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## UNIT 5 MODELS FOR SCM INTEGRATION

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### Objectives

- define SCM integration & describe strategies involved in SCM integration;
- illustrate models for integrating supply and demand chain;
- define demand management & visualize real demand;
- highlight the relationship between material flow, information flow and cash flow; and
- elucidate Bullwhip effect and illustrate measures to counter them.

### Structure

- 5.1 Introduction
- 5.2 Integrated Supply Chain/ Value Chain
- 5.3 Supply Chain Strategies
  - 5.3.1 Push Based Supply Chain
  - 5.3.2 Pull Based Supply Chain
  - 5.3.3 Push-Pull Strategy
- 5.4 Demand Management
- 5.5 Internet and SCM
- 5.6 Physical Goods Flow, Virtual Flow and Cash Flow
- 5.7 Bullwhip Effect
- 5.8 A New Perspective to Counter Bullwhip Effect
- 5.9 Drivers of SCM
- 5.10 Summary
- 5.11 Self Assessment Questions
- 5.12 References and Suggested Further Readings

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## 5.1 INTRODUCTION

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The main objective of the supply chain concept is to integrate and synchronize the service requirements of the consumer/customer with the flow of materials from suppliers in such a way that any conflicting or contradictory situation rising can be balanced out. These conflicts could be like, high customer service, low inventory investment and low operating cost. These have to be balanced or optimized, and therefore, various models have been proposed over the years in order to integrate the SCM systems, for example Stevens Model (1989), which proposes a balance in the supply chain involving functional trade-off. Supply chain management revolves around efficient integration of suppliers, manufacturers, warehouses and stores. The main challenge being coordination of the activities within the chain and across it for improved performance, reduced costs, increased service level, reduced bullwhip effect, resource utilization, and effective response to market changes. Companies have realized over a period of time that integrating the front-end of supply chain, customer requirements/demands, to the back-end of the supply chain, the production and manufacturing portions of the supply chain.<sup>1</sup>

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<sup>1</sup> Designing and managing the Supply Chain by Simchi Levi et al, TMH, p. 120

Development of an integrated supply chain requires management of material and information flows to be viewed from three perspectives:

- Strategic
- Tactical
- Operational.

At each of these levels, there has to be utmost coordination and harmonization between the finance, information, material, facilities, people and the system as a whole. Let us see these perspectives one by one.

## 5.2 INTEGRATED SUPPLY CHAIN/VALUE CHAIN

Integration of Supply Chain & Demand Chain can be seen from three angles as follows:

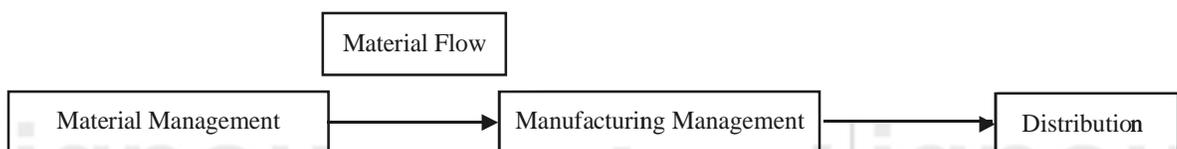
**Strategic Level:** What should be the focus at the strategic level?

- What are the objectives and policies for the supply chain and how can they be developed to achieve competitive superiority?
- How to develop the physical components of the supply chain?
- How to develop the statement of customer service intent by the product market, customer group or by a large customer?

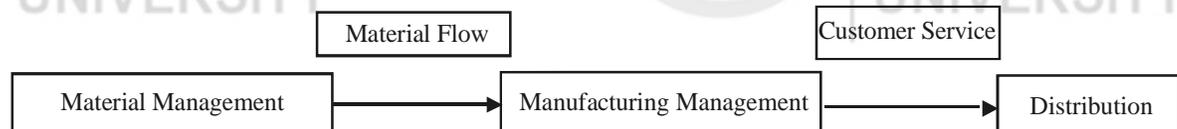
### Stage 1: Baseline, Elevation Principle:



### Stage 2: Functional Integration Elev:



### Stage 3 Internal Integration - Elev:



### Stage 4 External Intu



Fig 5.1: Steven's Model of Supply Chain Integration

- Developing an organizational structure capable of bridging the functional hurdles, thereby ensuring an integrated value delivery based supply chain.

