Supply Chain Management (Short Course)

This course covers the following topics:

Topic 1

Introduction to Supply Chain

The concept of Supply Chain Management originated in the late 1980s and became popular in the 1990s. Before the arrival of this concept, the terms operation management and logistics were used by the businesses. The following are several popular definitions of what a Supply Chain means.

- "A supply chain is the alignment of firms that bring products or services to market."—from Lambert, Stock, and Ellram
- "A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves . . ."
  —from Chopra and Meindl
- "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."—from Ganeshan and Harrison

A **SUPPLY CHAIN is** comprised of a series of organisations and activities that are carried out as the materials move on their passage from primary suppliers to end customers.

What is Supply Chain Management

Supply Chain Management is the process of planning and maintaining the *movement* of materials and products among a number of companies to supply goods and services to final consumers. Suppose you want to buy a new car because your current model has worn out. You require a four-cylinder sedan with a mechanical gearbox, four doors, and air conditioning. This car needs 8,000 parts from 300 suppliers from different regions all over the globe. Consider the basic supply chain for a GM car which includes an ignition module manufactured by a firm called Bosch from metal tools supplied by Kawasaki Steel and assembled into the completed car by G M, which keeps a stock of finished cars. You intended to buy the finished car from a dealership in Melbourne, Australia. The basic supply chain is shown in the following Figure -

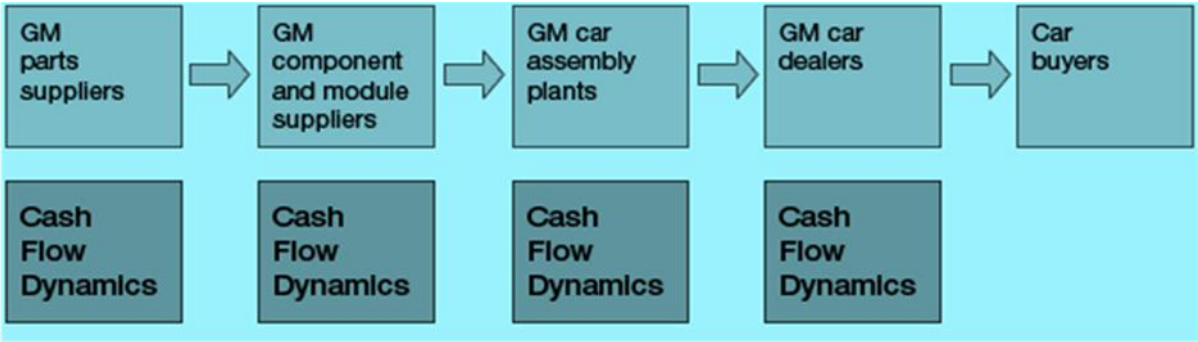


Fig: 1

Basic Supply Chain – Physical Movements

Until now, we have emphasized about the flow of materials through a single organisation. In reality, businesses do not work in seclusion, but each one acts as a consumer when it buys material from its own suppliers and then, it acts as a provider when it delivers materials to its consumers. A wholesaler, for instance, acts as a consumer when buying goods from producers, and then as a seller when selling goods to retail shops. A part maker buys raw materials from its suppliers, collects these into components, and passes the outcomes to other manufacturers. Most products flow through a chain of organisations as they travel between primary suppliers and end customers. Milk moves through a farm, tanker collection, dairy, bottling plant, distributor, and supermarket before we purchase it.

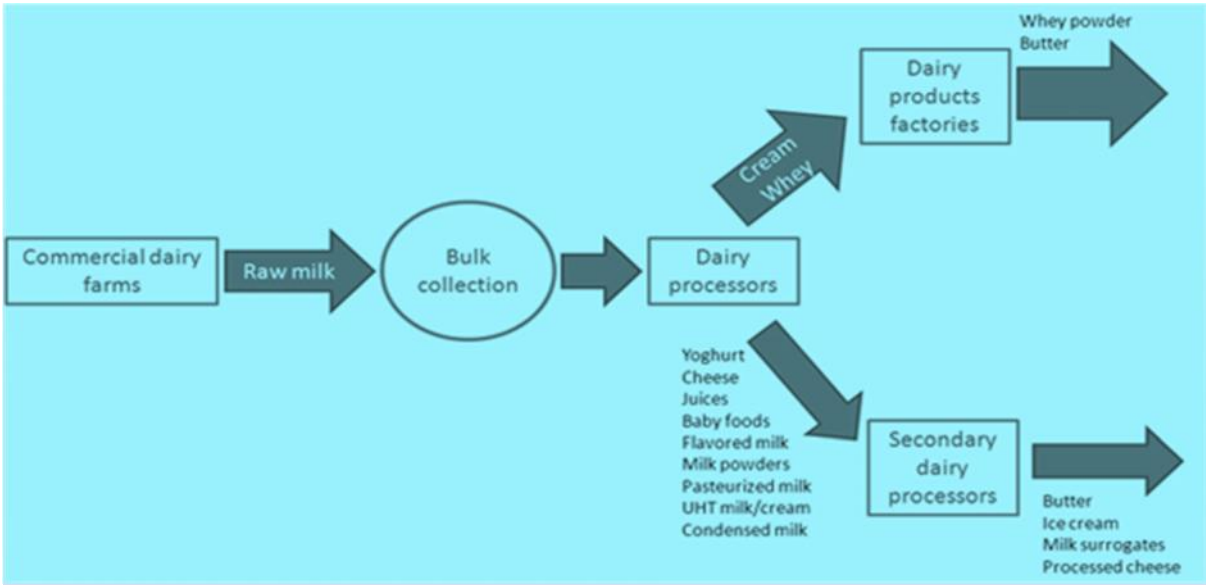


Fig: 2

A toothbrush starts its trip with a corporation that extracts crude oil and then, it passes through pipelines, refineries, chemical works, plastics companies, manufacturers, importers, wholesalers and retailers before consumed in your bathroom. A sheet of paper moves through numerous organisations before you put it on your desk. People use diverse names for these chains of activities and organisations.

Fig: 3

When they highlight the operations, which is considered the **process**; when they focus on marketing, they call it a **logistics channel**; when they emphasize the value added, they call it a **value chain**, when they observe how shopper demands are fulfilled, they call it a **demand chain**. All this makes a **supply chain**.

In other words, we can explain this definition in the following way -

A SUPPLY CHAIN is comprised of a chain of activities and organisations in which materials flow on their journey from primary suppliers to end customers.

Each product has its own exclusive supply chain and these supply chains can be extended and difficult. For instance, the supply chain for Cadbury begins with cocoa beans growing on farms and ends with the delivery of chocolate bars to hungry consumers. The supply chain for Levi jeans begins with cotton growing in a field and ends when you purchase the jeans in a shop. The supply chain represents the entire journey of materials as they flow 'from dirt to dirt'. During the trip, materials might flow through raw materials suppliers, finishing operations,manufacturers, logistics centres, third party operators, warehouses, transport companies, wholesalers, retailers,and an entire range of other operations. Sometimes, the supply chain moves beyond the endcustomer to add re-use and recycling of materials.

