks and to prevent losses due to defective storage handling.
5. Issuing materials to various departments against material requisition slips duly authorized by the respective departmental heads.
6. Undertaking a proper system of inventory control, taking up physical inventory of all stores at periodical intervals and also to maintain proper records of inventory.

7. Providing full information about the availability of materials and goods etc., whenever so necessary by maintaining proper stores records with the help of bin cards and stores ledger etc.

Working of the stores:

There are four sections in the process of storekeeping viz.

(a) Receiving section,

(b) Storage section,

(c) Accounting section, and

(d) Issue section.

These are explained as under:

(a) Receiving Section:

There are four kinds of inventories received by stores viz., (i) raw materials, (ii) stores and supplies, (iii) tools and equipment, (iv) work-in- progress or semi-finished goods.

Following procedure is followed in receiving these inventories:

(i) Receiving these incoming materials in stores.

(ii) Checking and inspection of these incoming materials and stores etc.

(iii) Recording the incoming materials in goods received book.

(iv) Preparing and forwarding goods inwards note to purchasing section.

(v) Informing the purchase department about damaged and defective goods and surplus or deficit supplies etc. along with rejection forms and notes.

(vi) Returning damaged or defective goods to the suppliers in accordance with the instructions of the purchase department.

(vii) Forwarding the materials to respective stores and locations where these are to be stored or preserved.

(b) Storage Section:

The store room should be located at a convenient and appropriate place. It should have ample facilities to store the materials properly viz. bins, racks and shelves etc. There can be a single store room in case of a small organization, but a large-scale concern can have different or multiple stock rooms in addition to general or main store.

The separate stockrooms may be used for different classes of inventories. The material should be stored in such a manner as to protect it against the risks of damage, destruction and any kind of loss. Each article should have identifying marks viz., stamping, embossing, color, coding and painting etc. These risks are very useful in locating or identifying an article in the stores.

(c) Accounting Section:

This section is concerned with keeping proper records with regard to receipt and issue of materials. The primary task of this section is to undertake the process of inventory control.

(d) Issue Section:

The materials should be issued to respective departments on receiving duly authorized requisition slips. An entry should be made immediately on the bin card attached with the bin from where the material has been issued.

Bin cards contain valuable information with regard to receipt and issue of materials, which is greatly helpful in exercising a system of inventory control. These cards are further helpful in determining various levels of materials viz., maximum, minimum, and re-ordering level.

3.6 Strategies of warehousing and store keeping space management

Warehouse Strategy

20 warehouse strategies to help you to reduce warehouse costs, trim your cost per order, increase capacity without expansion, and improve service levels in your warehouse or distribution center

1. Benchmarking

A program to set up internal benchmarks will reduce your cost per order or hold the cost in line as volumes increase. Translate these down to department and initial work standards. Contact us if we can help you with an independent internal benchmarking study.

2. Manage the labor force

Labor is the largest controllable expense item in your distribution center. Successful practices to improve performance can lower your labor cost.

3. Hiring, retention and attrition (turnover)

Labor is your first or second largest expense after outbound freight in the fulfillment center. Review the reasons attrition is so high and work to close the gap. Review your hiring, retention and training practices. How well are you able to staff for the peaks?

4. Reduce handling and touches

The fewer touches of product, the less cost of shipping an order. An effective warehouse cost reduction strategy is to streamline the operation and apply industry best practices in order to reduce the handling and cost of fulfilling an order.

5. Slotting:

Effective slotting practices can lower your costs for picking, replenishment, and put away warehouse labor.

6. Team building:

Successful organizations take team building seriously. Take your organization to a new level and improve productivity.

7. Picking options:

How can you use best practices to improve picking productivity?

8. Use what you have more productively

This is a mantra in fulfillment today. Our operational assessments will help you get more productivity from your layout, space/product storage utilization and staff. By not caring for the basics of fulfillment, you are adding costs to the warehouse operation. Increasing current capacity and utilizing that capacity more effectively are key objectives. We believe that getting as much productivity as possible out of the existing layout, processes and systems will help you reduce warehouse costs.

9. Performance reporting

The old adage of, "You can't improve what you don't measure" is certainly true. An effective measurement and reporting process can improve performance and lower costs.

10. Packing options

How can industry best practices help you improve performance and reduce costs of one of the most labor-intensive functions in the warehouse?

11. Freight management

Controlling inbound and outbound freight can make the difference between a profit or loss for your business. Learn more about freight cost reduction.

12. Use proper levels of quantities

Are you “over inspecting” activities to the point of diminishing returns and spending money that does not result in a return on the investment?

13. Receiving practices and cross docking

Cross docking is an effective practice to reduce handling and costs while improving customer service and shipping costs.

14. Process returns more efficiently

Returns cost more than orders to process. Untimely processing of customer credits, refunds and exchanges can damage customer service. Our assessments look at use of staff, people, space and systems to improve productivity.

15. Workforce software

Many companies are still using Excel for their staffing software. Excel cannot save you as much money year over year as a good workforce program. Team up with your Contact Center to share a scheduling system. It will pay for itself quickly. If you have one, understand how to use it to its maximum.

16. Outsourcing option

There are practical and cost-effective reasons to outsource part or all of your business. It may be to deal with a peak, new product categories or when fulfillment is not a company core competency.

17. Finding the right level of automation and systems

ROI analysis could put automation into your planning for cost improvement. The wrong material handling equipment can be creating hidden lost time and inefficient product flow, impacting cost and customer service.

18. Warehouse management/bar code systems

This should include reviewing how bar coding throughout the warehouse, conveyance, material handling and warehouse management systems can improve productivity, increase service levels and reduce costs. See more Warehouse Management Systems Implementation Strategies.

19. Inventory management in the warehouse

Effective inventory management is the single most important tool to improve customer service and reduce cost of operation. See more Inventory Management Cost Savings Strategies.

20. Replenishment practices

Effective replenishment is the basis of successful order fulfillment. Inefficient replenishment will cost huge dollars and negatively impact customer service.

Space Management:

Simply stated, Space Management involves the management of a company's physical space inventory. Every organization manages their space one way or another—whether it is through an automated space management system or with a pen and paper. This includes tracking and maintaining your space and occupancy information—identifying who sits where, how much space your organization has and projecting how much you will need in the future, reporting on your space data including space allocations and chargebacks, etc.

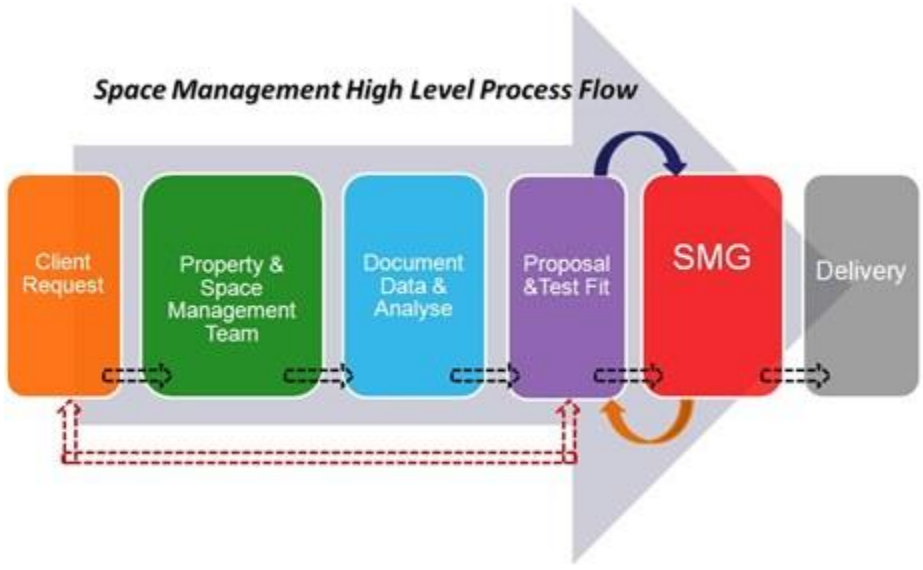


Fig No:8 Space Management-Process Flow

UNIT IV

Logistics management – Role of logistics in SCM – integrated logistics management – transportation design and decision multimodalism – Third Party logistics Services and providers – facilities management (Port / Airport / ICD's) channels of distribution logistics and customer service.

4.1 Logistics management

Logistics management is a supply chain management component that is used to meet customer demands through the planning, control and implementation of the effective movement and storage of related information, goods and services from origin to destination.

What is Logistics and Supply Chain Management?

"Logistics typically refers to activities that occur within the boundaries of a single organization and Supply Chain refers to networks of companies that work together and coordinate their actions to deliver a product to market. Also, traditional logistics focuses its attention on activities such as procurement, distribution, maintenance, and inventory management. Supply Chain Management (SCM) acknowledges all of traditional logistics and also includes activities such as marketing, new product development, finance, and customer service" - from Essential of Supply Chain Management by Michael Hugos

"Logistics is about getting the right product, to the right customer, in the right quantity, in the right condition, at the right place, at the right time, and at the right cost

In the past, various logistics tasks were under different departments, but now they are under "logistics department" and report to the same logistics head as below,

We would like to point out that the word "logistics" ends with the "s". Without the "s" (logistic), it means a kind of mathematical function showing exponential growth. "Logistics Management deals with the efficient and effective management of day-to-day

activity in producing the company's finished goods and services" - from Integral Logistics Management by Paul Schön Leben

Inbound and Outbound Logistics

"Inbound Logistics refers to movement of goods and raw materials from suppliers to your company. In contrast, Outbound Logistics refers to movement of finished goods from your company to customers"

To illustrate this term, we make a small graphic as below, As you can see, purchasing and warehouse function communicates with suppliers and sometimes called "supplier facing function". Production planning and inventory control function is the center point of this chart. Customer service and transport function communicates with customers and sometimes called "customer facing functions.

- Lack of technology to integrate supply chain processes
- The increase in operating complexities

"Supply Chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer" - from Logistics and Supply Chain Management by Martin Christopher

"Supply Chain Management (SCM) refers to the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served" - from Essential of Supply Chain Management by Michael Hugos

To dig deeper, supply chain management has 6 important components as below, - It's a Network: Many companies have the department that controls various activities within the supply chain. So, the people are led to believe that SCM is a "function" which it's not. Supply Chain is actually a "network" consists of many players as below,

A generic supply chain structure is as simple as Supplier, Manufacturer, Wholesaler and Retailer (it's more complex in the real world but a simple illustration serves the purpose).

The word "management" can be explained briefly as "planning, implementing, controlling". Supply Chain Management is then the planning, implementing and controllingof the networks.

Information Musts Flow:

Another important attribute of supply chain management is the flow of material, information and finance (money). Even though there are 3 types of flow, the most important one is information flow aka information sharing. Let's see the example of this through the simplified version of bullwhip effect as below,

When demand data is not shared, each player in the same supply chain must make some sort of speculation. According to the above graphic, the retailer has a demand of 100 units, but each player tends to keep stock more and more at every step of the way. This results in higher costs for everyone in the same supply chain.

When information is shared from retailer down to supplier, everyone doesn't have to keep stock that much. The result is lower cost for everyone.

Coordination is Essential:

Information sharing requires a certain degree of "coordination" (it's also referred to as collaboration or integration in scholarly articles). Do you wonder when people started working together as a supply chain network? In 1984, companies in the apparel business worked together to reduce overall lead-time. In 1995, companies in automotive industry used Electronic Data Interchange to share information. So, working as a "chain" is the real-worldpractice.

Avoid Conflicting Objectives:

Working as a supply chain network requires the same objective, but this is often not the case (even with someone in the same company). "Conflicting Objectives" is the term used to describe the situation when each function wants something that won't go well together. For example, purchasing people always place the orders to the cheapest vendors (with a very long lead-time) but production people need material more quickly.

To avoid conflicting objectives, you need to decide if you want to adopt time-based strategy, low cost strategy or differentiation strategy.

Balance Cost/Service:

The concept of Cost/Service Trade-off appeared as early as in 1985 but it seems that people really don't get it.

When you want to improve service, cost goes up. When you want to cut cost, service suffers. It's like a "seesaw", the best way you can do is to try to balance both sides.

Real world example is that a "new boss" ask you to cut costs by 10%, improve service level by 15%, double inventory turns and so on. If you really understand cost/service trade-off concept, you will agree that you can't win them all. The most appropriate way to handle this is to prioritize your KPIs.