**Tactical Level:** This focuses on the means by which the strategic objectives could be achieved. The various objectives for each element in the supply chain provide the directions for achieving the balance within the supply chain. It involves identifying the necessary resources with which the balance could be achieved.

**Operational Level:** the implementation level in the model, and aims at converting the objectives and policies so formulated into workable solutions. This is also the supply chain development phase and the strategy and plans for implementation are evolved. Implementation plans require a time-phased program for allocation of resources all through the supply chain. (Fig 5.1).

Steven's comment concerning supply chain development is equally interesting, which says while the impetus for the development of the strategy may be a top-down approach; its success is likely to be achieved by a bottom-up approach. The same is highlighted in the fig 5.1 (Stevens 1989):

- **Stage 1** is a situation in which the company approaches the supply chain tasks in discrete decisions with a responsibility lodged in each of the task centers. The result is usually a lack of control across the supply chain function because of organizational boundaries preventing the coordinated decisions from achieving an overall customer service objective.
- **Stage 2** of development is denoted by the functional integration of the inward flow of goods through material management, manufacturing management and distribution. The emphasis is mainly on cost reduction rather than on performance achievement and is focused on the discrete business functions with certain attempts at achieving internal trade-off between purchasing discounts and inventory investment, and also plant operating costs and batch volumes. Customer service is reactive in this case.
- **Stage 3** accepts the necessity of managing the flow of goods to the customer by integrating the internal activities. In this stage, the integrated planning is achieved by using the distribution requirement planning (DRP), JIT (just in time), manufacturing techniques, etc. This stage is essential before the company can consider integrating customer demand in an overall demand management activity. IT is an effective enabler for this process.
- **Stage 4** extends the integration to external activities. While doing so, the company becomes customer oriented by linking the customer procurement activities with its own procurement and marketing activities.<sup>2</sup>

The concept of value chain/supply chain management approach enables a company to react effectively to market swings and changes. However, in order to get the optimum potential, a connection and inter-relationship between the components of the supply chain has to be established and an integrated chain formed for utmost customer satisfaction, i.e. cost-effective product.

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### 5.3 SUPPLY CHAIN STRATEGIES

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The various strategies that has to be followed for an effective integration are:

- Push & pull
- Push-pull

<sup>2</sup> Mohanty & Deshmukh in Essentials of SCM, JAICO, 2004, pp. 8-10.

<sup>3</sup> Supply chain integration by Kaminsky, TMH pp. 120-122

### 5.3.1 Push Based Supply Chain

Long-term forecasts are the backbone of a push-based supply chain model, as regards the production and the distribution decisions are concerned. Typically though, the manufacturer bases demand forecasts in orders received from the retailer's warehouses. Therefore, it takes much longer for the push based supply chain to react to the changing marketplace, which may lead to<sup>3</sup>

- Inability to meet changing demand patterns.
- The obsolescence of supply chain inventory as demand for certain products disappears.

Actually, the bullwhip effect leads to under utilization of resources, because planning and managing is (to be discussed later in this block) more difficult. For example a production manager is in quandary as to how to discern production capacity. Should it be based on peak demand or average demand? Similarly it is not clear as to how to determine the transportation aspects, based on average or peak demand? Therefore, a push based chain we find extra transportation costs, higher inventory levels and higher manufacturing costs, due to need for emergency production change-overs.

### 5.3.2 Pull Based Supply Chain

In this type of supply chain the production and distribution is based on demands so that it can be effectively coordinated with true customer requirements rather than forecasts. Inventory in on firms following the pull system is negligible and it responds only to orders per se. This is further coupled with fast information flow mechanisms on customer demands to the various components of the supply chain. This system is more attractive in nature because, it leads to:

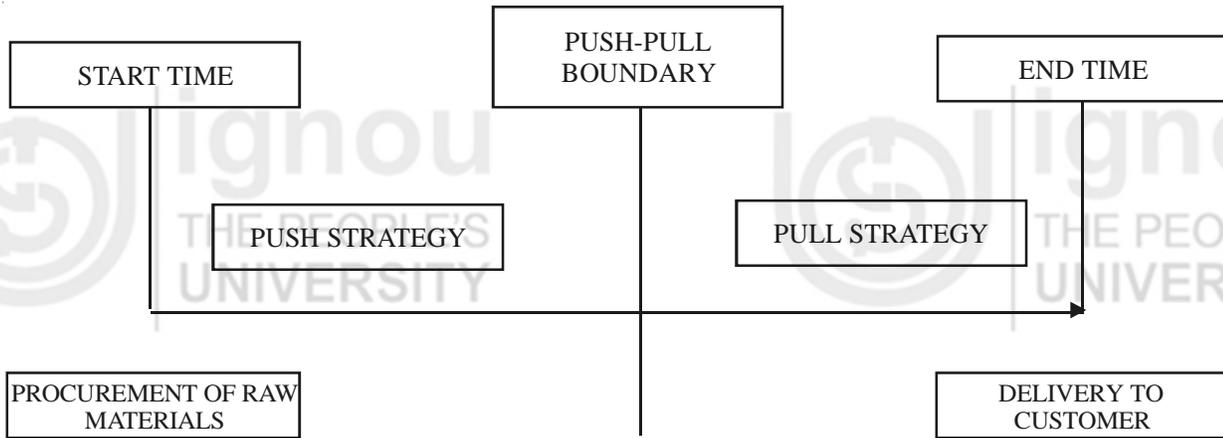
- A lesser lead-time, since better anticipation is made on customer demands and the retailers
- Lesser inventory with the retailers
- A decrease in variability due to reduction in lead-time
- Decreased inventory with manufacturer due to reduction in variability.

In a pull based supply chain there is considerable reduction in inventory, enhanced resource management and a comparable reduction in system costs to push based system. At the same time, pull based systems are difficult to implement when lead-time are long and it is not practical to react to the demand information. Moreover, since the systems are not planned well in time it's difficult to take advantage of economics of scale in manufacturing and transportation. Taking these advantages and disadvantages into consideration the companies have formulated a new system 'the push-pull' system, i.e. an integration of push and pull system.

### 5.3.3 Push-pull Strategy

This is an ideal mix of both push and pull strategy in which the first half of the system is based on push method and the remaining half as pull based. The interface between the two models is push-pull boundary. In order to comprehend the strategy better you have to consider the supply chain time line, that is, the time that elapses between procurement of raw materials and the delivery to the customer, the end of the time line. The push-pull boundary, exists somewhere in between this time line and denotes the time when the company switches from one strategy to the other as illustrated in figure 5.2.

Consider a computer manufacturer, who builds to stock and thus makes all production and distribution decisions based on forecast. This is a push system. Whereas, push-pull strategy is one in which manufacturer builds to order, which implies that component inventory is based on forecast and final assembly is in response to specific customer request. Therefore, the push system is prior to assembly and the pull system starts with assembling till delivery of the product. The push-pull boundary is prior to assembly.



**Fig. 5.2: The Push-Pull Supply Chain System**

### Activity 1

Visit a company and analyze the SCM strategy being followed in the light of present trends worldwide and justify your observation, with suitable case studies.

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## 5.4 DEMAND MANAGEMENT

Why do we require demand management? It's primarily required since accumulation of inventories amounting to millions in the supply chain shows absence of demand management in the total system. "Demand management's imperative of forecast error reconciliation with the actual order rate of an enterprise is one of the most overlooked potentials in the successful management of inventory levels, customer satisfaction, staffing strategies and facilities expansion or contraction".<sup>4</sup>

### An Example to Elucidate Forecast Accuracy

You are part of a counseling class on SCM at IGNOU that meets every day between 1800 hours to 2000 hours. Let the topic of discussion be forecast accuracy. The counselor asks you approximately as to where will you be one week from now at 2130 hours. You respond by saying 90% you will be here for the class, with a 10% possibility of getting tied down to family commitments.

<sup>4</sup> WCDM, from World Class Supply Management by Burt, Dobler & Starling, TMH, Chapter 8, pp. 624-626.

The next question of the counselor will be, with that in mind where will you be 4 years from now, at the same time?

You are partly speechless, and say “well one cannot be too sure and probably I will graduate from IGNOU with a degree in SCM and will be trying to cope with a job in hand.” The counselor adds on by saying, how sure can you be of that? “ Not to sure perhaps I will be where I presume to be at that point in time.”