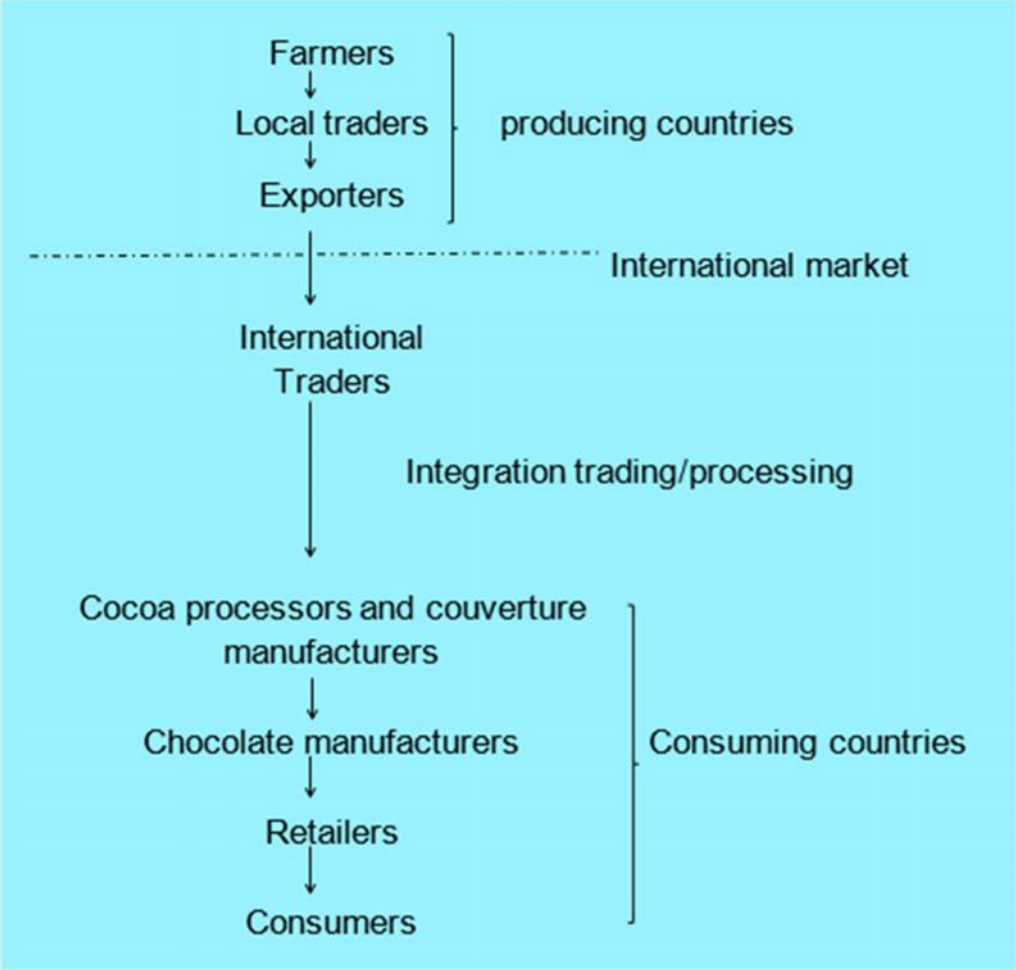


Fig: 4

There is a distinction between the idea of Supply Chain Management and the customary concept of logistics. Logistics usually refers to activities that happen within the boundaries of a particular organization and supply chains means networks of companies that work together and synchronize their actions to bring a product to market. Also, conventional logistics focuses its concentration on activities like procurement, distribution, protection, and inventory management. Supply Chain Administration acknowledges all of conventional logistics and also comprised of activities like marketing, finance, new product development, and customer service.

The Structure of a Supply Chain

The simplest way a supply chain works is when a single product passes through a chain of organisations, which, one way or other, adds value to the manufactured goods. Taking one organisation's perception, activities in front of it – flowing materials inwards – are called **upstream**; those after the organisation – flowing materials outwards – are called **downstream**.

The upstream activities are separated into **tiers** of suppliers. A supplier that drives materials straight to the operations is a first tier supplier; one that throws materials to a first tier supplier is a second tier supplier; one that sends materials to a second tier supplier is a third tier supplier, and so on back to the primary sources. Consumers are also divided into tiers. One that obtains a product straight from the operations is a first tier consumer; one that receives a product from a first tier consumer is a second tier customer; one that gets a product from a second tier customer is a third tier customer, and so on to end customers (see Figure 1.5)

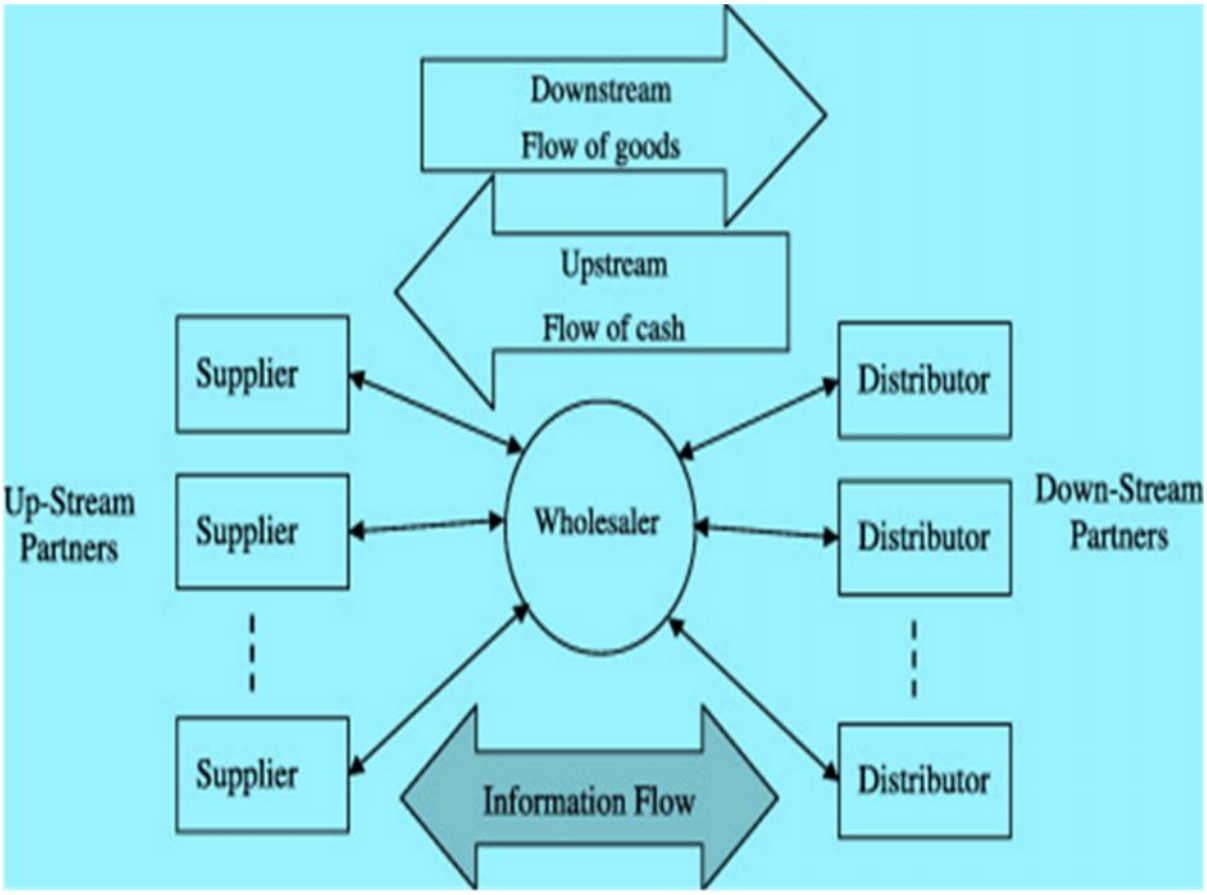


Figure 5 Activities in a supply chain

In practice, most of the organisations obtain materials from many suppliers, and sell products to a lot of diverse customers. Then the supply chain converges as raw materials flow in through the tiers of suppliers, and diverges as products flow out through tiers of customers. A producer may see sub-assembly providers as first tier suppliers, parts makers as second tier suppliers, materials suppliers as third tier suppliers, and so on. It may see wholesalers as first tier consumers, retailers as second tier consumers, and final users as third tier customers