Foster Long-term Relationship:

To work as the same "supply chain team", long-term relationship is a key. Otherwise, you're just a separate company with a different strategy / agenda. So, academia keeps preaching about the importance of relationship building, but is not for everyone.

Since there are too many suppliers to deal with, portfolio matrix is often used to prioritize the relationship building. Focus your time and energy to create long-term relationship with

suppliers of key products and items with limited sources of supply because these are people who can make or break your supply chain.

Logistics:

- (Definition) Logistics is the art and science of obtaining, producing and distributing material and product in the proper place and in proper quantities.
- This involves management of:
  - Order processing
  - Warehousing
  - Transportation
  - Materials handling
  - Packaging

All of this should be integrated through a network of facilities.

- Logistics adds value to the supply chain process if inventory is strategically positioned to achieve sales. But the cost of creating this value is high.
- The largest contributor to logistics cost is transportation: the movement of raw materials to a processing plant, parts to a manufacturer, and finished goods to wholesalers, retailers and customers.
- "Supply chain management is logistics taken to a higher level of sophistication. "– Douglas Long.
- Inventory and Forecasting must be considered when designing and managing an effective, efficient system for moving goods quickly from place to place.

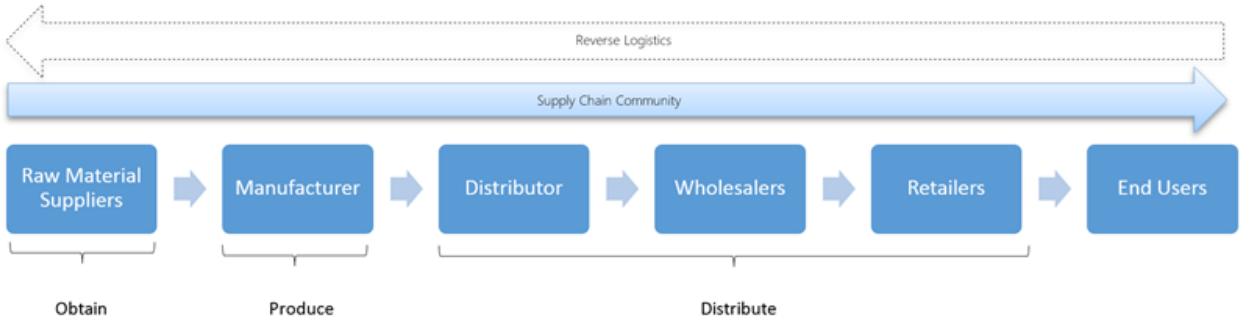


Fig No:9 Logistics Management

Logistics Value Proposition:

- Being able to match key customer expectations and requirements to your firm's operating competency level and customer commitment is the essential ingredient in optimizing the value of logistics.
- The value stems from your ability to know exactly how to balance logistics costs against the appropriate level of customer services for each of your key customers.
- If you keep in mind that logistics must be managed as an integrated effort to achieve customer satisfaction at the lowest total cost, then it makes sense that the following are the key elements in this proposition:

Service

- Technology isn't the limiting factor for logistics for most companies – it's the economics.
- The key is to determine how to outperform competitors in a cost-effective manner.

Cost Minimization

- The second element of the value proposition, cost minimization, should be interpreted as the total cost of logistics in order to be accurate.

- (Definition) Total cost concept of logistics is the idea that all logistical decisions that provide equal service levels should favor the option that minimizes the total of all logistical costs and not be used on cost reductions in one area alone, such as lower transportation charges.
- Today's leading supply chain companies develop functional cost analysis and activity-based costing activities that accurately measure the total cost of logistics. The goal now is for logistics to be cost-effective as determined by a cost-benefit analysis, taking into account how logistical service failure would impact a customer's business.

Logistics Goals & Strategies:

At the highest level, logistics shares the goal of supply chain management: "to meet customer requirements."

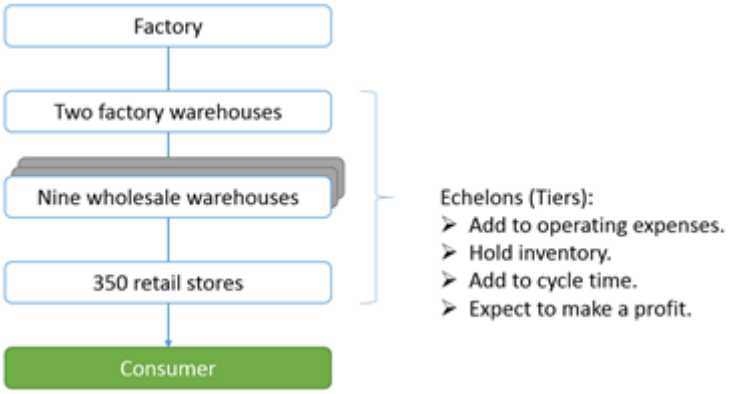
- There are a number of logistics goals that most experts agree upon:
  - Respond rapidly to changes in the market or customer orders.
  - Minimize variances in logistics service.
  - Minimize inventory to reduce costs.
  - Consolidate product movement by grouping shipments.
  - Maintain high quality and engage in continuous improvement.
  - Support the entire product life cycle and the reverse logistics supply chain.
- An effective logistics strategy depends upon the following tactics:
  - Coordinating functions (transportation management, warehousing, packaging, etc.) to create maximum value for the customer.
  - Integrating the supply chain.
  - Substituting information for inventory.
  - Reducing supply chain partners to an effective minimum number.
  - Pooling risks.

Coordinating Functions:

- Logistics can be viewed as a system made up of interlocking, independent parts. From this perspective, improving any part of the system must be done with full awareness of the effects on other parts of the system.
- You need a cross-functional approach in logistics, just as you do in supply chain management as a whole. Teams that cross functions are also very likely to cross company boundaries in a world of international supply chains with different firms focused on different functions.
- The overall goal of logistics management is not better shipping or more efficient location of warehouses but more value in the supply network as measured by customer satisfaction, return to shareholders, etc.

Integrating the Supply Chain:

- Integrating the supply chain requires taking a series of steps when constructing the logistics network. In a dynamic system, steps may be taken out of order and retaken continuously in pursuit of quality improvements:
  - Locate in the right countries
  - Develop an effective export-import strategy
  - Select warehouse locations
  - Select transportation modes and carriers
  - Select the right number of partners
  - Develop state of the art information systems
- You have to watch out for tradeoffs in effectiveness when reducing the number of logistics partners, you can generally increase efficiency by doing so.
- If possible, look for an entire echelon you can do without.



- The more partners there are in the chain, the more difficult and expensive the chain is to manage.
- Handoffs among partners cost money and eat up time.
- Having many partners means carrying more inventory.
- Reducing the number of partners can reduce operating costs, cycle time, and inventory holding costs.
- There is however some lower limit below which you create more problems than you solve.

Pooling Risks:

- (Definition) Risk pooling is a method often associated with the management of inventory risk. Manufacturers and retailers that experience high variability in demand for their products can pool together common inventory components associated with a broad family of products to buffer the overall burden of having to deploy inventory for each discrete product.
- By using a central warehouse to hold parts common to many products, a supply network can reduce storage costs and the risk of stock outs that would be experienced in smaller, decentralized warehouses.
- There are tradeoffs to consider. The central warehouse may be further away from some production facilities than the smaller warehouses would be, lead times and transportation costs are likely to go up in that case.

- Logistics has to be managed from the point of view of improving the value of the overall system, not just one part of the system.

Flow of Goods and Information:

- The enterprise must have internal process integration and collaboration between functions as well as alignment and integration across the supply chain.

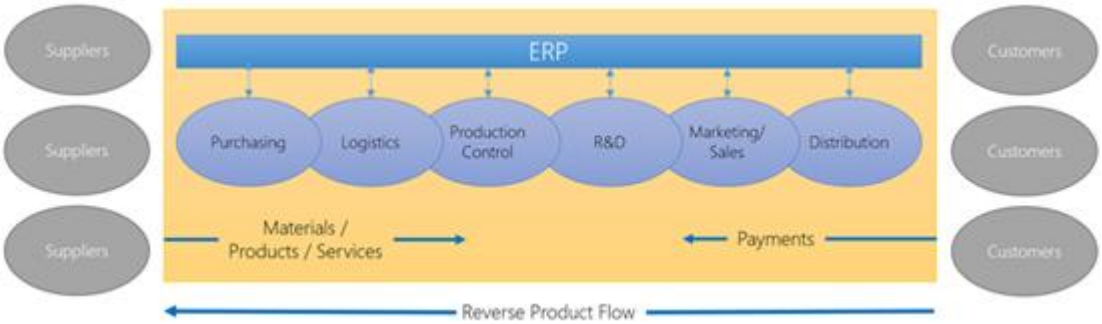


Fig No:10 ERP in SCM

4.2 Role of logistics in SCM:

The supply chain is a vital part of this process, including transportation, shipping, receiving, storage, and management of all these areas. Within the business sector, logistics can be applied to information, transportation, inventory, warehousing, material handling, and packaging, disposal, and security.

Supply Chain Management (SCM) can be divided into three main areas: purchasing, manufacturing, and transport. From end to end, this includes decisions about which input materials to use, production quantities, inventory levels, distribution network configuration, and transportation for both the input materials as well as for the finished products. Logistics Management is the component of SCM that focuses on how and when to get raw materials, intermediate products, and finished goods from their respective origins to their destinations. Today, international trade is commonplace and increasing market share in emerging markets

is highly desirable. It is therefore safe to say goods are rarely consumed where they are produced, and transportation services are the essential trait union between all of the elements of the Supply Chain. Effective, cost efficient Logistics Management can be a real point of competitive differentiation. But how does a company achieve this?

To practice effective, cost efficient Logistics Management, an organization must lay the foundation for a responsive, economical transportation network. With a responsive, economical transportation network, an organization is able to implement major strategic changes to reduce costs and increase customer service levels with very little disruption to the overall supply chain flow.

A responsive transportation network begins with end-to-end network visibility. Visibility allows the business to centralize production operations to lower-cost areas without impacting customer service levels, because any uncertainty within the network can be monitored and appropriately managed to keep inventory levels as low as possible.

An economical transportation network actually begins with a shift in attitude. Businesses are often trapped in the traditional view that transportation is a necessary evil – an inevitable source of cost and risk. And who can blame them? Transport is by far the largest component of the cost structure of a business' logistics. According to sector research (Chang, 1998), transport accounts for as much as 30% of the total cost of logistics operations – almost as much as Warehousing and Inventory together!

Now consider the impact of transportation activities on the overall economy of a country. The numbers are impressive. In the United States in 2005, freight transport activities accounted for 10% of the GDP. In Germany alone, the Freight Logistics Sector (the largest in Europe) came in third in total revenue (after retail trade and the automotive industry) with a whopping 170 billion Euros, or 7% of the German GDP.

While the data certainly lends itself to the mindset that transportation is a "cost albatross," if you will, around one's neck, this attitude is rapidly changing. In fact, Supply Chain Managers who are outpacing their competition have done so largely by acknowledging transportation as a ready vehicle through which to drive cost savings and create value within the Supply Chain. How? Technology, for one. More and more sophisticated tools allowing Managers to monitor, control, and optimize transportation networks are available, and in the wake of the Cloud – are available with increasingly easy implementations.

That said, while a Bloomberg survey reports that 73% of Supply Chain Managers are undergoing this shift in attitude toward transportation and identifying transportation as their key focus in 2014, the same survey also reported that the current adoption rate of transportation solutions is somehow lagging – with 46% of participants reporting current use of a solution, and another 22% reporting plans to adopt one in 2014.

The road ahead is therefore still long, but the systemic impact of transportation-related figures clearly demonstrates that transportation is much more than just the financial drain associated with trucks, pallets, and warehouses. When the appropriate tools to manage complexity and guarantee visibility are in place, transportation provides an organization with the opportunity to continuously create operational efficiency and improve the bottom line – ultimately unlocking previously untapped value for shareholders.

Role of Logistics Management Company:

The supply chain is a vital part of this process, including transportation, shipping, receiving, storage, and management of all these areas. Within the business sector, logistics can be applied to information, transportation, inventory, warehousing, material handling, and packaging, disposal, and security.