So that is what it is just try and visualize how difficult it is for the firms to forecast future demand for their product and services. It is quite akin to the policy on trees plantation adopted by certain firms a few years back, where you purchased trees today and expect a hike 20 years from now, without actually forecasting what is going to be the condition of the sapling planted today after 20 years. The firms actually utilized the concept of forecast demand in a reversing order and made the consumer/customer go in circles over own probability errors, which they miscalculated. The company had done their homework pretty well to convince you on this aspect, but you as the customer didn't predict the future too well. That is forecast accuracy, very difficult to predict in actuality but easy to talk appreciate, with a may/could be factor, a gamble better avoided.

### **What is Demand Management?**

Let us now see what is demand management per se? “It seeks to estimate, control, smooth, coordinate, balance and influence the demand and supply for a firm's products and services in an effort to reduce total costs for the firm and its supply chain.”<sup>5</sup> It recognizes that forecasts are developed at several points through out an organization, but doesn't develop forecast. It accepts forecast from other functions and updates these based on real time demand. It is also directly related to supply in order to adjust the flow of raw materials and services. So, how can we establish control in demand management?

By:

- Execution of effective production schedule
- Calculation of inventory levels
- Capabilities and capacity
- Developing of customer service strategies

It is also responsible for smoothing and streamlining production after the master production schedule is in place and been released to internal production and external suppliers. Demand keeps on changing on a day-to-day basis. Therefore the demand managers should have contingencies in place in coordination with the supply chain members so that necessary modifications could be affected well in time. “Demand management also balances the total costs of not meeting the demand against the total costs of adding additional resources required to meet the growing demand,” says Burt in his book WCSM. Actually, without a forecast of demand, supply channels tends to get cluttered and all this can effectively be overcome through a comprehensive demand management.

### **Demand Driven Strategies**

Demands forecast and demand shaping are the two different processes, which helps in generating information for integrating demand information into the supply chain planning process, as enumerated below:

- Demand forecast: A process in which historical demand data are used to develop long-term estimates of expected demand, that is, forecast.<sup>6</sup>

<sup>5</sup> Demand Management from WCSM by Burt, TMH, pp. 326.

<sup>6</sup> Demand driven strategies in designing and managing supply chain, Simchi Levi et. al, pp. 126-128

- Demand shaping: It is a process in which the firm determines the impact of various marketing plans such as promotions, pricing discounts, rebates, new product introduction and product withdrawal on demand forecasts.

In either case, the forecast is not completely accurate, and hence an important output from demand forecast and demands shaping processes is an estimate of the accuracy of the forecast, the so called forecast error, measured according to standard deviation. This information provides insight into the likelihood that demand will be higher (or lower) than the forecast. High demand forecast error has a negative impact on supply chain performance, resulting in obsolete inventory and underutilization of resources. Therefore, can the firm employ supply chain strategies to increase forecast accuracy and thus decrease error? Let us see with the following approaches:

- Select the push-pull boundary so that demand is aggregated over one or more of the following dimensions:
  - Demand is aggregated across products
  - Demand is aggregated across geography
  - Demand is aggregated across time

The objective is clear. Since aggregate forecasts are more accurate, the result is improved forecast accuracy.

- Use market research, demographic and economic trends to improve forecast accuracy
- Incorporate collaborative planning and forecasting processes with the customers for better understanding of demands
- Determining the optimal assortment of products by store so as to reduce the number of SKUs competing in the same market

At the end of it the firm has a demand forecast by SKU by location. The next is to analyze the supply chain and see if it can support these forecasts. This process, called supply and demand management, involves matching supply and demand by identifying a strategy that maximizes profit or minimizes transportation costs, inventory costs and production costs. The firm also determines the best possible way to handle volatility and risks in supply chain. This is tactical planning, which is impact to demand planning. Therefore an iterative process must be used to identify the following:

- The best way to allocate marketing budgets and supply and distribution resources
- The impact of deviation from forecast demand
- The impact of changes in supply chain lead-times
- The impact of competitors' promotional activities on demand and supply chain strategies

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## 5.5 INTERNET AND SCM

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The influence of Internet has been tremendous over a very short period of time. Changes are taking place rapidly and the emerging e-business has its inherent advantages and disadvantages. E-business strategies supposedly reduce costs, increase service level, increase flexibility and increase profits. But in reality very few have been successful. Many Internet companies have crashed due to their individual logistic gray areas. On the other hand some of them have been

successful in developing new business models and profited significantly by capturing a sizable market share. These companies use the Internet as the driver of business changes. Next is e-business and e-commerce. Now what is e-business? It is a collection of business models and processes motivated by the Internet technology and focuses on improvement of extended enterprise performance. E-commerce is the ability to perform major commerce transactions electronically, and it forms the integral part of e-business.