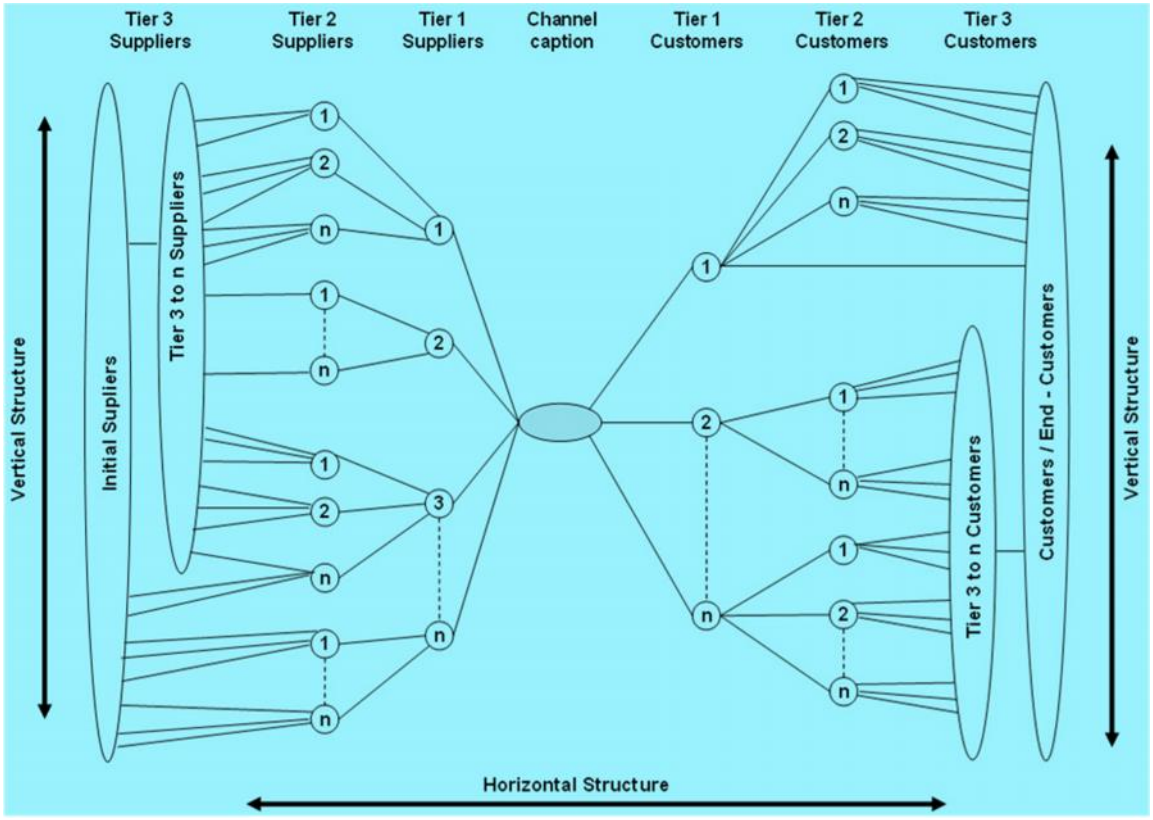


Figure 6 Supply chain around a manufacturer

It is quite easy to visualize the figure of a manufacturer's supply chain, but the majority organisations use the similar general approach. Airlines, for instance, shift passengers from pick-up points, through local feeder services to chief 'hub' airports, on to another hub, and then back out via local services to their destinations; banks collect all cheques in central clearing houses prior to sending them back to branches and customers; blood transfusion services have local centres that act as wholesalers for plasma. Every product has its own supply chain, and there are so many different configurations. Some are very small and simple – like a cook purchasing potatoes straight from a farmer. Others are astonishingly long and complex. A daily routine product like a shirt has an extensive trip from the farm growing cotton through to the end consumer. It also has a number of chains merging as buttons, dyes, polyester, and other materials connect the major process.

Supply chains deviates to take the demand from dissimilar types of consumer. Manufacturers of car components, for instance, sell some products to car assemblage plants, some to wholesalers for garages doing repairs, some to retail shops for customers, and some directly to customers via websites. Then, the supply chain split into divided strands with the same product following different routes.

Benefits of Supply Chains

Supply chains are so complex that you may doubt if there is some means of avoiding them. Sometimes, this is feasible, when we shift products directly from primary producers to final consumers – when, for instance, farm shops sell vegetables straight to consumers, or authors who issue their works on the Internet. In general, there are very fine reasons for having an extended supply chain. Suppose the residents of a town decide to purchase vegetables from a farm shop. This would have a negligible supply chain, but the entire population would travel alone to the farm. It would make more logic to have a transport business for collecting the vegetables and delivering them to a middle location in the town – like a supermarket. If the transport business delivers to one town, without difficulty it can deliver to other nearby towns as well, maybe by stopping at a depot to arrange local deliveries. As there is a depot, vegetables can be placed into storage while the supply is abundant, and detached when there are shortages. If the vegetables require cleaning or preparation, the transport business can redirect to a processing plant. Continuing in this mode, you can observe why a long supply chain expands, and what profits it brings.

Supply chains are developed to beat the gaps, which are formed when suppliers are some distance away from consumers. They permit for operations that are best completed – or can simply be done – at locations that are far-away from sources of materials or customers. For instance, coffee beans are cultivated in South America, but the major consumers are in Europe and North America. The most excellent locations for power stations are away from both their major customers in cities and their fuel supplies.

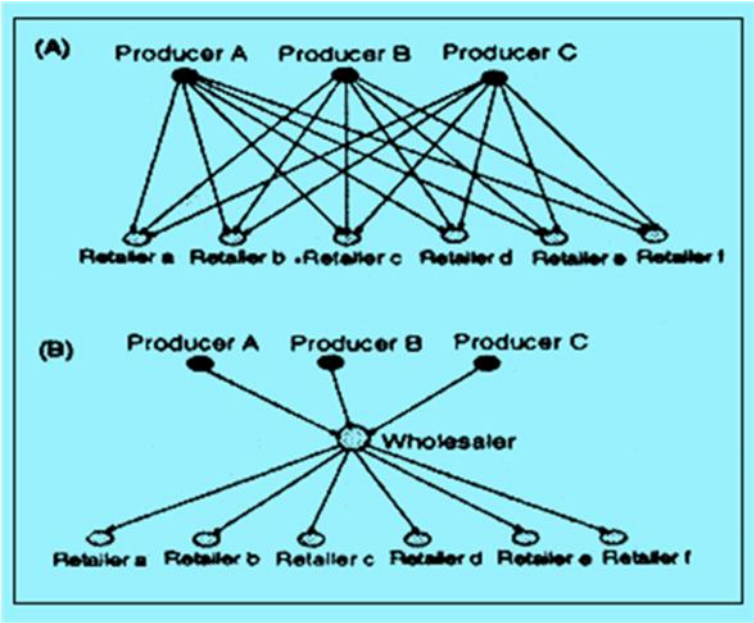


Fig: 7

Visualize four factories directly delivering products to eight consumers. Logistics has to systematize 32 diverse delivery routes, however, if the factories employ a central wholesaler, the number of routes can be cut to 12. The following list puts forward some other benefits of elegant supply chains (where we apply the terms 'wholesaler' and 'retailer' as a suitable label for intermediaries):

- Producers place operations in the finest locations, regardless of the locations of their consumers.
- By focused operations in big facilities, producers can obtain economies of scale.
- Producers do not maintain huge stocks of finished goods, as these are detained further down the supply chain closed to customers.
- Wholesalers put big orders, and producers pass on lesser unit costs in price discounts.
- Wholesalers maintain stocks from a lot of suppliers, giving retailers an alternative of goods.
- Wholesalers are close to retailers and have little lead times.
- Retailers take lesser stock as wholesalers offer reliable deliveries.
- Retailers can have minute operations, giving a reactive service close to customers.
- Transport is simpler, larger and fewer deliveries reducing costs.
  Organisations can expand expertise in particular kinds of operation.

There is a fundamental outline related to the practice of Supply Chain Management. Every supply chain has its own exclusive set of market demands and working challenges and yet the issues remain fundamentally identical in each case. Businesses in any supply chain must take decisions individually and jointly concerning their actions in the following five areas:

1. **Production** —what products does the market demand? How much of which products should be manufactured and by when? This activity comprises of the formation of master production schedules that consider plant capacities, quality control, workload balancing, and equipment preservation.
2. **Inventory** —what inventory should be placed in stock at every phase in a supply chain? How much stock should be held as raw materials, semi finished, or finished goods? The main reason of inventory is to act as a cushion against ambiguity in the supply chain. However, holding inventory can be costly, so what are the best inventory levels and reorder points?
3. **Location** —where should production facilities and inventory storage space be located? Where are the most inexpensive locations for production and for storage of stock? Should present facilities be used or new ones established? Once these decisions are made, they decide the potential paths which are accessible for products to flow through for delivery to the final customer
4. **Transportation** —how should stock be flown from one supply chain site to another? Air freight and truck delivery are usually fast and consistent but they are costly. Shipping by sea or rail is much less costly but generally involves longer transit times and more doubt. This doubt must be

remunerated for by stocking higher levels of inventory. When is it better to utilize which form of transportation?

5. **Information** —how much data should be gathered and how much information is to be shared? Timely and accurate information holds the guarantee of better coordination and better decision making. With fine information, people can make effective decisions concerning what to make and how much, about where to place inventory and how best to transfer it.