The success of an organization is greatly dependent on how efficient its Supply Chain Management is. Supply Chain Management involves purchasing, operations, distribution and

integration. As Supply chains become more complex, it means dealing with multiple vendors to coordinate, allowing redundancy and inefficiency to creep in easily. This is where Third Party Logistic (3PL) providers come into the picture, to provide a one stop solution. 3PLs provide in depth logistics knowledge and experience that importers need to become leaner and more efficient to focus on core competencies. Logistics involves delivering the right product in right condition at the right time. Logistics is that part of Supply Chain management that enables effective and efficient storage and flow of good from point of origin of raw materials through the manufacturing cycle, to point of consumption.3PL helps to guide the shipment from one port to destination point by navigating customs and regulatory requirements seamlessly. Selection of a good logistic provider is hence critical for Supply Chain competitiveness.

Logistic providers offer critical value enhancing functions for all stages of Supply Chain management. They cater to the needs of exporters and importers by managing all transport requirements right from the point of origin to delivery to the final consumer. Third party logistics agents are highly trained, licensed and qualified professionals having extensive knowledge of tariffs schedules and customs regulations, and know how to ensure the fastest, safest, and most efficient route for delivery. The role of Third party logistic service providers today is not restricted to storing and distribution but rather to serve as a partner by identifying problems and implementing solutions that add value to supply chain. Real-time data sharing and ongoing timely responsiveness is crucial to for a seamless supply chain.

A good track record of meeting complex requirements and compliances of retail distribution has stringent compliance requirements like labelling etc. Your Logistic partner should be well equipped to help you meet these requirements. Strategically located warehouse facilities to minimize inbound transit time to ensure timely delivery of goods and products it is imperative to choose logistic partners who have good warehouse and

distribution facilities in close proximity to seaport/airport. Experience and expertise in domestic and international transportation Experienced logistic players know exactly what are the challenges and ways to handle it smoothly, be in domestic or international markets. And this is critical for ensuring an uninterrupted Supply Chain management.

Offering end-to-end, complete logistic solutions your logistic partner should have the ability and resource to offer integrated services to simplify your business need.

Support Value added services like labelling, packaging, palletizing an added advantage when your Logistics partner provides valuable Value-added services that can directly or indirectly enhance your business efficiency. Choose a logistic service provider who offers global services like overseas transport and customs brokerage this ensures you work with a single point of contact that is reliable and has hands on experience.

Visibility and control of critical information on real time basis, like inventory details, shipment status Choose a technology savvy Logistics partner who offers you the convenience and facility to monitor inventory flow on real time basis through reports online. Use of such automated inventory management software will ensure smoother functioning of other related aspects of your Supply Chain management.

4.3 Integrated Logistics Management

Definition:

It is a technique which utilizes various sources and channels to meet the customer demand in time. First step is to anticipate and forestall the demand the customer. After that the required resource that will be utilized for fulfilling the need are acquired. These resources range from human resource to technology, material, IT resources etc. After that all effort are made to meet the customer demand timely by the active participation of all the resources. It utilizes the various operations like transport, logistics, physical distribution,

Fig No:11 Integrated Logistic Support

4.4 Transportation Design and decision multi-modalism:

Transportation Design:

In the field of transport design, you might find work designing private or commercial automobiles, marine vessels, motorcycles, aircrafts, rockets or mass-transit vehicles. You could also focus on specific areas of transportation design, such as interior design.

Transport design focuses on creating models for vehicles. Also referred to as transportation design, this field provides you with a variety of design, development and engineering employment options. Continue reading for more information about this career field. Schools offering Logistics & Transportation Management degrees can also be found in these popular choices.

While transport design is often focused within the automotive industry, it can also encompass the creation of aircraft, spacecraft or marine vessels. Within the field, an emphasis is placed on creating vehicles that are innovative and solve problems currently seen within

the transportation industry. Other concepts involved in transport design include style, comfort, branding, safety and function.

Working in transport design, you might focus on improving the aerodynamics of a vehicle, designing a safer vehicle or creating a vehicle that gets better gas mileage. You could study topics related to automotive design, surface molding, ergonomics, manufacturing and sustainable technology to aid you in the design process.

Decision multi-modalism:

Multimodal transportation is defined as completing the transportation process by using at least two transportation tools to connect and transport together; it is a kind of transportation organization form which uses optimum efficiency as the goal. There are no new transportation channels and tools in the multimodal transportation process; it is a combination of modern organization means and single transportation mode. It has important and realistic meaning for saving transportation costs and transportation time and improving transportation service quality by researching the decision of multimodal transportation scheme in the process of transportation.

There are some shortcomings existing in the domestic and foreign documents all above about the multimodal transportation modes selection; the main problem is that the impact of transportation cost and time selection on multimodal transportation modes was considered in the past; only a single target situation for multimodal transportation mode optimal selection failed to consider other factors in the problems. But, in the actual decision process selection in multimodal transportation modes, in order to ensure the continuity and safety, we need to consider transportation safety and transportation risk factors comprehensively; only in this way we can meet the actual needs of transportation.

Multimodal transportation is a kind of holistic and integrated operation process about the mutual coordination and cooperation between multimodal transportation network nodes,

node enterprises lines, social economic conditions, and natural environment factors. Risk factors existed in several aspects of the multimodal transportation network, including multimodal transportation enterprises, transportation channels, external economic, social environment, and natural factors; these risk factors are not only the necessary conditions for the formation of multimodal transportation network risk but also an important prerequisite for the existence of multimodal transportation network risk.

4.5 Third party logistics services and providers:

When this integration occurs, the provider is then called a third-party supply chain management provider (3PSCM) or supply chain management service provider (SCMSP). 3PL targets particular functions within supply management, such as warehousing, transportation, or raw material provision.

Logistics Functions:

- The supply chain is about moving or transforming raw materials and ideas into products or services and getting them to customers.
- Logistics is about moving materials or goods from one place to another. Thus, logistics is the servant of design, production and marketing.
- The following areas of logistics management contribute to an integrated approach to logistics within supply chain management:
  - Transportation
    - Many modes of transportation play a role in the movement of goods through supply chains: air, rail, road, water, and pipeline.
  - Warehousing
    - (Definition) Warehousing is the activities related to receiving, storing and shipping materials to and from production or distribution locations.

- Third-and fourth-party logistics
  - The various logistics functions can be outsourced to firms that specialize in some or all of these services.
  - (Definition) A third-party logistics provider (3PL) is an entity that provides product delivery services for a buyer and supplier team. Third-part logistics providers actually perform or manage one or more logistics services.
  - (Definition) A fourth-party logistics provider (4PL) is a logistics specialist that plays the role of general contractor by taking over the entire logistics function for an organization and coordinating the combination of divisions or subcontractor's necessary to perform the specific tasks involved.
- Reverse logistics (or reverse supply chain)
  - This is the area which determines how best to handle the return, reuse, recycling, or disposal of products that make the reverse journey from customer to the supplier.

Types:

Third-party logistics providers include freight forwarders, courier companies, as well as other companies integrating & offering subcontracted logistics and transportation services. Hertz and Alfred son (2003) describe four categories of 3PL provider.

- Standard 3PL Provider: this is the most basic form of a 3PL provider. They would perform activities such as, pick and pack, warehousing, and distribution (business) – the most basic functions of logistics. For a majority of these firms, the 3PL function is not their main activity.
- Service Developer: this type of 3PL provider will offer their customers advanced value-added services such as: tracking and tracing, cross-docking, specific packaging, or providing a unique security system. A solid IT foundation and a focus on economies of scale and scope will enable this type of 3PL provider to perform these types of tasks.

- The Customer Adapter: this type of 3PL provider comes in at the request of the customer and essentially takes over complete control of the company's logistics activities. The 3PL provider improves the logistics dramatically, but does not develop a new service. The customer base for this type of 3PL provider is typically quite small.
- The Customer Developer: this is the highest level that a 3PL provider can attain with respect to its processes and activities. This occurs when the 3PL provider integrates itself with the customer and takes over their entire logistics function. These providers will have few customers, but will perform extensive and detailed tasks for them.

Outsourcing may involve a subset of an operation's logistics, leaving some products or operating steps untouched because the in-house logistics is able to do the work better or cheaper than an external provider. Another important point is the customer orientation of the 3PL provider. The provider has to fit to the structures and the requirements of the company. This fit is more important than the pure cost savings, like a survey of 3PL providers shows clearly: The customer orientation in form of adaptability to changing customer needs, reliability and the flexibility of third-party logistics provider were mentioned as much more important than pure cost savings.

Layers:

First party logistics providers (1PL) are single service providers in a specific geographic area that specialize in certain goods or shipping methods., N. Schröter, I. Schröter, Supply Chain Management and Logistics, Verlag W. Kohlhammer, Stuttgart 2010, Examples are: carrying companies, port operators, depot companies. The logistics department of a producing firm can also be a first party logistics provider if they have own transport assets and warehouses.

Second party logistics providers (2PL) are service providers which provide their specialized logistics services in a larger (national) geographical area than the 1PL do. Often

there are frame contracts between the 2PL and the customer, which regulate the conditions for the transport duties that are mostly placed short term. 2PL's provide own and external logistics resources like trucks, forklifts, warehouses etc. for transport, handling of cargo or warehouse management activities. Second party logistics arose in the course of the globalization and the uprising trend of lean management, when the companies began to outsource their logistics activities to focus on their own core companies. Examples are: courier, express and parcel services; ocean carriers, freight forwarders and transshipment providers.

Lead logistics providers:

3PL providers without their own assets are called lead logistics providers. Lead logistics providers have the advantage that they have specialized industry expertise combined with low overhead costs, but lower negotiating power and less resources than a third-party provider has, based on a normally big company size, a good customer base and established network systems. 3PL providers may sacrifice efficiency by preferring their own assets in order to maximize their own efficiency. Lead logistics providers may also be less bureaucratic with shorter decision-making cycles due to the smaller size of the company.

Advantages of 3PL

At the beginning the primary advantage of outsourcing logistics activities to a Third-Party Logistics (3PL) is focusing on core activities of the business. This means the core activities is much more important than logistics due to the companies have to create on value added activities for making much better revenue, the logistics operations is a beyond activity for each company in delivering the service to the customer. In the other words, the companies have to give the focusing in their main working areas and so, they do not willing to be busy about the logistics activities they believe to outsource their logistics activities to one of the

best LSP's. This is an improvement and contribution to the quality of service levels in overall performance in the company's core activities.

Another case is the company they are not able of having its own logistics activities because of the potential financial conditions logistics activities such transportation, warehousing is not able of managing them. Then deciding on getting better transportation solution, more cost effective, better services, professional's equipment in transportation. Maybe help of reduction the carrying costs, loss in selling orders and are able to help to the company of moving more merchandise with less assets during delivering service to the customers. Some companies have an expectation from 3PL to improve their performance in the inventory reduction, availability of the capacity and less customer complaints by improving order accuracy. Also, if the company is need the 3PL for better performance in the supply chain they should have well past data system.

However, the company who is going to hiring a 3PL, the company has employees this is the biggest cost of hiring employees for every company, by providing the logistics services this is one of the important benefit is the reduction in the number of labors by outsource the logistics activities. Additionally, the flexibility is the other important factor of outsourcing logistics operations. Flexibility is one of the main strategic competitive market element, about the changing the market conditions very frequently, in those cases the company should be responsive to those unexpected changes, the company could not be responsive to those changes they choosing the way of outsourcing logistics activities to LSP's. For example: If any company has customers in different part of countryside for delivering goods to its customers by hiring a Third-Party Logistics it would more efficient by delivery them. They can have sufficient equipment and could provide reasonable solutions to them if the demand is low or high because of their storage and delivery performance this help to the company of saving time and costs.

Furthermore, logistics activities in some cases become too much costly, the budget of the company is not sufficient for finance it so, they accept of giving those activities to be outsourced. Also, may have as an object of making achievements in environmental issues the Third-Party Providers have the capability to optimize a distribution networks and the most costless routes, reduction in carbon emission and control technology to rationalize the inventory to develop the trucks performance.

Disadvantages of 3PL

Although there are also disadvantages in hiring Third Party Logistics provider in the selection of the outsourcing at the beginning, it is difficult to realize if it is reliable and cost-effective between the company and the Third-Party Logistics provider. Every firm has to pay great attention at the selection of their Third-Party Logistics partner; they have really to check if they are able to provide a better service to them. The biggest mistakes have been made because of the insufficient financial position, the companies cannot select the reliable outsourcing providers. It is not easy for identifying the Third Service Provider (3PL) if it is suitable or not, it a complex period. However, to solve this problem are required to clarify the ability of service provider. There are several procedures such as transaction costs, organize a system for maintain their reliability to work together with them if they could be choosing as logistics providers.