Companies have realized over a period of time that Internet can have a huge impact on supply chain performance. Internet can help in a big way to move away from the traditional push strategies to the pull system, but eventually most of the companies have landed up with the push-pull strategy.

### **The Bottom Line**

Recently, many companies have improved performance, reduced costs, increased service levels, reduced bullwhip effect and improved responsiveness to changes in marketplace by integrating the supply chain. In most cases, this was facilitated by the push-pull model and by a focus on demand driven strategies, however, in effect the Internet has created a revolution in integrating the SCM and evolving supply chain strategies. At the same time the collapse of many such internet companies does send an alarm that e-business not only makes business but break them too. The key to these challenges lies in identifying the appropriate strategies for a particular company and individual product. The new supply chain paradigm, push-pull strategy, advocates holding inventory, though it pushes the inventory upstream. Most important is that the traditional companies are required to maintain an effective distribution system depending on environmental factors, warehouses, direct shipment, transshipment so as to ensure effective management of inventory and reduction of distribution costs.

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## **5.5 PHYSICAL GOODS FLOW, VIRTUAL FLOW AND CASH FLOW**

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Related to what we have studied earlier in integration of Supply chain, physical flow, virtual flow and cash flow could be seen in more detail. David N Burt in his book *World Class Supply management* says ‘the supply chain extends from the ultimate consumer to the mother earth’ and has explained the same with an illustration, which we shall see later. “The chain is viewed as a whole, a single entity rather than fragmented groups, each performing its own function”.<sup>7</sup> Only when an ultimate customer buys a product does the money enter the supply chain. Transactions help in allocating the customer’s money among the members of the chain. “A firm’s supply system includes all the internal functions plus external suppliers involved in the identification and fulfillment of needs for materials, equipment and services in an optimized fashion”.<sup>8</sup> Supply system plays a key role in helping the firm satisfy its role in supply chain. Professor Charles of MIT writes, “Supply chain design is the meta-core competency for organizations”.<sup>9</sup>

The Internet today permits the supply chain managers to manage their supply chains collaboratively and also synchronizes their operations. The net result is:

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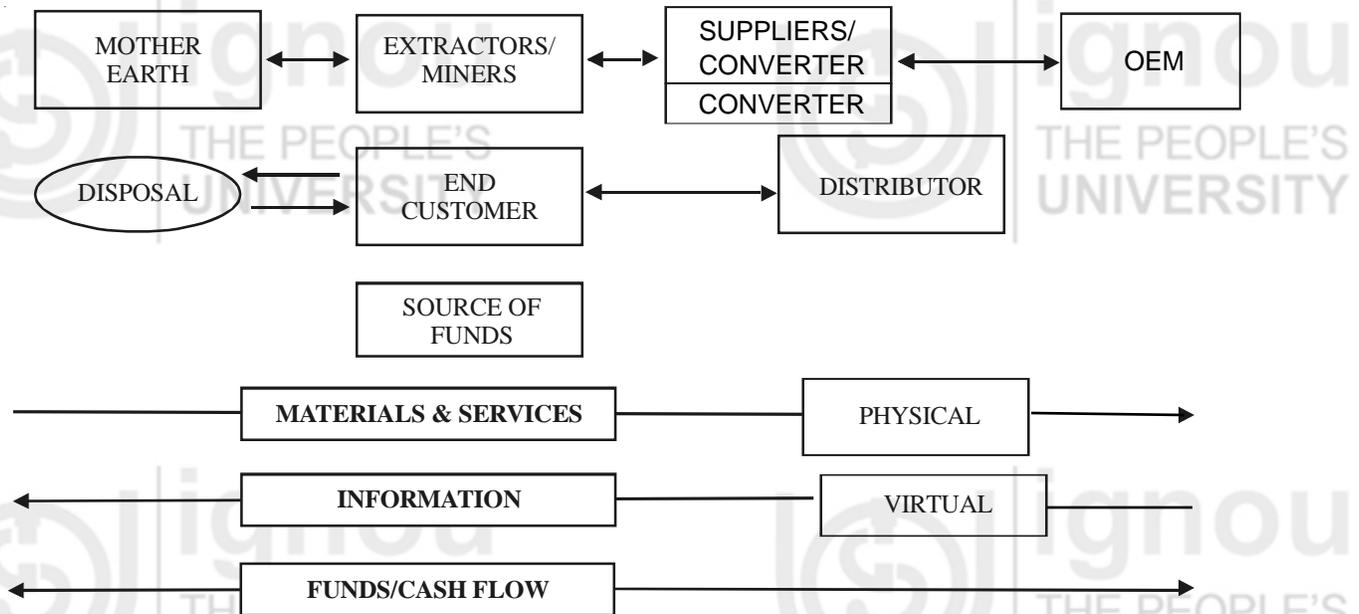
<sup>7</sup> Gentry, J. J, “The role of Carriers in buyer-supplier strategic partnerships: a supply chain management approach,” *Journal of Business logistics* pp. 35-53, cited in Amelia S. Carr & Larry Smeltzer, “The relationship of strategic purchasing to supply management”, *European Journal of Purchasing and supply management* 5 (1999) p. 44.