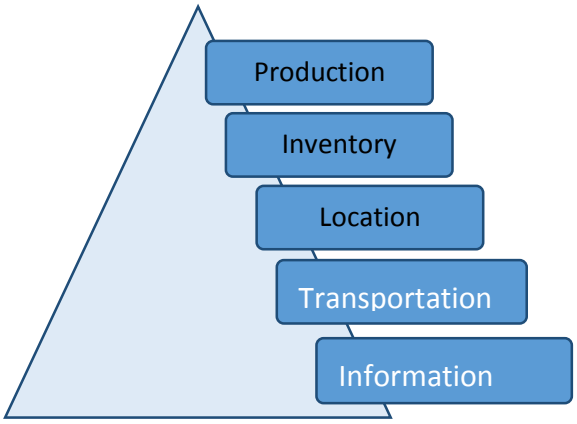
All these decisions will describe the effectiveness and capabilities of a company's supply chain. The things a business can do and the ways that it can struggle in its markets are all very much reliant on the success of its supply chain. If a company's policy is to serve a mass marketplace and fight on the basis of price, it had better have a supply chain that is optimized for lowest possible cost. If a company's strategy is to supply a market segment and fight on the basis of consumer service and expediency, it had better have a supply chain optimized for receptiveness. What is a business? What can a business do? This is shaped by its supply chain and by the markets it caters.

Topic 2

How the Supply Chain Works

As we saw in the earlier section, there are five areas where businesses can make decisions that will describe their supply chain capabilities:

- Production
- Inventory
- Location
- Transportation
- Information



Chopra and Meindl describe these areas as performance drivers that can be run to generate the capabilities required for a given supply chain.

Effectual Supply Chain Management calls first for a thoughtfulness of every driver and how it operates. Every driver has the skill to directly influence the supply chain and allow certain capabilities. The next step is to expand an approval for the results that can be acquired by mixing diverse combinations of these drivers. Let's begin by looking at the drivers individually.

Production

Production refers to the capability of a supply chain to create and store products. The facilities of production are warehouses and factories. The basic decision that managers encounter when making manufacturing decisions is how to decide the trade-off between efficiency and responsiveness. If warehouses and factories are constructed with a lot of surplus capacity, they can be extremely flexible and react quickly to broad swings in product demand. Whereas the facilities where approximately all capacity is being used already they are not able to responding easily to variations in demand. On the other hand, capacity costs cash and surplus capacity is inactive capacity not in use and not producing revenue. So the more surplus capacity that exists, the less well-organized the operation becomes. Factories can be constructed to house one of two approaches to manufacturing:

1. **Product Focus** —a factory that focuses on a product performs the variety of diverse operations necessary to make a given product line from production of diverse product parts to assembly of these parts.
2. **Functional Focus** —a functional approach focuses on performing only a few operations like simply making a select collection of parts or only doing assembly. These functions can be performed for making a lot of different types of products.

A product approach aims to result in developing skills regarding a given set of products at the cost of expertise regarding any specific function. A functional approach usually results in proficiency about particular functions rather than expertise in a given product. Companies need to make a decision which approach or what combination of these two approaches will provide them the ability and expertise they require to best react to consumer demands. As with factories, warehouses also can be built to house diverse approaches. There are three major approaches to utilize in warehousing:

1. **Stock Keeping Unit (SKU) Storage**— in this conventional approach, every kind of product, which is the same, is stocked up together. This is a competent and simple to understand means to hoard products.
2. **Job Lot Storage** —in this method, all kinds of different products are associated with the needs of a definite type of consumer or related to the requirements of a particular job are stored together. This permits for a well-organized picking and packing process but generally requires more storage room than the conventional SKU storage approach.
3. **Cross docking** — an approach that was founded by Wal-Mart in its drive to boost efficiencies in its supply chain. In this method, the product is not really warehoused in the facility. In its place the facility is deployed to house a procedure where trucks from suppliers enter and unload huge quantities of dissimilar products. These large lots are then broken down into smaller lots. Smaller lots of dissimilar products are recombined according to the requirements of the day and rapidly loaded onto outbound trucks that carry the products to their end destination.

Inventory

Inventory is spread throughout the entire supply chain and consists of everything from raw material to work in process to finished goods that are detained by the manufacturers, distributors, and retailers in a supply chain. Again, administrators must choose where they want to place themselves in the trade-off between efficiency and responsiveness. Holding large sum of inventory allows a business or a whole supply chain to be extremely responsive to variations in customer demand. However, the formation and storage of stock is a cost and to attain high levels of efficiency, the outlay of inventory should be reserved as low as possible. There are three essential decisions to make concerning the creation and holding of stock:

1. **Cycle Inventory** —this is the quantity of the inventory, which is required to satisfy demand for the product in the time between purchases of the product. Companies tend to manufacture and to buy in large lots in order to increase the benefits that economies of scale can carry. However, with big lots also come improved carrying costs. Carrying costs come from the expenditure to store, handle, and indemnify the inventory. Managers face the trade-off between the decreased cost of ordering and superior prices offered by purchasing product

in big lots and the augmented carrying cost of the cycle stock that comes with purchasing in large lots.

2. **Safety Inventory —**this is theinventory that is held as a cushion against ambiguity. If the demand needs are made with perfect accuracy, then the only inventory that would be required would be cycle inventory. But as each forecast has some level of uncertainty in it, we wrap that uncertainty to a greater or lesser quantity by holding further inventory in case demand is unexpectedly greater than predictable. The trade-off here is to consider the costs of carrying additional inventory against the costs of losing sales because of having insufficient inventory.
3. **Seasonal Inventory —**this is inventory, which is stocked up in expectation of expected increases in demand, which occurs at certain times of the year. For instance, it is expected that demand for antifreeze will rise in the winter. If a business that manufactures antifreeze has a permanent production rate that is costly to change, then it will try to produce product at a stable rate all year long and build up supply during periods of low demand to cover for periods of high demand that will go beyond its production rate. The alternative to maintaining a seasonal inventory is to invest in flexible manufacturing facilities that can quickly change their rate of production for different products in response of increase in demand. In this case, the trade-off is between the cost of having seasonal inventory and the cost of having more stretchy production capabilities.

Location

Location means the geographical setting of supply chain facilities. It also consists of decisions that are related to the activities that should be carried out in every facility. The efficiency versus responsiveness trade-off here is the choice whether to consolidate activities in fewer locations to expand economies of scale and efficiency, or to distribute activities in several locations close to consumers and suppliers in order for operations to be more receptive.

When making location based decisions, managers are required to consider various factors that relate to a given site including the cost of facilities, labour cost, skills available in the workforce, transportation conditions, taxes and tariffs, and the nearness to suppliers and consumers.

Location decisions are fairly strategic decisions as they involve large amounts of money to long-term plans. Location decisions have powerful impacts on the performance and cost of characteristics of a supply chain. Once the number, size, and location of facilities are determined it also helps in defining the number of feasible paths through which products can run on the way to the end customer. Location decisions depict a company's fundamental strategy for building and delivering its products to market.