Another disadvantage of outsourcing the logistics activities is that the company doing the outsourcing loses control over the finished goods once they are transferred to the warehouse location. What this means is that although the 3PL company may have a computerized inventory system to which you have access, you lack the ability to perform a physical count in the event of a discrepancy. You also lack the ability to confirm shipping dates to your customers or promise quick shipment for orders that were short shipped or not delivered at all.

4.6.1 Facilities Management:

Facility management (or facilities management or FM) is a professional management discipline focused upon the efficient and effective delivery of support services for the organizations that it serves. It serves to ensure the integration of people, systems, place, process, and technology.

Professional FM as an interdisciplinary business function has the objective to coordinate demand and supply of facilities and services within public and private organizations. The term “Facility” (pl. facilities) means something that is built, installed or established to serve a purpose, which, in general, is every “Tangible asset that supports an organization.” Examples are real estate property, buildings, technical infrastructure, (HVAC), lighting, transportation, IT-services, furniture, Custodial, grounds, and other user-specific equipment and appliances.

The European standard for facilities management defines it as "the integration of processes within an organization to maintain and develop the agreed services which support and improve the effectiveness of its primary activities." The International Organization for Standardization will publish the first two international standards relating to facilities management in 2017. A recent ISO article outlines what is being done within this committee including the development of a Management System Standard for Facilities Management see.

Scope:

FM covers these two main areas: 'Space & Infrastructure' (such as planning, design, workplace, construction, lease, occupancy, maintenance, furniture and cleaning) and 'People & Organization' (such as catering, ICT, HR, accounting, marketing, hospitality). The first refers to the physical built environment with focus on (work-) space and (building-) infrastructure. The second covers the people and the organization and is related to work psychology and occupational physiology.

According to the International Facility Management Association (IFMA): "FM is the practice of coordinating the physical workplace with the people and work of the organization. It integrates the principles of business administration, architecture and the behavioral and engineering sciences." In a 2009 Global Job Task Analysis, IFMA identified the core competencies of facility management as:

- communication
- emergency preparedness and business continuity
- environmental stewardship and sustainability
- finance and business
- Hospitality Management
- human factors
- leadership and strategy
- operations and maintenance
- project management
- quality
- real estate and property management
- technology.

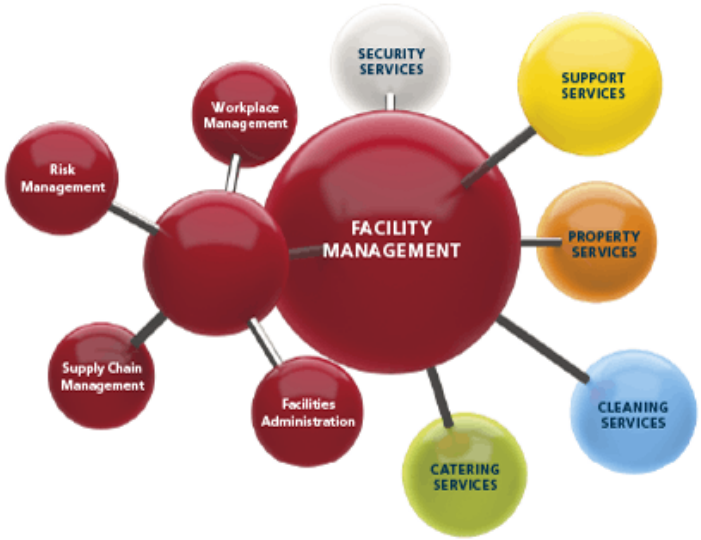


Fig No:12 Facility Management

4.6.2 Channels of distribution logistics and customer service:

Logistics distribution channels:

The logistic distribution is a continuous probability distribution. Its cumulative distribution function is the logistic function, which appears in logistic regression and feed forward neural networks.

The Importance of Distribution:

Most producers use intermediaries to bring their products to market. They try to develop a distribution channel (marketing channel) to do this. A distribution channel is a set of interdependent organizations that help make a product available for use or consumption by the consumer or business user. Channel intermediaries are firms or individuals such as wholesalers, agents, brokers, or retailers who help move a product from the producer to the consumer or business user.

A company's channel decisions directly affect every other marketing decision. Place decisions, for example, affect pricing. Marketers that distribute products through mass merchandisers such as Wal-Mart will have different pricing objectives and strategies than will those that sell to specialty stores. Distribution decisions can sometimes give a product a distinct position in the market. The choice of retailers and other intermediaries is strongly tied to the product itself. Manufacturers select mass merchandisers to sell mid-price-range products while they distribute top-of-the-line products through high-end department and specialty stores. The firm's sales force and communications decisions depend on how much persuasion, training, motivation, and support its channel partners need. Whether a company develops or acquires certain new products may depend on how well those products fit the capabilities of its channel members.

Some companies pay too little attention to their distribution channels. Others, such as FedEx, Dell Computer, and Charles Schwab have used imaginative distribution systems to gain a competitive advantage.

Fig No:13 Distribution Channel

Functions of Distribution Channels:

Distribution channels perform a number of functions that make possible the flow of goods from the producer to the customer. These functions must be handled by someone in the channel. Though the type of organization that performs the different functions can vary from channel to channel, the functions themselves cannot be eliminated. Channels provide time, place, and ownership utility. They make products available when, where, and in the sizes and quantities that customers want. Distribution channels provide a number of logistics or physical distribution functions that increase the efficiency of the flow of goods from producer to customer. Distribution channels create efficiencies by reducing the number of transactions necessary for goods to flow from many different manufacturers to large numbers of customers. This occurs in two ways. The first is called breaking bulk. Wholesalers and retailers purchase large quantities of goods from manufacturers but sell only one or a few at a time to many different customers. Second, channel intermediaries reduce the number of

transactions by creating assortments—providing a variety of products in one location—so that customers can conveniently buy many different items from one seller at one time. Channels are efficient. The transportation and storage of goods is another type of physical distribution function. Retailers and other channel members move the goods from the production site to other locations where they are held until they are wanted by customers. Channel intermediaries also perform a number of facilitating functions, functions that make the purchase process easier for customers and manufacturers. Intermediaries often provide customer services such as offering credit to buyers and accepting customer returns. Customer services are oftentimes more important in B2B markets in which customers purchase larger quantities of higher-priced products.

Some wholesalers and retailers assist the manufacturer by providing repair and maintenance service for products they handle. Channel members also perform a risk-taking function. If a retailer buys a product from a manufacturer and it doesn't sell, it is "stuck" with the item and will lose money. Last, channel members perform a variety of communication and transaction functions. Wholesalers buy products to make them available for retailers and sell products to other channel members. Retailers handle transactions with final consumers. Channel members can provide two-way communication for manufacturers. They may supply the sales force, advertising, and other marketing communications necessary to inform consumers and persuade them to buy. And the channel members can be invaluable sources of information on consumer complaints, changing tastes, and new competitors in the market.

The Internet in the Distribution Channel:

By using the Internet, even small firms with limited resources can enjoy some of the same competitive advantages as their largest competitors in making their products available to customers internationally at low cost. E-commerce can result in radical changes in

distribution strategies. Today most goods are mass-produced, and in most cases end users do not obtain products directly from manufacturers. With the Internet, however, the need for intermediaries and much of what has been assumed about the need and benefits of channels will change. In the future, channel intermediaries that physically handle the product may become largely obsolete. Many traditional intermediaries are already being eliminated as companies question the value added by layers in the distribution channel. This removal of intermediaries is termed disintermediation, the elimination of some layers of the distribution channel in order to cut costs and improve the efficiency of the channel.

Customer service:

Customer service is the provision of service to customers before, during and after a purchase. The perception of success of such interactions is dependent on employees "who can adjust themselves to the personality of the guest". Customer service concerns the priority an organization assigns to customer service relative to components such as product innovation and pricing. In this sense, an organization that values good customer service may spend more money in training employees than the average organization or may proactively interview customers for feedback.

From the point of view of an overall sales process engineering effort, customer service plays an important role in an organization's ability to generate income and revenue. From that perspective, customer service should be included as part of an overall approach to systematic improvement. One good customer service experience can change the entire perception a customer holds towards the organization.

A customer support is a range of customer services to assist customers in making cost effective and correct use of a product. It includes assistance in planning, installation, training, trouble shooting, maintenance, upgrading, and disposal of a product. These services even

may be done at customer's side where he/she uses the product or service. In this case it is called "at home customer services" or "at home customer support".

Regarding technology products such as mobile phones, televisions, computers, software products or other electronic or mechanical goods, it is termed technical support.

Automated customer service:

Customer service may be provided by a person (e.g., sales and service representative), Examples of automated means are Internet sites. An advantage with automated means is an increased ability to provide service 24-hours a day, which can, at least, be a complement to customer service by persons.

Another example of automated customer service is by touch-tone phone, which usually involves a main menu, and the use of the keypad as options (i.e. "Press 1 for English, Press 2 for Spanish", etc.)

However, in the Internet era, a challenge has been to maintain and/or enhance the personal experience while making use of the efficiencies of online commerce. "Online customers are literally invisible to you (and you to them), so it's easy to shortchange them emotionally. But this lack of visual and tactile presence makes it even more crucial to create a sense of personal, human-to-human connection in the online arena."

An automated online assistant with avatar providing automated customer service on a web page. Examples of customer service by artificial means are automated online assistants that can be seen as avatars on websites. It can avail for enterprises to reduce their operating and training cost. These are driven by chatterbots, and a major underlying technology to such systems is natural language processing.

UNIT V

Information technology and SCM – EDI, ERF, Internet and intranet, e – Commerce, Advance Planning Systems. Bar coding, Telecommunication Network, Video Conference and Artificial Intelligence. Best practice in Supply chain management – Organisational issues to implement SCM.

5.1 Information Technology - A Key Driver of SCM

Supply Chain Management is a broad-based function that encompasses all business and operational processes involved in but not limited to Procurement, Manufacturing, and Finished Goods Transportation, warehousing & Distribution and Inventory Management.

In a globalized business scenario characterized by geographically spread markets, raw material procurement sources across the world and cheaper manufacturing and labor markets being available in developing world, the business of meeting demand with supply is constantly changing and evolving.

Global business has been fueled and enabled by the IT Technology which has redefined all aspects of business today. All businesses today are run on ERP - Enterprise Resource Planning which provides the organizations with tools to manage all the functions including procurement, production, sales, and finance management in seamless and integrated manner.

These software systems like SAP, Oracle, People soft, etc., have taken over and enhanced the business processes that were traditionally being managed manually.

Demand planning, Forecasting, Global procurement management is some of the enabling tools on which the Global procurement strategies are built and managed. The availability of these sophisticated systems has further enabled companies to implement good and cost-effective manufacturing practices like JIT, Kanban, VMI, etc.

Finished goods distribution, transportation, and inventory management, besides sales process is again driven by the various ERP modules combined with additional specific applications as required.

ERP has enabled companies to manage their business processes in different markets and countries under one common business process thus providing standardization and control.

The complex network of various processes, software platforms and applications and different software tools used by various vendors and agents in the entire chain drive the supply chain of the companies.

E-commerce has further redefined the way business is carried on. Online purchase has impacted the way supply chains are organized and markets are driven. Customer behavior and preferences are changing as online marketing is establishing a one to one contact with the customer and can offer a personalized experience. The instant delivery of the information through internet elicits immediate response and action from the customer. The sales lead time is rapidly decreasing. The demanding customer, therefore, needs to be serviced immediately at the same speed.

The internet technology has further opened up the geographical boundaries for the companies. Any person sitting in any corner of the globe can purchase a product online at the click of a button. The companies have to be well equipped with the logistics and supply chain network to be able to service the customer.

When in a global scenario, goods and services move through multiple chains involving very many agents including transporters, forwarders, customs, distribution centers, distributors and lastly the retail outlets, availability of data, documentation and information becomes the lifeline for the organization to be able to take decisions and ensure seamless processes and control the supply chain.

IT is one of the most important enabler of the Supply chain in complex modern world of Global Businesses.

5.2.1 Electronic Data Interchange (EDI)

What is EDI?

Electronic Data Interchange (EDI) is the electronic interchange of business information using a standardized format; a process which allows one company to send information to another company electronically rather than with paper. Business entities conducting business electronically are called trading partners.

Many business documents can be exchanged using EDI, but the two most common are purchase orders and invoices. At a minimum, EDI replaces the mail preparation and handling associated with traditional business communication. However, the real power of EDI is that it standardizes the information communicated in business documents, which makes possible a "paperless" exchange.