<sup>8</sup> Burt, Dobler & Sterling *WCSM* by Tata Mc Graw Hill 7<sup>th</sup> edition, p. 7 in *Supply chain & networks*.

<sup>9</sup> Charles H. Fine, *Clockspeed: Winning Industry Control in the Age of Temporary advantage*. (as specified by Burt in his book *WCSM* by Mc Graw-Hill, p. 7.)

- Reduced costs.
- Time management.
- Competitiveness.
- Profitability.

Success of an organization in the near future will be driven by its ability to compete effectively as a contributing member of a dynamically connected supply chain management and not in isolation. Connectivity with customers, suppliers and other partners and be able to interact quickly is critical to survival. Tomorrow, a tightly connected e-chain will be a necessity.”<sup>10</sup>



**Fig 5.3: Supply System’s Role in helping the Firm satisfy its role in its Supply Chain (Adapted from ‘The Supply Chain’ By Burt In WCSM, 7th Edition, TMH)**

Supply chains are relatively easier to describe and visualize, but the terminology is already dated. “Traditionally, companies have connected with one another in simple, linear chains, running from raw material producers to distributors to retailers.”<sup>11</sup> But the day is not far off that most companies will be an integral part of the supply networks worldwide. Networks optimize the flow of goods (physical flow) and services, virtual flow (information) and money (cash flow). It focuses on the ultimate customer, who is once again the generator of funds. They are so designed that one member doesn’t benefit at the cost of the other, the networks are therefore:

- Adaptive
- Speedy
- Innovative
- Integrated

SCM in essence is based on creation of values. It is a network of business processes used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution and cash flow. It oversees the organizational relationships in order to get the information necessary (virtual flow) to run the business, to get the products delivered (physical flow) and get the finances that generate the business profits

<sup>10</sup> Lisa L. Henriott, “Transforming Supply Chains into e-chains,” Supply chain management supplement, Spring 1999, p.16 (Burt and Dobler in WCSM Tata Mc Graw-Hill pp. 7-9.)

<sup>11</sup> Kevin Werbach, “Syndication: The emerging model for business in Internet era”, Harvard Business Review, May-June 2000, pp. 85-93.

(cash flow). This is an integrated and extended enterprise concept and includes not only relationships with internal business functions, but also with those outside the firm. What has been explained above is just the tip of the iceberg, since SCM strategies are changing rapidly with growing involvement of IT and electronic media.