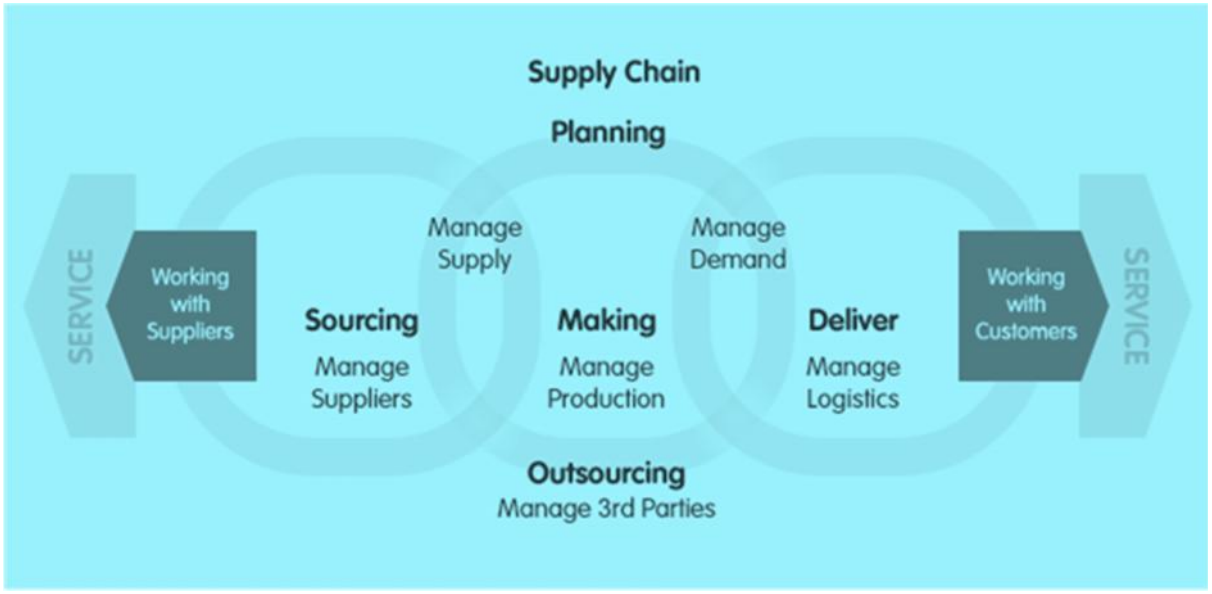


Fig: 8

Transportation

This represents the movement of everything, from raw material to completely manufactured goods, between various facilities in a supply chain. In transport, the trade-off between efficiency and responsiveness is manifested in the selection of transport form. Fast means of transport like airplanes are very reactive but also more expensive. Slower modes like ship and rail are very inexpensive but not as receptive. Since transportation costs can be as much as a third of the operating cost of a supply chain, decisions made here are very significant.

There are six critical modes of transport that a business can pick from:

1. **Shipping** is very cost effective, but, at the same time, it is the slowest means of transport. It is restricted to use between sites that are located next to crossable waterways and facilities like canals and harbours.
2. **Rail** is a very cheap mode but can be slow. This is also restricted to be utilized between locations that are served by rail lines.
3. **Pipelines** can be very flourishing but are inadequate to merchandise that are gases or liquids such as water, natural gas, or oil.
4. **Trucks** are moderately rapid and highly flexible means of transport. Trucks can go about anywhere. The cost of this mode is subject to variations though, as the outlay of fuel fluctuates and the state of roads varies.
5. **Airplanes** are extremely rapid means of transport and are quite responsive. This is also the most luxurious mode and it is rather limited by the accessibility of suitable airport facilities.

6. **Electronic Transport** is the fastest means of transport and it is really cost efficient and flexible. Though, it can only be utilized for flow of particular kinds of products like electric energy, data, and products made up of data such as, pictures, music, and text. Someday, technology that permits us to convert matter to energy and back to matter again might fully rewrite the theory and application of supply chain management.

With these available means of and the site of the facilities in a supply chain, supervisors need to plan routes and networks for making products flow. A route is the course through which products shift and networks consist of the group of the paths and facilities connected by those paths. As a universal rule, the higher the worth of a product (like electronic parts or pharmaceuticals), the more its transport system should highlight responsiveness and the lower the worth of a product (like bulk commodities e.g. grain or lumber), the more its system should stress efficiency.

Information

Information is the foundation upon which to make decisions concerning the other four supply chain drivers. It is the link between all of the operations and activities in a supply chain. To the degree this link is a strong one (i.e., the data is precise, well-timed, and complete), the companies in a supply chain will each be able to make fine decisions for their own operations. This will also be inclined to get the utmost profitability of the supply chain as a whole. This is the way stock markets and other free markets function and supply chains have a lot of the same dynamics as markets.

Information is utilized for two purposes in organization's supply chain:

1. **Coordinating Daily Activities** are related to the implementation of the other four main supply chain drivers:
   - Production
   - Inventory
   - Location
   - Transportation

   The organizations in a supply chain utilize accessible data on product supply and demand to make a decision on weekly inventory levels, production schedules, transportation passages, and stocking sites.
2. **Forecasting and Planning** to foresee and convene future demands. Available information is utilized to make planned forecasts to guide the situation of monthly and quarterly production schedules and timetables. Information is also utilized for strategic forecasts to direct decisions regarding whether to construct new facilities, enter a new market, or leave a present market.

Topic 3

Participants in the Supply Chain

In any given supply chain, there is some blend of companies who carry out different functions. There are businesses who are producers, distributors or wholesalers, retailers, and businesses or individuals who are the customers, the final consumers of a product.

Producers

These are the organizations that make a product. This includes businesses that are producers of raw materials and corporations that are makers of finished goods. Producers of raw materials are businesses that drill for oil and gas, mine for minerals, and cut timber. It also consists of organizations that raise animals, farm the land, or catch seafood. Producers of finished goods utilize the raw materials and subassemblies produced by other producers to make their products.

In any supply chain, there is a variety of companies who perform different functions. Producers can make products that are not tangible items like music, software, entertainment, or designs. A product may also be a service like mowing a lawn, cleaning an office, performing surgery, or teaching a skill. In a lot of instances the producers of tangible, industrial products are shifting to areas of the world where there is costly labour. Producers in the developed world of Europe, North America, and parts of Asia are increasingly producers of non tangible items and services.

Distributors

Distributors are businesses that take inventory in mass from producers and supply a bundle of associated product lines to consumers. Distributors are termed as wholesalers. They usually sell to other businesses and they sell products in bigger quantities than an individual customer would generally buy. Distributors cushion the producers from variations in product demand by stocking inventory and doing a lot of sales work to discover and service consumers. For the consumer, distributors complete the “Time and Place” function—they supply products when and where the consumer wants them.

A distributor is normally a business that takes possession of important inventories of products that they purchase from producers and sell to customers. In addition to product advertising and sales, other functions the distributor carries out are inventory administration, warehouse operations, and product transportation along with customer support and post-sales service. A distributor may also be a business that only brokers a product between the manufacturer and the consumer and never takes possession of that product. This type of distributor performs mostly the functions of product advertising and sales. In both these cases, as the requirements of customers develop and the range of obtainable products changes, the distributor is the mediator that repeatedly tracks consumer needs and aligns them with products available.

Retailers

Retailers stock inventory and sell in lesser quantities to the common public. This business also closely tracks the demands and preferences of the consumers that it sells to. It advertises to its consumers and often utilizes some blend of price, service, convenience and product selection, as the primary draw to attract consumers for the products it sells. Discount department stores draw customers using price and extensive product selection. Upscale specialty stores suggest an exclusive line of products and high levels of service. Fast food hotels use ease and low prices as their draw.

Customers

Customers are any organization that buys and consumes a product. A customer organization might buy a product in order to integrate it into another product that they in turn sell to other consumers. A consumer maybe the final end - user of a product who purchases the product, who consumes it.

Service Providers

These are groups that offer services to producers, distributors, retailers, and consumers. Service providers have come up with special expertise and skills that emphasize on a specific activity required by a supply chain. Because of this, they are capable to carry out these services more successfully and at a superior price than producers, distributors, retailers, or customers could do on their own.

Some general service providers in any supply chain are those providers of warehousing services and transportation services. These are trucking businesses and public warehouse companies and they are termed as logistics providers. Financial service providers deliver services like making loans, gathering past due invoices and doing credit investigations.

These are banks, credit rating companies, and collection agencies. Some service providers deliver market research and advertising, while others provide product design, engineering services, legal services, and management advice. Still other service providers offer information technology and data collection services. All these service providers are integrated to a greater or lesser degree into the ongoing operations of the producers, distributors, retailers, and consumers in the supply chain.Supply chains consist of repeating sets of participants that fall into one or more of these categories. Over all need of the supply chain as a whole remains fairly constant. What changes is the mix of contributors in the supply chain and the roles that each contributor performs.

In some supply chains, there are only few service providers because most of the participants of the supply chain perform these services on their own and they do not need to outsource these services, while others prefer to hand over these services to specialised professionals instead of performing them by themselves.

Topic 4

Managing, Planning & Sourcing Operations

A fundamental model of Supply Chain Operations consist of four classes of operations:

1. Plan
2. Source
3. Make
4. Deliver

Plan

This means all the operations that are required to plan and systematize the operations in the other three classifications.

We will examine three operations in this class in detail:

- demand forecasting;
- product pricing; and
- Inventory management.

Source

Operations in this class consist of the activities essential to obtain the inputs to make products or services. We examine two operations here. Procurement is the purchase of materials and services. Credit and collections is not usually taken as a sourcing activity, however, it can be thought of as, exactly, the gaining of cash. Both these operations hold a big influence on the supply chain effectiveness and efficiency.