The traditional invoice illustrates what this can mean. Most companies create invoices using a computer system, print a paper copy of the invoice and mail it to the customer. Upon receipt, the customer frequently marks up the invoice and enters it into its own computer system. The entire process is nothing more than the transfer of information from the seller's computer to the customer's computer. EDI makes it possible to minimize or even eliminate the manual steps involved in this transfer.

The process improvements that EDI offers are significant and can be dramatic. For example, consider the difference between the traditional paper purchase order and its electronic counterpart:

A Traditional Document Exchange of a Purchase Order	An EDI Document Exchange of a Purchase Order
This process normally takes between three and five days.	This process normally occurs overnight and can take less than an hour.
Buyer makes a buying decision, creates the purchase order and prints it.	Buyer makes a buying decision, creates the purchase order but does not print it.
Buyer mails the purchase order to the supplier.	EDI software creates an electronic version of the purchase order and transmits it automatically to the supplier.
Supplier receives the purchase order and enters it into the order entry system.	Supplier's order entry system receives the purchase order and updates the system immediately on receipt.
Buyer calls supplier to determine if purchase order has been received, or supplier mails buyer an acknowledgment of the order.	Supplier's order entry system creates an acknowledgment and transmits it back to confirm receipt.

What is EDI?

Electronic commerce is the communication of business information through the sending and receiving of electronic messages between trading partners. Various types of electronic exchanges fall within this definition of electronic commerce. One form of electronic commerce is Electronic Data Interchange (EDI) which is the computer-to-computer exchange of business documents between companies, using a public standard format. EDI is a vital tool available to every business which increases efficiency and productivity, and replaces the traditional processes of preparing data in paper form and sending it by mail or by facsimile.

The use of EDI is not limited by differences in computer or communications equipment among trading companies. It bridges the previous information gap that existed between companies with different computer systems.

EDI is also independent of users' internal computerized application systems, since it interfaces with those systems rather than being integrated into them. However, the degree of effectiveness of the EDI operation itself, as well as the internal management information available from its use, will certainly be greater if application systems are up-to-date and efficient.

EDI is based on the use of message standards, ensuring that all participants use a common language. A message standard consists of uniform formats for business documents, which have been adopted for electronic transmission purposes. It also includes security and control elements and other rules and conventions relating to the use of transaction sets that all users agree to follow.

EDI transmission typically involves the following process. The sender uses internal computer files to assemble the data needed for the transaction. This data file then becomes input to a software module that generates the transaction into the EDI standard format. The resulting data file is then transmitted to the receiver. At the receiving end, this data file is input to a software module that translates the data from an EDI format into a file that can be entered into the receiver's computer application systems.

The above process includes a number of control and security procedures. Data security is maintained through the use of user identification numbers and passwords. EDI generation/translation software that is available from commercial suppliers typically includes extensive data editing and error-checking routines. This ensures that the data is valid at the time of transmission, and that it is also valid when it is received. EDI standards also allow the receiver to acknowledge successful receipt of the transmission by sending an acknowledgment message back to the sender. EDI, then, is at least as secure and accurate as your present method of exchanging paper documents.

Through electronic commerce, business information can be communicated through standard electronic messages to your trading partners. With your accurate electronic messages in their computers and your bar codes printed on your products and shipments, your trading partners are able to directly connect your products and shipments to information about them as they travel through the supply chain.

Benefits of Implementing EDI

The benefits available by using EDI are being realized by a large number of companies, many of which transmit a substantial percentage of their transaction volume via EDI. For companies using I/C EDI, UCS or VICS EDI on a volume basis, the realization of available benefits can result in a definite competitive advantage.

Users report benefits in the following major areas:

Reduced Lead Time/Quick Response:

EDI can provide a direct reduction in the ordering/shipping time cycle. This benefit both customer and supplier.

Warehouse Efficiencies:

In addition to the benefits cited above relating to warehouse operations, the following benefits are also being realized in this traditionally high-cost area:

Transaction Handling/Processing Accuracy:

The automated procedures associated with EDI result in a reduction in transaction errors and resulting corrective action, including the following:

Administrative and Clerical Costs:

One of the major goals in creating EDI was to reduce the great volume of business paperwork and many of the clerical tasks involved in handling the processing of paper documents. Many users have realized substantial productivity improvements and/or direct

cost savings in their office operations by reducing or eliminating the time required for the following tasks.

EDI Implementation Guidelines:

The Uniform Code Council, Inc. (UCC) manages and administers the following EDI implementation guidelines. These guidelines are industry specific guidelines of ASC X12 standard

INDUSTRIAL/COMMERCIAL (I/C) EDI– used by providers and users of raw materials, packaging materials and maintenance-repair-operations (MRO) products.

UNIFORM COMMUNICATION STANDARD (UCS)– used primarily by the grocery industry.

VOLUNTARY INTERINDUSTRY COMMERCE STANDARD (VICS) EDI– used by the general merchandise retailing industry

There are lots of different terms used to describe B2B process automation. I am often told that the terms are confusing, partly because they are so inter-related, so, I thought this would make a useful blog.

Here's my take on the meanings of these terms. I hope that this provides clarification for you.First, electronic commerce (e-commerce) is a very common term that refers to the exchange of information via electronic media such as the Internet and private communication networks. There are two types of e-commerce:

- Business-to-Consumer (B2C) e-commerce – this is the term that most people are think of when e-commerce is mentioned. Every day, we experience B2C e-commerce, whether it is booking airline tickets and hotel reservations or buying books, shoes and clothes online.
- Business-to-Business (B2B) e-commerce – as its name implies, B2B e-commerce is the electronic exchange of information between two businesses, rather than between a consumer and a business.

Electronic data interchange (EDI) is the most commonly used B2B e-commerce technology today. It is the computer-to-computer exchange of business documents, such as purchase orders and invoices, in a standard electronic format between business partners. You can use standards such as ANSI X12, EDIFACT, or an XML-based standard such as Rosetta Net in the high-tech industry.

EDI has been in use across many industries, including retail, banking, manufacturing, high-tech and services, since the 1980s and it remains a game-changer. In order to achieve the benefits of EDI, the businesses involved must aim to be as tightly integrated as possible with each other.

Twenty first century corporations expect a network of business partners – their suppliers, their customers, their logistics providers, and their banks – to function online.

Two types of B2B Integration:

(1) Integration at the data level –automation of the exchange of business documents between business applications, such as automating the exchange of all the documents in the procure-to-pay process.

(2) Integration at the people level – enabling B2B collaboration between the people in different companies during business processes such as dispute resolution and new vendor registration.

INTEGRATION AT THE DATA LEVEL

For two businesses to tightly integrate at the data level, they need to automate the following tasks:

- Connect electronically – usually via the internet using a secure communications protocol, such as AS2, SFTP, or FTPS

- Exchange data electronically in a format that can be understood by the computer systems at each company – usually via an EDI standard format, which can be immediately understood
- Translate the EDI data to the format of each company's in-house system – typically accomplished by using special EDI translator software

Integration at The People Level – Collaboration

For two businesses to tightly integrate at the people level, and truly collaborate to resolve issues or plan new initiatives, they need a central repository of critical information about business partners, such as details related to e-commerce readiness, regulatory compliance, consumer product safety, supplier diversity programs and environmental responsibility surveys.

Furthermore, they need the information management tools too simply and easily:

- Enable business partners to maintain their own company and contact profiles, thus keeping partner information fresh and up-to-date
- Perform mass communications to appropriate segments of the trading partner base without relying on out-of-date spreadsheets on various employees' computers
- Roll out compliance initiatives (e.g., send a 20-question survey to suppliers regarding the greenhouse gas initiative) to all or a subset of your partner community
- Audit business partners' compliance with various initiatives
- Capture, share, and collaborate on performance-related data that helps to rapidly resolve multi-party disputes and discrepancies with full traceability and audit control. For example, this can result in improvements like a reduction of over-payments resulting from unprocessed or poorly negotiated shipping, pricing or claims dispute

5.2.2 ERF

Internet and Intranet

Supply chain management can be defined as the planning as well as management of all activities that are involved in sourcing as well as procurement, conversion, plus including all logistics management activities. In addition, it is important to note that it also includes the coordination plus collaboration with channel partners that may be intermediaries, suppliers or customers, etc. In other words, supply chain management merges supply as well as demand management within and across businesses or companies. And, it has an integrating function with the main responsibility of linking primary business functions as well as processes within as well as across business firms into a strong and high-performing model.

Procurement:

The Internet reduces the cost of purchases by giving supply-chain partners quick access to information about sources, availability, pricing and technical data. Members of the supply chain must cooperate in making this information available online, possibly in secure folders only accessible to account holders who are supply-chain partners. Once information required to make a purchase is available online from several sources, procurement is more efficient because the best source can be identified more quickly. While the actual prices paid do not necessarily diminish, the cost of the procurement transactions is lower.

Supply:

On the supply side, the most important role of the Internet is to greatly increase the size of the accessible market. Suppliers using the Internet to market their goods and services can sell world-wide. With the Internet's greater transparency regarding pricing, suppliers have lost some of the strategic levers that allowed them to cultivate preferred accounts with higher margins. The ability of competitive suppliers to achieve greater sales volumes balances this

disadvantage. Once the supplier has found a customer, he benefits from similarly reduced transaction costs as the purchaser, because completing the transaction is quicker and more efficient.

Direct Transactions:

For supply chains in general, the role of the Internet has been to reduce the power of intermediaries. Suppliers can offer their products and services directly to customers, and purchasers can find what they need directly from producers. This disintermediation has simplified supply-chain management by making real time data on changes in demand and supply available to the markets, rather than having the information filtered through re-sellers. This trend has been especially pronounced in B2B transactions, while intermediaries remain more important in retail.

Collaboration:

While supply-chain management through the Internet is still in its infancy, the possibilities exist for even closer integration of supply and procurement functions. Suppliers are interested in having a high, predictable sales volume, while purchasers are looking for a reliable, low-cost source. Companies can satisfy both goals by providing data on production and on procurement needs to each other under long term relationships. The resulting high, steady volume allows the supplier to offer his products at lower cost, while the purchaser benefits from this cost reduction and receives a reliable supply. Now the internet has revolutionized supply chain management. There are at least five roles the internet has played when it comes to this. Below are the different areas in which this has happened:

Inventory-Management:

Definitely one aspect of supply chains that is most costly is inventory management. And, the internet has made it possible for business firms to quickly set up EDI information

programs with their clients. Before the emergence of the internet, EDI will usually take a longer time to be implemented in a supply chain. Then, every channel member had to massively invest in software, equipment, as well as training before EDI systems could be made operational.

Purchasing:

The internet has also made it possible for cost associated with purchasing to be reduced. In the United States, business firms have been able to make use of the internet to streamline the purchasing function. With it there is reduction in paper-flows as well as order-cycle times- the time it takes for purchased order to be delivered. Today, face-to-face negotiations, which might be considered the order of the day in the past, are not frequently used as bargaining, re-negotiations, term and price agreements, etc. can now be done via the internet.

Transportation:

Transport management is probably the most popular use of the internet in supply chains. This is so important for any business since the tracking of shipments to regional depots will provide the firm with data that shows how reliable or otherwise the performance of its carriers is, making it possible for transport managers to confirm whether their motor carriers are meeting the promised arrival time. And, it also enables them to inform carriers about shipment delays as this occurs rather than wait for days or even longer before informing them.

Order-processing:

This critical role of order processing is one that the internet has helped to dramatically reduce costs. And, reduction in paperwork is a major item of this cost saving when compared to conventional practices. Okay another major benefit that the internet has bestowed on this

process is the increase in speed with which order processing is now done. Since there is now a reduction in the time it takes for orders to be placed and received by clients.

Vendor Relationships:

A critical factor when it comes to vendor relations for a business is being able to rate the performance of its vendors. This will be based on elements agreed by both parties (the company and its vendors). And, such performances include factors like deliveries to the company's warehouses including depots; vendor raw material inventory among others. The internet has been used to monitor these areas.

Customer service:

The internet has made it possible for customers to have 24-hour access to a business firm's customer service department making it possible for companies to be notified of any problem or service issue. Now apart from providing another option for customers to contact a company concerning service issues this has helped improve communication flow between business firms and their customers.

5.2.3 INTRANET:

An intranet is a private - internal - business network that enables your employees to share information, collaborate, and improve their communications.

An intranet is a private network accessible only to an organization's staff. ... A company-wide intranet can constitute an important focal point of internal communication and collaboration, and provide a single starting point to access internal and external resources.