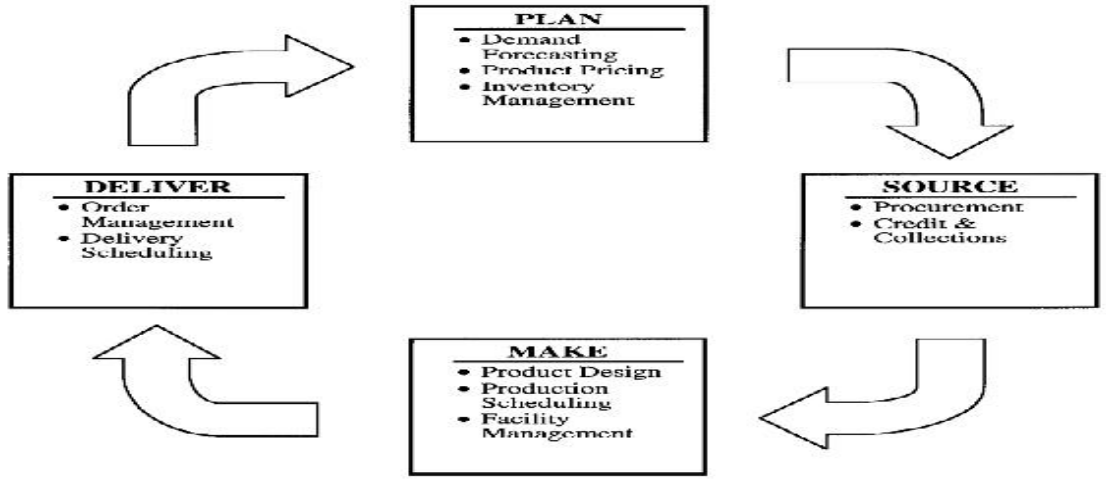


Fig: 9 Fig Four Categories of Supply Chain Operations

Make

This group includes the operations necessary to build up and expand the products and services that a supply chain offers.

Operations that we talk about in this class are:

- Product Design
- Production Management
- Facility and Management

The SCOR Model does not particularly consist of the product design and expansion process but it is included here since it is essential to the production procedure.

Deliver

These operations include the activities that are element of receiving client orders and delivering products to them.

The three operations we evaluate are:

- Management
- Product Delivery
- Return Processing

These are those operations that create the core connections between organizations in a supply chain.

Demand Forecasting and Planning

Decisions in supply chain depend on the forecasts that identify which products will be required, what amount of these products will be needed, and when they will be required.

The demand forecast becomes the basis for companies to plan their internal operations and to cooperate among each other to meet market demand.

All forecasts deal with four major variables which together determine what market conditions will be like.

Those variables are:

1. Supply
2. Demand
3. Product Characteristics
4. Competitive Environment

Supply is calculated by the number of manufacturers of a product and by the lead times that are linked with a product. The more manufacturers there are of a product and the shorter the lead times, the more expected this variable is. When there are just a few suppliers or when lead times are longer, there is more possibility of ambiguity in a market. Like variability in demand, ambiguity in supply makes predicting trickier. Also, longer lead times linked with a product need a longer time prospect over which forecasts must be completed. Supply chain forecasts must cover a time period that encompasses the mutual lead times of all the components that go into the formation of a final product.

Demand means the overall market demand for a collection of related products or services. Is the market going upward or declining? If so, what is the annual or periodical rate of expansion or decline? Or perhaps, the market is comparatively mature and demand is stable at a level that has been expected for some period of years. Also, a lot of products have a seasonal demand model. For instance, snow skis and heating oil are in greater demand in the winter season while tennis rackets and sun screen have more demand in the season of summer. Maybe the market is a developing market—the products or services are innovative and there is not much chronological data on demand or the demand changes widely since new customers are just being introduced to the products. Markets where there is small historical data and lots of unpredictability are the most hard when it comes to demand predictions.

Product features include the characteristics of a product that affect consumer demand for the product. Is the product innovative and developing fast like a lot of electronic products or is the product grown-up and changing gradually or not at all, as is the case with numerous commodity products? Forecasts for grown-up products can be of longer timeframes than forecasts for products that develop rapidly. It is also significant to know whether manufactured goods will steal demand away from a different product.

Can it be used as an alternative for another product? Or will the utilization of a product drive the matching use of an associated product? Products that either struggle with or balance each other should be predicted together.

Competitive environment stands for the activities of a corporation and its competitors. What is the market share of a business? In spite of whether the total size of a market is increasing or shrinking, what is the movement in an individual company's market share? Is it rising or declining?

What is the market share inclination of competitors? Market share trends are influenced by product advertising and price wars, so forecasts must consider events that are planned for the forthcoming period. Forecasts must also account for predictable promotions and price wars that will be beginning by competitors.

Forecasting Methods

There are four fundamental methods to employ when doing forecasts. Most forecasts are completed by using a variety of combinations of these four methods.

Chopra and Meindl describe these methods as:

1. Time Series
2. Simulation
3. Qualitative
4. Causal

Qualitative Methods depend upon a person's perception or subjective views about a market. These methods are most suitable when there is little past data available to work with. When a new line of products is launched, people can formulate forecasts on the basis of comparisons with other products or conditions that they consider alike. Using production adoption curves people can predict what will occur in the market.

Other more fundamental methods of forecasting presume that demand is strongly related to particular environmental or market factors. For instance, demand for commercial loans is often closely associated with interest rates. So if interest rate cuts are expected in the next period of time, then loan forecasts can be derived using a causal relationship with interest rates. Another strong fundamental relationship is present between price and demand. If prices are lowered, demand can be expected to increase and if prices are raised, demand can be expected to fall.

Time series approaches are the most general type of forecasting. They are based on the supposition that past patterns of demand are a fine sign of future demand. These methods are finest when there is a dependable body of past data and the markets being predict are steady and have demand patterns that do not differ much from one year to the subsequent. Mathematical techniques like moving averages and exponential smoothing are utilized to make forecasts on the basis of time series data. These techniques are engaged by most o the forecasting software packages.

Simulation Methods utilize combinations of fundamental and time series means to replicate the behavior of customers under diverse circumstances. This technique can be employed to answer questions like what will happen to proceeds if prices on a line of products are decreased or what will occur to market share if a competitor introduces a challenging product or opens a store in close proximity.

Few companies use only one of these means when forecasting demand. Most corporations do different forecasts using diversified methods and then, they compile the information gathered through different forecasts and apply this to map their business. Studies have revealed that this procedure of creating forecasts using diverse methods and then joining the results into a concluding forecast generally produces superior accuracy than the yield of any one method alone.

In spite of the forecasting methods utilized, when doing forecasts and appraising their results, it is important to keep numerous things in mind – especially the fact thatshort-term predictions are essentially more precise than long-term forecasts.

Collective forecasts are more precise than forecasts for individual products or for minor market segments. For instance, yearly forecasts for soft drink sales in a given urban area are quite correct but when these forecasts are broken down to sales by districts within that urban area, they turn out to be less precise. Aggregate forecasts are done using a wide base of data that provides superior forecasting accuracy. As a rule, the more closely focused or exact a forecast is, the less data is accessible and the more changeability there is in the data, so the accurateness is diminished.

Lastly, forecasts are always incorrect to a bigger or smaller degree. There are no ideal forecasts and businesses require assigning some predictable degree of error to each forecast. A precise forecast might have a degree of fault that is plus or minus 5 percent. A more tentative prediction might have a plus or minus 20 percent degree of error. It is significant to know the degree of error as a business must have emergency plans to face those outcomes. What would a corporation do if raw material prices got 5 percent higher than estimated? What would it do if demand was 20 percent higher than anticipated?

The Four Forecasting Variables

• Supply	Amount of Product Available
• Demand	Overall Market Demand for product
• Product Characteristics	Product Features that influence demand
• Competitive Environment	Actions of product suppliers in the market

The Four Forecasting Methods

• Qualitative	Relies on a person's intuition or opinions
• Casual	Assumes that demand is strongly related to certain factors
• Time Series	Based on historical demand patterns
• Simulations	Combines casual and time series methods

Aggregate Planning

Once demand forecasts have been formed, the next stage is to generate a plan for the business to meet the predictable demand. This is termed as aggregate planning and its function is to assure demand in a way that can maximizes revenue for the corporation. The planning is done at the collective level and not at the level of individual stock keeping units (SKUs). It sets the best levels of production and stock that will be implemented over the next 3 - to - 18 months.