Intranets are used by many companies as a way of conveying information and sharing data with other members of their network. It is setup as an internal website for members of an organization. Intranets are hosted within a private network meaning that only users inside of that network can access it.

An intranet is a private network accessible only to an organization's staff.Generally, a wide range of information and services from the organization's internal IT systems are available that would not be available to the public from the Internet. A company-wide intranet can constitute an important focal point of internal communication and collaboration, and provide a single starting point to access internal and external resources. In its simplest form an intranet is established with the technologies for local area networks (LANs) and wide area networks (WANs). Intranets began to appear in a range of larger organizations from 1994.

Uses:

Increasingly, intranets are being used to deliver tools, e.g. collaboration (to facilitate working in groups and teleconferencing) or sophisticated corporate directories, sales and customer relationship management tools, project management etc., to advance productivity.

Intranets are also being used as corporate culture-change platforms. For example, large numbers of employees discussing key issues in an intranet forum application could lead to new ideas in management, productivity, quality, and other corporate issues.

In large intranets, website traffic is often similar to public website traffic and can be better understood by using web metrics software to track overall activity. User surveys also improve intranet website effectiveness.

Larger businesses allow users within their intranet to access public internet through firewall servers. They have the ability to screen messages coming and going keeping security intact. When part of an intranet is made accessible to customers and others outside the business, that part becomes part of an extranet. Businesses can send private messages through

the public network, using special encryption/decryption and other security safeguards to connect one part of their intranet to another.

Intranet user-experience, editorial, and technology team work together to produce in-house sites. Most commonly, intranets are managed by the communications, HR or CIOdepartments of large organizations, or some combination of these.

Because of the scope and variety of content and the number of system interfaces, intranets of many organizations are much more complex than their respective public websites. Intranets and their use are growing rapidly. According to the Intranet design annual 2007 from Nielsen Norman Group, the number of pages on participants' intranets averaged 200,000 over the years 2001 to 2003 and has grown to an average of 6 million pages over 2005–2007.

Benefits:

Workforce productivity:

Intranets can help users to locate and view information faster and use applications relevant to their roles and responsibilities. With the help of a web browser interface, users can access data held in any database the organization wants to make available, anytime and — subject to security provisions — from anywhere within the company workstations, increasing the employees ability to perform their jobs faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users.

- **Time:**

  Intranets allow organizations to distribute information to employees on an as-needed basis; Employees may link to relevant information at their convenience, rather than being distracted indiscriminately by email.

- **Communication:**

  Intranets can serve as powerful tools for communication within an organization, vertically strategic initiatives that have a global reach throughout the organization. The type of information that can easily be conveyed is the purpose of the initiative and what the initiative is aiming to achieve, who is driving the initiative, results achieved to date, and who to speak to for more information. By providing this information on the intranet, staff has the opportunity to keep up-to-date with the strategic focus of the organization. Some examples of communication would be chat, email, and/or blogs. A great real-world example of where an intranet helped a company communicate is when Nestle had a number of food processing plants in Scandinavia. Their central support system had to deal with a number of queries every day. When Nestle decided to invest in an intranet, they quickly realized the savings. McGovern says the savings from the reduction in query calls was substantially greater than the investment in the intranet.

- Web publishing allows cumbersome corporate knowledge to be maintained and easily accessed throughout the company using hypermedia and Web technologies.

  Examples include: employee manuals, benefits documents, company policies, business standards, news feeds, and even training, can be accessed using common Internet standards (Acrobat files, Flash files, CGI applications). Because each business unit can update the online copy of a document, the most recent version is usually available to employees using the intranet.

- **Business operations and management:**

  Intranets are also being used as a platform for developing and deploying applications to support business operations and decisions across the internetworked enterprise.

- **Cost-effective:**

  Users can view information and data via web-browser rather than maintaining physical documents such as procedure manuals, internal phone list and requisition forms. This can potentially save the business money on printing, duplicating documents, and the environment as well as document maintenance overhead. For example, the HRM company PeopleSoft "derived significant cost savings by shifting HR processes to the intranet". McGovern goes on to say the manual cost of enrolling in benefits was found to be USD109.48 per enrollment. "Shifting this process to the intranet reduced the cost per enrollment to $21.79; a saving of 80 percent". Another company that saved money on expense reports was Cisco. "In 1996, Cisco processed 54,000 reports and the amount of dollars processed was USD19 million".

- **Enhance collaboration:**

  Information is easily accessible by all authorized users, which enables teamwork.

- **Cross-platform capability:**

  Standards-compliant web browsers are available for Windows, Mac, and UNIX.

- **Built for one audience:**

  Many companies dictate computer specifications which, in turn, may allow Intranet developers to write applications that only have to work on one browser (no cross-browser compatibility issues). Being able to specifically address your "viewer" is a great advantage. Since Intranets are user-specific (requiring database/network authentication prior to access), you know exactly who you are interfacing with and can personalize your Intranet based on role (job title, department) or individual ("Congratulations Jane, on your 3rd year with our company!").

- **Promote common corporate culture:**

  Every user has the ability to view the same information within the Intranet.

- **Immediate updates:**

  When dealing with the public in any capacity, laws, specifications, and parameters can change. Intranets make it possible to provide your audience with "live" changes so they are kept up-to-date, which can limit a company's liability.
- Supports a distributed computing architecture: The intranet can also be linked to a company’s management information system, for example a time keeping system.

5.2.4 E-Commerce:

E-Commerce is the electronic trade with goods and services. E-Commerce means an electronic integration of processes across companies using information- and communication technologies in order to eliminate media disruptions. In e-commerce business processes and information transfers are conducted electronically in order to improve the efficiency of processes and to accelerate them. For instance, Chain Execution-Suites/-Software is an efficient support for e-commerce solutions.

1.Introduction

As computer networks and communication technology is developing rapidly, especially in the popularization and application of the Internet, social economy is experiencing a great change. As the inevitable product of the network economy, ecommerce set off a revolution in the economic field, the human way of thinking and life have had a profound impact. Responded to this sudden surge of e-commerce tide, many enterprises are most concerned about is how to solve business through ecommerce supply chain management issues, the ecommerce raised to the strategic position of supply chain management so that the ecommerce can infiltrate the process of supply chain management to improve supply chain performance levels. In this paper, e-commerce and supply chain management issues related to a preliminary study.

2.Relationships between E-Commerce and Supply Chain Management

2.1 Concepts of E-Commerce and Supply Chain Management as the Internet's Rapid Development Has Created a Web-Based Information-Trading Way

It is a means of computer technology by means of electronic transactions within the world and completes a variety of business activities, transactions, financial activities and related integrated services activities. Simply to point out, e-commerce is 654 G. Yang conducted through the Internet computer network products, trading, payment and services and other economic activities. For enterprises, the overall goal of ecommerce includes:

1. to help companies establish sales network around the world;
2. to provide enterprises with information and data of various business activities, production and sales information to solve the difficult problem of collection;
3. to reduce market entry link that help companies open up the market to minimize the circulation of goods;
4. to reduce business cost of sales and minimize the transaction costs of goods;
5. Both for trading and online commodity trading to facilitate negotiations;
6. to provide the most reliable quality assurance;
7. to provide customers the most convenient means for retrieval. Supply Chain Management (Supply Chain Management, referred to SCM) is based on customer demand, providing a common focus on the related products or services, enterprise information resources, software products based on Internet technology as a tool to manage, the entire channel which all relevant processes to maximize net value added, and improve the efficiency and effectiveness of a platform.

2.2 E-Commerce in Supply Chain Management Application, the Main Task of the Supply Chain Management Is to Coordinate the Formation from the Order to Complete the Orders and Ship the Product in the Process of the Service and Information Exchange

With the continuous development of e-commerce, e-commerce environment, the supply chain between the various companies that engaged in business activities can be increased, e-commerce application of the supply chain management reflected more and more important role.

E-commerce in supply chain management application fully illustrated

E-commerce and supply chain management that are complementary based on the successful implementation of e-commerce, which is an excellent supply chain management support. Through the supply chain management on information flow and capital flow for effective integration and control, e-commerce of business activities delivered the right product to the right customers at the lowest cost to achieve maximum economic benefits.

ROLE OF E-COMMERCE IN SCM

E-commerce will give businesses more flexibility in managing the increasingly complex movement of products and information between businesses, their suppliers and customers.

Customer Orientation

E-commerce will help companies deliver better services to the customers, and lower their operating costs. E-commerce makes it easier for customer to do business with the companies.

Online shipping enquiry:

This gives instant shipping information access to anyone in the company, from any location. A customer's transportation costs and performance can be analyzed, thus helping the customer negotiate rates and improved services.

Electronic commerce and the internet are fundamentally changing the nature of supply chains, and redefining how consumers learn about, select, purchase, and use products and services.

They also provide customized products and services.

Benefits of e-commerce

- Banks and their collateral managers can exercise better control over the execution of the transactions they fund, an important factor when financing trade in commodities. Depending on industry demand, electronic warehouse receipts could also be linked into the system, for example to start the funding chain of the coffee that is to be procured, processed for export and shipped. Or coffee could be tendered to commodity exchanges such as New York and London, linking into systems as e-COPS for example.
- All concerned, including the bankers, can see the progress of the goods and, therefore, the progress of the transaction.
- Shipping documents are prepared, issued and transmitted more quickly, resulting in earlier payment. · Turnover is faster, meaning more business within the same amount of working capital, or a reduction of the working capital required.
- Costs are lower: less interest, no errors, no lost or late documents, no arguments, no waiting for shipping documents.
- Sellers have better control. So, do importers and roasters, who can trace both coffee and documents.
- In some consuming countries, special arrangements permit coffee to be cleared through customs ahead of arrival, resulting in direct dispatch from ship to final destination. This could bring many exporters closer to participation in the just-in-time supply systems of larger roasters.

5.2.5 Advanced Planning System:

Advanced planning and Scheduling:

Advanced Planning and Scheduling (APS) is a system of techniques that deal with analysis and planning of logistics and manufacturing during short, intermediate, and long-term time periods. APS describes any computer program that uses advanced mathematical algorithms or logic to perform optimization or simulation on finite capacity scheduling, sourcing, capital planning, resource planning, forecasting, demand management, and others. These techniques simultaneously consider a range of constraints and business rules to provide real-time planning and scheduling, decision support, available-to-promise (ATP), and capable-to-promise capabilities. APS often generates and evaluates multiple scenarios. Management then selects one scenario to use as the "official plan." An APS system allocates raw materials and production capacity optimally to balance demand and plant capacity.

The five main components of APS systems

1. demand planning,
2. production planning,
3. production scheduling,
4. distribution planning, and,
5. transportation planning.

Organizations in manufacturing and retail are now using multiple applications like enterprise resource planning (ERP), supply chain management (SCM), and advance planning and scheduling (APS) to optimize the production and distribution processes. Each business application has its own features and functions, but there is a definite overlap between these applications. When these applications integrate with each other they can deliver optimized business operations and increase return on investment (ROI), which gives greater value on investment (VOI) for the organization. In an in-depth article, analyst KhudsiyaQuadri of

Technology Evaluation Centers (TEC) explores the major differences between APS, SCM, and ERP are and how these applications complement each other.

5.2.6 Bar Codes - The Easy way for SCM efficiency

Introduction

With the advent of liberalization and globalization of the Indian economy since the last decade, working to global standards and matching them has become a necessity for the Indian industry. All over the developed world work is done by minimum number of people and in an efficient manner without errors. This they achieve by the use of automation techniques. In automation, the bedrock is accurate and efficient data capturing. In automatic data capture the various technologies available are Electronic vision. Magnetic Stripe, Magnetic Character Recognition, Optical Character Recognition, Voice Data Entry, Radio Frequency, Infrared, Biometric Identification and Barcodes. The technology most economical and most popular is barcode technology.

BARCODE-Technology:

Barcodes are used to capture data quickly and accurately into a computer. Used properly, barcodes can replace or enhance paper based tracking and data collection. In today's fast, paced business world bar coding is becoming a necessity, not an option. Any company's future may soon depend upon the implementation of such a system.

A wide variety of bar-code printing and scanning solutions capable of handling most complex needs are available. With the implementation of data collection system, the need for keying and re-keying is totally eliminated. Since the data is read and written by machine, possibilities of human error are avoided, shop floor paperwork is almost eliminated, thus decreasing worker time for clerical functions. Tum-around time is reduced with the availability of data/information via the local departmental computer. Better co-ordination of

material, machine, tool and labor result in faster total through put and less wait time for jobs. The focus of the barcode solutions is to bring about the following desired results for the industry.

A high-tech material tracking system enhances employee productivity:

This system integrates bar codes and a sophisticated customized software package that enables users to monitor and manage material movement within warehouses, manufacturing, distribution and utility facilities in real time. These systems are modular and can be used for receiving, storage, picking and transporting and inventory control. Each of these systems can be used independently or integrated to form a comprehensive material tracking system.

Employee time and attendance systems:

This is successfully deployed at various offices and manufacturing facilities. The system uses a bar code swipe reader with inbuilt memory, which is placed at the entrance and transfers the time and attendance data on-line or off-line to the main computer system of the complex. Customized software package is used to integrate the system with the existing computer network to provide instant reports like late coming, early leaving, leave status, current attendance strength, complete employee record, etc. Furthermore, the system can be integrated to provide complete payroll of employee including statutoryrequirementsas PF, ESI, etc.

Capital asset management:

All organization has a number of assets-small and large-like computers, printers, fax machines, telephones, tables, chairs, etc. In order to ensure proper and optimal usage of these assets it is desirable to have a proper maintenance to stocks with respect to time of issue,

person to whom it has been issued, readily available information of assets at any given time and its present location?

Normally this task is carried out manually leading to delays, errors and ultimately to mismatch between actual stocks and book stocks. Barcodes offer the best and most convenient solution for accurate and online data handling of all assets along with their present location.

Library automation solution:

A fully barcode integrated Library Management Software can provide not only Issue/Return through barcodes but also the stocktaking and dynamic location tagging can be done through barcodes. This provides complete control over library functions. Bar codes assist in easy and efficient tracking of books while reducing data errors. An important feature of the software is its On Line Public Access Catalogue (OPAC). This system facilitates search of a book using various criteria like title, author's name, publisher's name, subject, ISBN, class number, etc. OPAC has a multi feature advance search function which enables the user to find out the exact location of the book he needs (even if the book is in a wrong location) and also whether the book is available or issued out. It even provides information on when the book is expected back.

5.6.7 Telecommunications network:

Telecommunications network, electronic system of links and switches, and the controls that govern their operation, that allows for data transfer and exchange among multiple users. When several users of telecommunications media wish to communicate with one another, they must be organized into some form of network. In theory, each user can be given a direct point-to-point link to all the other users in what is known as a fully connected topology (similar to the connections employed in the earliest days of telephony), but in

practice this technique is impractical and expensive especially for a large and dispersed network. Furthermore, the method is inefficient, since most of the links will be idle at any given time. Modern telecommunications networks avoid these issues by establishing a linked network of switches, or nodes, such that each user is connected to one of the nodes. Each link in such a network is called a communications channel. Wire, fiber-optic cable, and radio waves may be used for different communications channels.

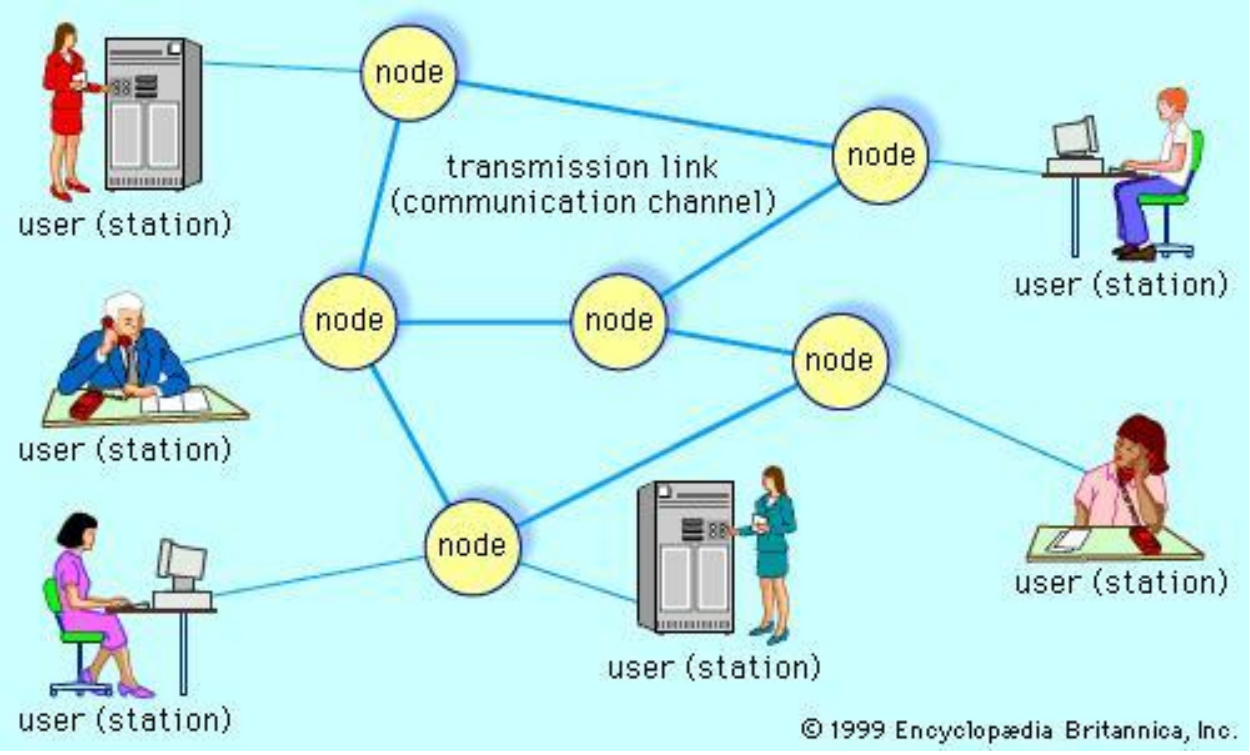


Fig No:14 Telecommunication Network

Types of Networks

Switched communications network:

A switched communications network transfers data from source to destination through a series of network nodes. Switching can be done in one of two ways. In a circuit-switched network, a dedicated physical path is established through the network and is held for as long as communication is necessary. An example of this type of network is the traditional (analog) telephone system. A packet-switched network, on the other hand, routes digital data in small pieces called packets, each of which proceeds independently through the network. In

a process called store-and-forward, each packet is temporarily stored at each intermediate node, then forwarded when the next link becomes available. In a connection-oriented transmission scheme, each packet takes the same route through the network, and thus all packets usually arrive at the destination in the order in which they were sent. Conversely, each packet may take a different path through the network in a connectionless or datagram scheme. Since datagrams may not arrive at the destination in the order in which they were sent, they are numbered so that they can be properly reassembled. The latter is the method that is used for transmitting data through the Internet.

Broadcast network:

A broadcast network avoids the complex routing procedures of a switched network by ensuring that each node's transmissions are received by all other nodes in the network. Therefore, a broadcast network has only a single communications channel. A wired local area network (LAN), for example, may be set up as a broadcast network, with one user connected to each node and the nodes typically arranged in a bus, ring, or star topology, as shown in the figure. Nodes connected together in a wireless LAN may broadcast via radio or optical links. On a larger scale, many satellite radio systems are broadcast networks, since each Earth station within the system can typically hear all messages relayed by a satellite.

Network Access:

Since all nodes can hear each transmission in a broadcast network, a procedure must be established for allocating a communications channel to the node or nodes that have packets to transmit and at the same time preventing destructive interference from collisions (simultaneous transmissions). This type of communication, called multiple access, can be established either by scheduling (a technique in which nodes take turns transmitting in an orderly fashion) or by random access to the channel.

Scheduled access:

In a scheduling method known as time-division multiple accesses (TDMA), a time slot is assigned in turn to each node, which uses the slot if it has something to transmit. If some nodes are much busier than others, then TDMA can be inefficient, since no data are passed during time slots allocated to silent nodes. In this case a reservation system may be implemented, in which there are fewer time slots than nodes and a node reserves a slot only when it is needed for transmission.

A variation of TDMA is the process of polling, in which a central controller asks each node in turn if it requires channel access, and a node transmits a packet or message only in response to its poll. “Smart” controllers can respond dynamically to nodes that suddenly become very busy by polling them more often for transmissions. A decentralized form of polling is called token passing. In this system, a special “token” packet is passed from node to node. Only the node with the token is authorized to transmit; all others are listeners.

Random access:

Scheduled access schemes have several disadvantages, including the large overhead required for the reservation, polling, and token passing processes and the possibility of long idle periods when only a few nodes are transmitting. This can lead to extensive delays in routing information, especially when heavy traffic occurs in different parts of the network at different times—a characteristic of many practical communications networks. Random-access algorithms were designed specifically to give nodes with something to transmit quicker access to the channel. Although the channel is vulnerable to packet collisions under random access, various procedures have been developed to reduce this probability.

Carrier Sense Multiple Access:

One random-access method that reduces the chance of collisions is called carrier sense multiple access (CSMA). In this method, a node listens to the channel first and delays transmitting when it senses that the channel is busy. Because of delays in channel propagation and node processing, it is possible that a node will erroneously sense a busy channel to be idle and will cause a collision if it transmits. In CSMA, however, the transmitting nodes will recognize that a collision has occurred: the respective destinations will not acknowledge receipt of a valid packet. Each node then waits a random time before sending again (hopefully preventing a second collision). This method is commonly employed in packet networks with radio links, such as the system used by amateur radio operators.

It is important to minimize the time that a communications channel spends in a collision state, since this effectively shuts down the channel. If a node can simultaneously transmit and receive (usually possible on wire and fiber-optic links but not on radio links), then it can stop sending immediately upon detecting the beginning of a collision, thus moving the channel out of the collision state as soon as possible. This process is called carrier sense multiple access with collision detection (CSMA/CD), a feature of the popular wired Ethernet. (For more information on Ethernet, see computer: Local area networks.)

Spread-spectrum multiple accesses:

Since collisions are so detrimental to network performance, methods have been developed to allow multiple transmissions on a broadcast network without necessarily causing mutual packet destruction. One of the most successful is called spread-spectrum multiple access (SSMA). In SSMA simultaneous transmissions will cause only a slight increase in bit error probability for each user if the channel is not too heavily loaded. Error-free packets can be obtained by using an appropriate control code. Disadvantages of SSMA

include wider signal bandwidth and greater equipment cost and complexity compared with conventional CSMA.

Open Systems Interconnection:

Different communication requirements necessitate different network solutions, and these different network protocols can create significant problems of compatibility when networks are interconnected with one another. In order to overcome some of these interconnection problems, the open systems interconnection (OSI) was approved in 1983 as an international standard for communications architecture by the International Organization for Standardization (ISO) and the International Telegraph and Telephone Consultative Committee (CCITT). The OSI model, as shown in the figure, consists of seven layers, each of which is selected to perform a well-defined function at a different level of abstraction. The bottom three layers provide for the timely and correct transfer of data, and the top four ensure that arriving data are recognizable and useful. While all seven layers are usually necessary at each user location, only the bottom three are normally employed at a network node, since nodes are concerned only with timely and correct data transfer from point to point.

Data recognition and use:

The application layer is difficult to generalize, since its content is specific to each user. For example, distributed databases used in the banking and airline industries require several access and security issues to be solved at this level. Network transparency (making the physical distribution of resources irrelevant to the human user) also is handled at this level. The presentation layer, on the other hand, performs functions that are requested sufficiently often that a general solution is warranted. These functions are often placed in a software library that is accessible by several users running different applications. Examples are text conversion, data compression, and data encryption.

User interface with the network is performed by the session layer, which handles the process of connecting to another computer, verifying user authenticity, and establishing a reliable communication process. This layer also ensures that files which can be altered by several network users are kept in order. Data from the session layer are accepted by the transport layer, which separates the data stream into smaller units, if necessary, and ensures that all arrive correctly at the destination. If fast throughput is needed, the transport layer may establish several simultaneous paths in the network and send different parts of the data over each path. Conversely, if low cost is a requirement, then the layer may time-multiplex several users' data over one path through the network. Flow control is also regulated at this level, ensuring that data from a fast source will not overrun a slow destination.

Data transfer:

The network layer breaks data into packets and determines how the packets are routed within the network, which nodes (if any) will check packets for errors along the route, and whether congestion control is needed in a heavily loaded network. The data-link layer transforms a raw communications channel into a line that appears essentially free of transmission errors to the network layer. This is done by breaking data up into data frames, transmitting them sequentially, and processing acknowledgment frames sent back to the source by the destination. This layer also establishes frame boundaries and implements recovery procedures from lost, damaged, or duplicated frames. The physical layer is the transmission medium itself, along with various electric and mechanical specifications.