The aggregate plan is the frame within which short-term decisions are taken about production, stock, and distribution. Production decisions engage setting parameters like the rate of manufacturing and the amount of production capability to use, the volume of the workforce, and how much subcontracting and overtime to use. Inventory decisions can be how much demand will be served right away by stock on hand and how much demand can be met later and turned into backlogged orders. Distribution decisions describe how and when product will be shifted from the place of production to the site where it will be used or acquired by customers. There are three fundamental approaches to take in creating the collective plan.

They involve trade-offs among three variables, which are:

Amount of production capacity;	The level of utilization of the production capacity	The amount of inventory to carry.

Let's examine these three approaches briefly.

(1) Use Production Capacity to Match Demand.

a. In this method the total capacity of production is matched to the level of demand. The purpose here is to use 100 percent of production capacity at all times. This is attained by adding or abolishing plant capacity as required and hiring and laying off workers, as needed. This method results in short levels of stock but it can be very costly to execute if the cost of adding or dropping plant capacity is high. It is also often troublesome and uncomforting to the labor force if people are continually being hired or fired in response to rises and falls in demand. This method works best when the cost of moving inventory is high and the cost of shifting capacity—workforce and plant —is low.

(2) Utilize Varying Levels of Total Capacity to Match Demand.

This model can be utilized if there is surplus manufacturing capacity available. If on hand plants are not employed 24 hours a day and 7 days a week then there is a chance to meet varying demand by increasing or decreasing consumption of production capacity. The size of the labor force can be maintained at a stable rate and flexible work scheduling and overtime used to go with production rates. The consequence is low levels of stock and also lower average levels of capacity use. The approach is logical when the outlay of carrying inventory is high and the expenditure of surplus capacity is comparatively low.

(3) Use Inventory and Backlogs to Match Demand.

Using this method provides for constancy in the plant capacity and labor force and enables a steady rate of output. Production is not coordinated with demand. Instead stock is either built up during periods of low demand in expectation of future demand or stock is allowed to run low and backlogs are built up in one stage to be packed in a following period. This method results in higher capacity consumption and lower costs of varying capacity but it does make large inventories and backlogs with time as demand changes. It should be utilized when the price of capacity and altering capacity is high and the expenditure of carrying stock and backlogs is fairly low.

Product Pricing (Plan)

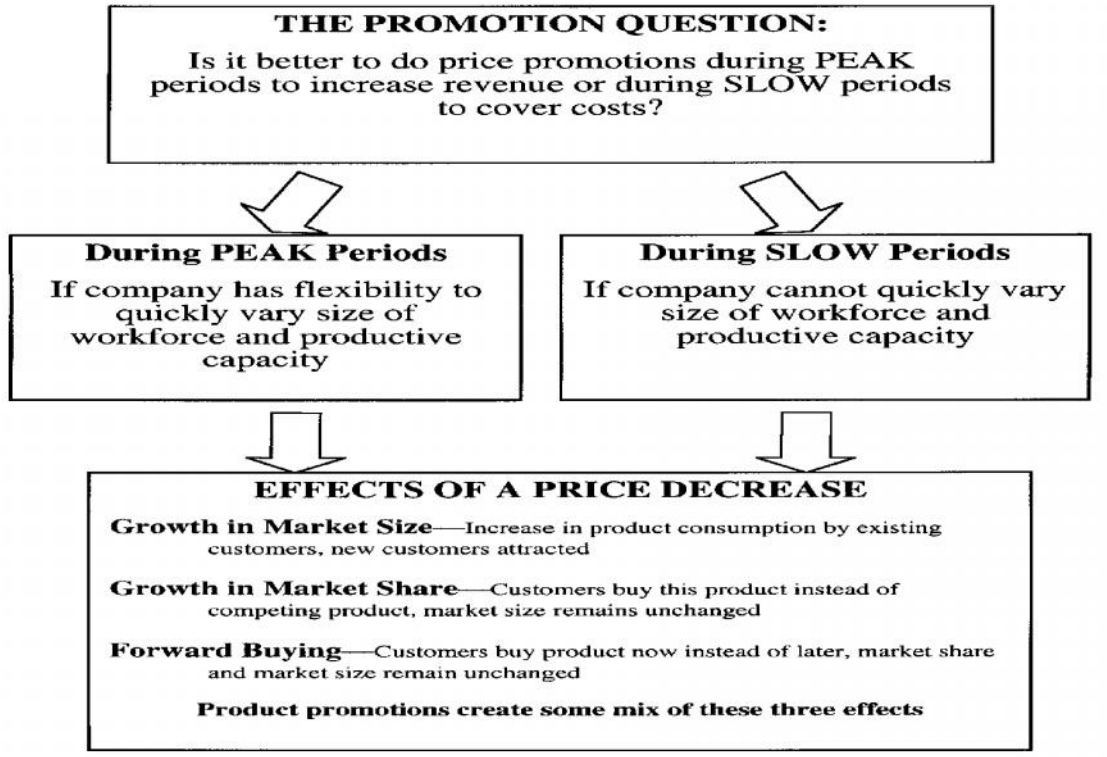
Companies and whole supply chains can pressurize demand over time by using price. Depending on how price is utilized, it will be inclined to either exploit revenue or gross profit. Typically advertising and salespeople desire to take pricing decisions that will kindle demand during climax seasons. The objective here is to make maximum total revenue. Often financial or manufacturing people want to make pricing decisions that arouse demand during low periods. Their plan is to maximize gross profit in crest demand periods and make revenue to cover costs during low demand periods.

Relationship of Cost Structure to Pricing

Every business needs to ask the following question, " is it better to do price advertising during peak periods to boost revenue or during low period to face costs?"

The answer depends on the cost structure of the company. If a company has flexibility to differ the size of its personnel and productive facility and the cost of carrying stock is high, then it is finest to generate more demand in peak seasons. If there is less flexibility to fluctuate workforce and capacity and if expenditure to carry stock is low, it is best to make demand in low periods.

These companies are normally motivated to run advertising in peak periods to motivate demand even more. Since they can rapidly boost production levels, a lessening in the profit margin can be made up for by an increase in overall sales if they are able to sell all of the products that they make.



Inventory Management (Plan)

Inventory Management is a collection of techniques that are applied to supervise the inventory levels within dissimilar companies in a supply chain. The objective is to decrease the cost of stock as much as possible while still maintaining the levels of service that customers need. Inventory management takes its main inputs from the demand predictions for products and the prices of products. With these two inputs, stock management is a constant procedure of balancing product inventory levels to serve demand and gaining economies of scale to get the best product prices.

As discussed previously there are three types of inventory:

(1) Cycle inventory
(2) Seasonal inventory
(3) Safety inventory

Both Cycle Inventory and Seasonal Inventory are affected by economy of scale concerns. Thecost structure of the businesses in any supply chain will propose certain levels of stock on the basis of production costs and stock carrying cost. Safety Inventory is affected by the certainty of product demand. The less expected product demand is the superior the level of Safety Inventory is necessary to cover unanticipated changes in demand. The Inventory Management Operation in a business or a complete supply chain consists of a mix of activities related to running the three diverse kinds of inventory. Every type of inventory has its own detailed challenges and the combination of these challenges will differ from one business to another and from one supply chain to another.

Cycle Inventory

This is the type of inventory, which is needed to meet the demand of the product over the time period between placing orders for the product. Cycle Inventory is essential because economies of scale craft it attractive to make smaller number orders of big quantities of a product rather than permanent orders of little product quantity. The end use consumer of a product might actually utilize a product in constant small amounts all over the year. But the distributor and the producer of that product might find it cheaper to make and stock the product in huge batches that do not match the consumption pattern.

Cycle inventory is the accumulation of inventory in the supply chains because of the fact that production and stocking of stock is done in lot sizes that are bigger than the constant demand for the product. For instance, a distributor might experience an enduring demand for Item A that is 100 units per week. The distributor finds, though, that it is cheapest to order in batches of 650 units. Every six weeks or so, the distributor sets an order causing cycle stock to build up in the distributor's warehouse at the start of the ordering period. The producer of Item A may find that it is most proficient for them to produce in batches of 14,000 units at a time. This also results in buildup of cycle stock at the manufacturer's site.

Seasonal Inventory

Seasonal Inventory occurs when a corporation or a supply chain with a predetermined amount of productive capacity chooses to create and stock products in expectation of future demand. If future demand is going to exceed productive capacity, then the answer is to produce products in times of low demand that can be put into inventory to meet the high demand in the future.

Decisions about seasonal inventory are driven by a need to get the most excellent economies of scale given the capacity and cost arrangement of every company in the supply chain. If it is costly for a producer to boost productive capacity, then, the capacity can be considered as a fixed rate.

Once the yearly's demand for the manufacturer's products is determined, the most efficient schedule to exploit that fixed capacity can be measured. This schedule will call for Seasonal Inventory. Managing seasonal stocks calls for demand predictions to be precise since large amounts of stocks can be built up this way and it can turn out to be outdated or holding costs can mount if the stock is not sold off as expected. Managing seasonal stock also calls for manufacturers to recommend price incentives to influence distributors to buy it and put it in their warehouses well before demand for it arises.

Safety Inventory

Safety Inventory is essential to balance the ambiguity that is present in a supply chain. Retailers and distributors do not like to run short of inventory in the face of unanticipated customer demand or unforeseen delay in getting replenishment orders so they carry safety stock on hand. As a rule, the higher the level of ambiguity, the higher the level of safety stock that is essential.

Procurement (Source)

Usually, the major activities of a procurement executive were to beat up possible suppliers on price and then purchase products from the lowest cost supplier that was available. That is still a significant activity, but there are other activities that are becoming equally important. Because of this, the purchasing activity is now taken as part of a broader task called procurement.

The Procurement Function can be divided into five major activity categories:

1. Purchasing
2. Consumption Management
3. Vendor Selection
4. Contract Negotiation
5. Contract Management

Purchasing

These activities are the normal activities linked to issuing purchase orders for required products. There are two kinds of products that a company buys: (1) direct or planned materials that are required to make

the products that the business sells to its consumers; and (2) indirect or MRO (Maintenance, Repair, and Operations) products that a business uses as part of everyday operations. The mechanics of buying both types of products are mainly the same. Purchasing decisions are taken, purchase orders are places, vendors are contacted, and orders are delivered. There is a lot of data exchanged in this procedure between the purchaser and the supplier— prices, items and quantities ordered, delivery dates, delivery addresses, billing addresses, and payment terms.

One of the biggest challenges of the buying activity is to see whether this data communication is happening in a timely way and without fault. Much of this activity is quite unsurprising and follows distinct routines.

Consumption Management

Effective procurement starts with a thought of how much of what classifications of products are being bought across the whole company as well as by every operating unit. There must be an understanding of how much of what types of products are purchased from whom and at what prices.

Anticipated levels of expenditure for diverse products at the different locations of a business should be placed and then compared against real consumption on a usual basis. When consumption is considerably above or under expectations, this should be taken to the attention of the suitable parties so probable causes can be examined and correct actions taken. Consumption above expectations is either a problem to be rectified or it reflects wrong expectations that are required to be reset. Expenditure below expectations might point to a chance that should be exploited or it also might simply reveal incorrect expectations to start with.

Vendor Selection

There must be a continuous procedure to explain the procurement capabilities required to support the company's business strategy and its operating structure. This definition will give insight into the comparative significance of supplier's capabilities. In addition to the price of a vendor's product the value of these capabilities has to be measured as well. The value of product class, service levels, just in time delivery, and mechanical support can simply be estimated in light of business plan and the company's operating model.

Contract Negotiation

As a specific need for a business arises, contracts must be discussed with individual suppliers on the chosen vendor list. This is where the particular items, prices, and service levels are carried out. The simplest negotiations are those agreements where vendors are selected on the basis of lowest prices. The most multifaceted negotiations are for agreements to buy direct materials that must gather exacting quality essentials and where high service levels and mechanical support are required.

Suppliers of both direct and indirect materials require a regular set of capabilities. Gaining more purchasing efficiencies needs that suppliers of these products have the abilities to set up electronic links

for purposes of getting orders, conveying delivery notifications, sending invoices, and getting payments. Better inventory management wants that inventory levels be lowered down, which often means suppliers require making more recurrent and smaller deliveries and orders must be places accurately and absolutely.

All these necessities need to be discussed in addition to the fundamental issues of products and prices. The discussions must make tradeoffs between the unit price of a product and all the other value added services that are necessary. These other services can either be paid for by a higher margin in the unit price, or by separate payments, or by some blend of the two. Performance targets, penalties and other fees must be defined when these targets are not met.

Contract Management

Once contracts are placed into action, supplier performance against these contracts should be measured and administered. Because businesses are shortening their suppliers' base, the performance of every supplier that is selected becomes more important. A particular contractor might be the only source of an entire group of products that a business wants and if the supplier not meeting its contractual obligations, the activities that depend on those products will be negatively suffered.

A company needs the skill to follow the performance of its suppliers and hold them responsible to meet the service levels as agreed in the contract. Just as with consumption management, people in a business need to regularly gather data regarding performance of suppliers. Any supplier that constantly falls below standards should be made conscious of their shortcomings and asked to make them right.

Credit and Collections (Source)

Credit and Collections is the sourcing procedure that a company employs to acquire its money. The credit operation examines potential consumers to make sure that their company only conducts business with consumers who will be able to pay their bills. The Collections Operation is what in fact brings in the money that the corporation has earned.

The supply chains that a business participates in are often chosen on the basis of credit decisions. Most of the faith and cooperation that is potential between companies who do business jointly is based upon good credit ratings and well-timed payments of invoices. Credit decisions influence who a company will sell to and also, the terms of the sale.

The Credit and Collections task can be broken into three major categories of activity:

1. Set Credit Policy
2. Implement Credit and Collections Practices
3. Manage Credit Risk

Set Credit Policy

Credit Policy is made by senior managers in a business such as the Controller, Treasurer, Chief Financial Officer, and Chief Executive Officer. The primary step in this procedure is to evaluate the performance of the company's receivables. Every corporation has distinct a set of measurements that they employ to examine their receivables, such as the following: Days Sales Outstanding (DSO); percent of receivables, which are past customer payment terms; and bad debt write-off amount as percent of sales.

What are the trends?

Where there are problems?

Once management starts understanding of the company's receivables position and the trends affect that state, they can take the subsequent step which is to set or alter the risk acceptance criterion to react to the position of the company's receivables.

Implement Credit and Collections Practices

These activities mean putting in rest and operating the events that will execute and impose the credit policies of the corporation. The first main activity in this type is to work with the business salespeople to approve sales to particular customers. As noted earlier, making a sale is like making a loan for the amount of the sale. Consumers often purchase from a company since that company extends them bigger lines of credit and longer payment terms than its participants. Credit investigation goes a long way to promise that this loan is merely made to consumers who will pay it off punctually as called for by the terms of the sale.

After a sale is made, people in the credit area work with customers to provide a variety of services; they work with consumers to develop product returns and issue credit memos for returned products, they work with consumers to determine disputes and clear up queries by issuing copies of contracts, purchase orders, and invoices. The third main activity that is performed is collections; this is a procedure that starts with the constant maintenance of every customer's accounts payable status. Customers that have past due accounts are contacted and payments are requested. Sometimes new terms and schedules are negotiated for the payments.

Manage Credit Risk

The credit function works to aid the company take intelligent risks that maintain its business plan. What may be an awful credit decision from one viewpoint might be a good business decision from some another perspective. If a business wants to expand market share in a definite area it might make credit decisions that assist it to do so. Credit people work with other people in the company to find new ways to lower the danger of selling to new types of customers. Payment terms that are good-looking to consumers in these market segments can be devised. Credit risks can be decreased by the use of credit insurance, liens on consumer assets, and government loan guarantees for exports.

For main customers and chiefly large individual sales, people in the credit area work with others in the business to structure particular deals just for a single consumer. This increases the worth that the business can offer to such a consumer and can be an important part of securing a new business.

Assessment

Total Marks: 20

1. Outline the main benefits of a supply chain 5
2. Companies in any supply chain can make their decisions individually and collectively in five areas. What are these areas? 5
3. What is inventory management? 5
4. Write short notes on the following participants of supply chain: 5
   a. Producers
   b. Distributers
   c. Retailers