5.6.8 Video conference and artificial intelligence:

DEFINITION of 'Video Conferencing'

A technology that allows users in different locations to hold face-to-face meetings without having to move to a single location. This technology is particularly convenient for business users in different cities or even different countries because it saves the time, expense and hassle associated with business travel. Uses for video conferencing include holding routine meetings, negotiating business deals and interviewing job candidates.

BREAKING DOWN 'Video Conferencing'

Video conferencing's main advantage over teleconferencing is that users can see each other, which allows them to develop stronger relationships. When a video conference is held for informal purposes, it is called a video call or video chat.

A virtual office is a business location that exists only in cyberspace. A virtual office setup allows business owners and employees to work from any location by using technology such as laptop computers, cell phones and internet access. A virtual office can provide significant savings and flexibility compared to renting a traditional office space. Meetings can be conducted via teleconferencing and video conferencing, and documents can be transmitted electronically. Some companies even provide virtual office services to give virtual offices the prestige associated with physical offices, such as an important-sounding address, a professional phone-answering service and even occasional rental of office space and conference rooms.

5.6.9 ArtificialIntelligence:

What is Artificial Intelligence?

According to the father of Artificial Intelligence, John McCarthy, it is “The science and engineering of making intelligent machines, especially intelligent computer programs”.

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.

AI is accomplished by studying how human brain thinks and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

Philosophy of AI

While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, "Can a machine think and behave like humans do?" Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

Goals of AI

- To Create Expert Systems − the systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.
- To Implement Human Intelligence in Machines − Creating systems that understand, think, learn, and behave like humans.

What Contributes to AI?

Artificial intelligence is a science and technology based on disciplines such as Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. A major thrust of AI is in the development of computer functions associated with human intelligence, such as reasoning, learning, and problem solving. Out of the following areas, one or multiple areas can contribute to build an intelligent system.

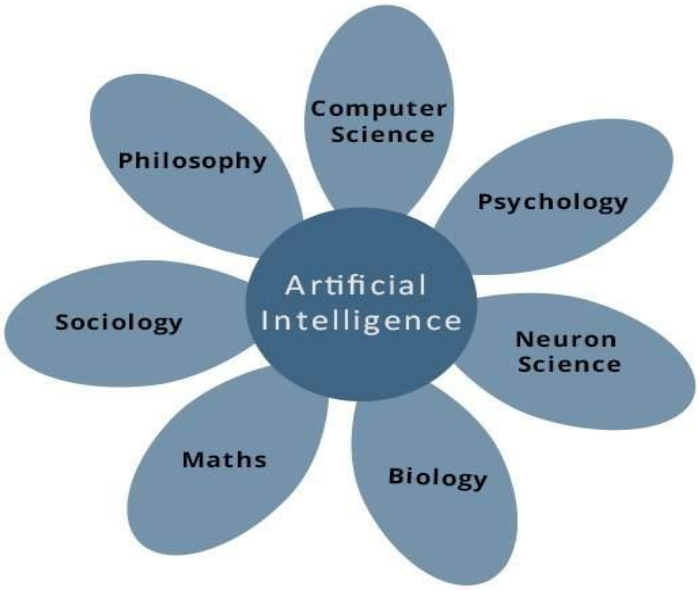


Fig No:15 Artificial Intelligence

Programming Without and with AI:

The programming without and with AI is different in following ways −

Programming Without AI	Programming With AI
A computer program without AI can answer the specific questions it is meant to solve.	A computer program with AI can answer the generic questions it is meant to solve.
Modification in the program leads to change in its structure.	AI programs can absorb new modifications by putting highly independent pieces of information together. Hence you can modify even a minute piece of information of program without affecting its structure.
Modification is not quick and easy. It may lead to affecting the program adversely.	Quick and Easy program modification.

Applications of AI:

AI has been dominant in various fields such as −

- Gaming − AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.
- Natural Language Processing − It is possible to interact with the computer that understands natural language spoken by humans.
- Expert Systems − There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.
- Vision Systems − these systems understand, interpret, and comprehend visual input on the computer. For example,
    - A spying aero plane takes photographs, which are used to figure out spatial information or map of the areas.
    - Doctors use clinical expert system to diagnose the patient.
    - Police use computer software that can recognize the face of criminal with the stored portrait made by forensic artist.
- Speech Recognition − Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talk to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.
- Handwriting Recognition − The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

- Intelligent Robots − Robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure. They have efficient processors, multiple sensors and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

5.7 Best practice in supply chain management:

"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," according to the Council of Supply Chain Management Professionals (CSCMP), the premier supply chain management association. "In essence, supply chain management integrates supply and demand management within and across companies." In most corporations, SCM is important from both a cost and revenue perspective. It is not unusual for supply chain costs to represents 50 percent to 75 percent of the total expenditures. Thus, properly managing the supply chain can create a competitive advantage.

According to academic researchers in the Department of Supply Chain Management and Marketing Sciences (SCMMS) at the Rutgers Business School, the following 10 best practices, if implemented properly, can create a strong competitive advantage for a firm in today's dynamic market.

1) Begin with your customers

The goal of a supply chain is to deliver products or services to customers when and where they are needed. An enlightened supply chain manager understands the needs and service requirements of the organization's customers. A strong supply chain always

collaborates directly with its customers on the forecasting of demand, replenishing of supplies, and on the development of innovative products, services and business processes. Allowing the market demand to drive the operations of all partners involved reduces the needs for forecasting, the level of forecasting errors and the wastes caused by forecasting errors (e.g. poor customer service, poor capacity utilization, excessive inventory). Working directly with customers creates real value for every business partner in a supply chain.

2) Engage senior management

You need to ask yourself, "Does SCM have a seat at the senior management table?" If not, you need to engage senior management in the important role that SCM can play in achieving your organization's strategic objectives. While the trend has been positive in recent years, many CEOs still view SCM as a "cost." Reducing costs is all that matters to them. Supply chain management can create real value for a firm but, to be really successful, SCM needs a seat at the management table.

3) Manage and recruit SCM talent

Many supply chain best practices are well known, but how you implement them requires talented people. Importantly, there is a real shortage of talented SCM professionals available. As an expert from Rutgers'Center for Supply Chain Management points out, "We get lots of resumes but few that are exceptional." Top management must take a leadership role in the acquisition and development of highly skilled supply chain professionals.

4) Build your supply chain with intelligence

Today's supply chains are very complex and quite large in scope. In order to be efficient and effective in managing these supply chains, one must implement a world class Enterprise Resource Planning (ERP) system to support its information flows. Best-in-class companies implement business process best practices in conjunction with ERP systems. In a

recent PRTM consulting group study, implementing business best practices in conjunction with a best-in-class ERP system, increased the profitability of the firms by 75%. ERP is an important enabler to optimize customer service and inventory, logistics execution and increased visibility across the supply chain with both internal and external partners.

5) Optimize your IT network

Some of the most strategic SCM issues are where plants and warehouses should be located, how big they should be, and how to get the right balance between costs and service. While it is a very complex problem, software is available to solve this dilemma. Based on the authors' personal experience,implementing this strategy has the potential to dramatically reduce costs and improve customer service.

6) Outsource non-core functions and processes

Whether we like it or not, the trend of outsourcing and off shoring is here to stay. While it always has to be addressed strategically, outsourcing has to be considered, particularly for non-core functions or processes. If strategically aligned and properly managed, outsourcing has the potential to dramatically lower costs, increase flexibility, and allow you to focus on your core competencies. A good example is the Apple i-phone, which has been completely outsourced to Asia while Steve Jobs and his company focus on innovation and marketing.

7) Adopt and implement a best-in-class sourcing strategy

Although it varies from industry to industry, a typical manufacturing company has approximately two thirds of their total cost of goods sold in purchased raw materials, components and packaging from outside suppliers. Implementing a professional procurement organization and strategic sourcing initiatives that consolidate suppliers is the fastest way to save money, increase margins and improve operating profits. For this reason, executives rank

strategic sourcing as the number one action being taken to reduce costs. Additionally, by identifying and working with your key suppliers (or partners), you have the potential to deliver 2-3 times more value for each dollar spent in purchasing3.

8) Manage risk

As businesses continue to expand globally, increased outsourcing and off-shoring, and practicing lean manufacturing techniques (with minimal inventories), drastically increases risks. It is extremely important to manage these risks and implement plans to mitigate major exposures where possible. As Warren Buffett says, “It takes 20 years to build a reputation and five minutes to ruin it. If you think about that, you'll do things differently.”

9) Establish key performance indicators/metrics

It goes without saying that you can’t expect to improve what you don’t measure. It is critical that SCM has a robust set of metrics or key performance indicators (KPIs) that drive the right behavior. Too many times we see too many metrics that are not driving the right behavior or, worse; no one is paying attention to them. Lastly these KPIs must be directly linked to individual performance appraisals to drive accountability.

10) Build your sustainability

Every supply chain is facing furious challenges today. These challenges will only become worse in future years. How do you develop a business strategy so you can stay strong? Building your supply chain sustainability is a key.The Institute for Supply Management (ISM) defines sustainability as “The ability to meet current needs without hindering the ability to meet the needs of future generations in terms of economic, environmental and social challenges.” In short, supply chain strategies must not only consider how to meet immediate business objectives, but also evaluate if these strategies enable a strong economic, environmental and socially responsible future.

5.8Organizational issues to implement Supply Chain Management:

Supply chain managers have seen increasing challenges to create, and keep, efficient and effective supply chain methods. Here we discuss five of the biggest supply chain challenges.

- Customer service - Supply chain management is all about providing the right product in the right quantity to the right place and the right time. Seems simple, but can get complicated...quickly.
- Cost control - Operating costs are under extreme pressure by rising energy/fuel and freight costs, greater number of global customers, technology, increasing labor rates and new regulations and rising commodity prices.
- Planning & risk management - In order to stay as efficient and effective as possible, periodic assessments and redesigns are needed. These adjustments are in response to changes in the market - changes such as new product launches, global sourcing, credit availability and the need to protect intellectual property. These risks must be identified and quantified in order to control and mitigate.
- Supplier/partner relationship management - It is important to create, understand and follow mutually agreed upon standards to better understand current performance and opportunities for improvement. Having two different methods for measuring and communicating performance and results wastes time and effort. Trust the system that was put in place for consistent results and better supplier/partner relationships.
- Talent - This was touched on in a previous post. It is becoming increasingly more difficult to find qualified and interested talent. Supply chain leaders need an extensive understanding of the key competencies and duties needed for supply chain management roles and the ability to efficiently source specific skill sets and methods for developing future leaders.

Current supply chains are growing in complexity due to several factors. We, the customers, are demanding innovative products at the right time and at a reasonable price. This creates challenges for companies since creating both responsive and cost-effective supply chains is critically difficult. I find these challenges exciting and that's why I decided to pursue a career in the field. Let me expand on today's main supply chain challenges.

Globalization:

One of the biggest challenges that companies are facing is how to reduce their supply chain cost. In order to satisfy customers' price expectations, companies have opted to relocate manufacturing to low cost countries around the world in an effort to reduce direct and indirect costs and to minimize taxes. But, having global suppliers contributes significantly to complexity that comes from extended delivery lead times. Customers not only want lower prices, but they also want their products on time.

Customer Preferences:

As stated above, global supply chains are complex. Add to that product features that are constantly changing, and the challenge is even greater. A product is released and customers rapidly pressure companies to come up with the next big thing. Innovation is important since it allows companies to stay competitive in the market, but it's also a challenge. To enhance a product, companies have to redesign their supply network and meet market demand in a way that's transparent for customers.

Market Growth:

Another factor that presents a challenge is the pursuit of new customers. The cost of a developing a product, from R&D to product introduction, is significant. Therefore, companies are trying to expand their distribution to emerging markets in order to grow

revenues and increase market share. Companies all around the world are expected to expand in their home and foreign markets. The introduction to new markets is difficult due to trading policies, fees, and government policies.

Customers' expectations nowadays are more demanding than ever. As described here, companies have responded with global networks, product innovation, and market expansions. This means that companies now rely on supply chain managers to optimize their value chains in order to stay competitive. As such, it's no surprise that these professionals are in high demand. So, customers, rest assured - experts in supply chain management, including our own Grainger Center graduates - are behind the scenes tackling these complexities each and every day and are eager to delight the customer experience.

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