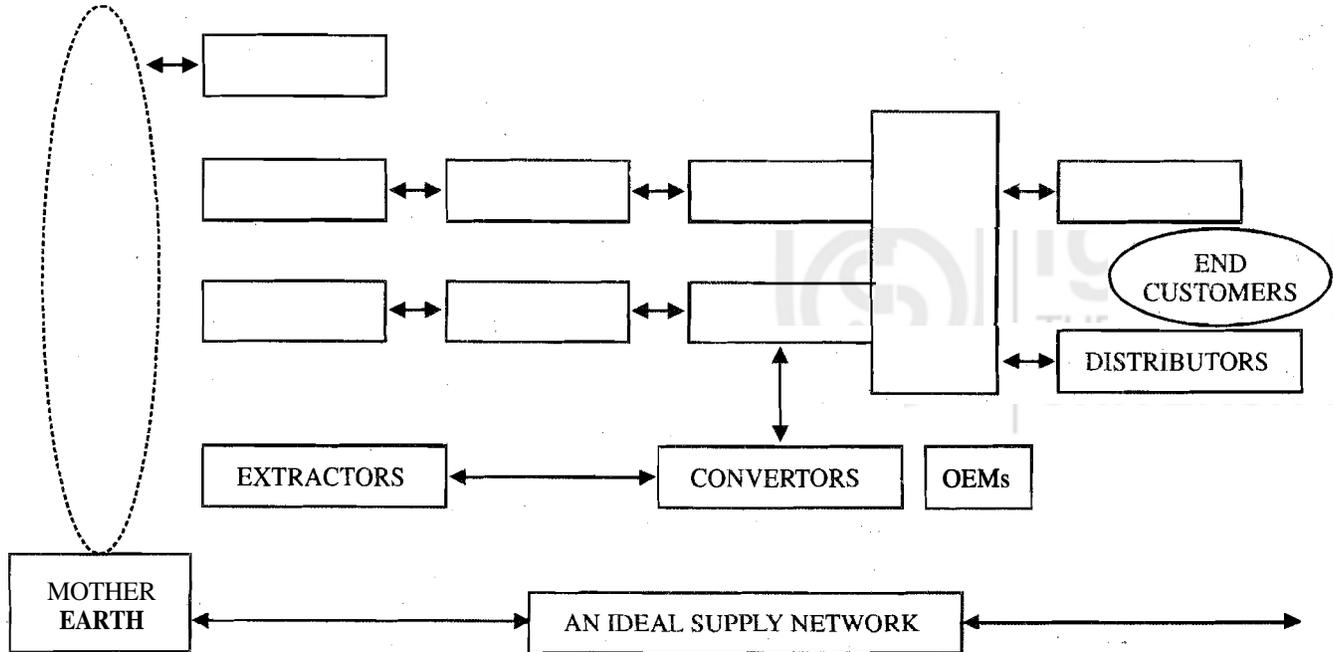


Fig 5.4: An Ideal Supply Network (Adapted From Supply Networks, Chapter 1 WCSM By Burt, Dobler & Starling)

With this as a backdrop we come to bullwhip effect, which happens to be the basic benchmark in understanding the supply, demand and inventory management, and reasons why companies fall pray to this effect and how best can they reduce it if not eliminate.

## 5.7 BULLWHIP EFFECT

“Failure to accurately estimate demand and share information among supply chain entities can result in bloated inventory levels due to cumulative effect of poor information cascading up through a supply chain<sup>12</sup>, says Burt in his book WCSM. This is in fact quite natural in a way. If a firm doesn’t have information of the demand it will unnecessary carry a load of additional inventory or even increase the lead-time to cater for the uncertainty. Either ways the inventory gets bloated, if the lead-time increases so will the buyer increase order quantities (based on conventional recorder point calculations). This will result in the supplier interpreting this to be growing customer demand, with a cascading effect on the supplier who feels the necessity to increase capacity to meet the trend. To add fuel to the fire, just as supplier has added additional capacity to meet the increase in demand, demand falls off because the buying firm has excessive stock available. The resultant is firing of employees, selling of assets in order to reduce the capacity. This ‘phantom’ demand in SCM is called as bullwhip effect. In other words, ‘the increase in variability as we travel upwards in the supply chain is referred to as the *bullwhip effect*.<sup>13</sup>”

<sup>12</sup> ‘The Bullwhip Effect’ Chapter 27 towards world-class supply chain management, WCSM by Burt, Dobler & Starling, TMH, pp. 627-628

<sup>13</sup> Value of information, in Designing & managing the SC by Samchi Levi et. al, second edition, 2004, TMH

Therefore, in order to identify and control the bullwhip effect its pertinent to understand the main factors that contribute towards increase in variability in the supply chain.<sup>14</sup>

- **Demand forecasting:** Traditional inventory management techniques practiced at each level in the supply chain lead to the bullwhip effect. As discussed earlier in unit 5, managers generally use standard forecast smoothing techniques to estimate average demand and demand variability. The important characteristics of forecasting are that as more data are observed, the more we modify the estimates of the mean and standard deviation in customer demands. Since safety stocks strongly depend on these estimates, the user is forced to change the order quantities, thereby increasing variables.
- **Lead Time:** Increase in variability is magnified with increase in lead-time. In order to calculate safety stock levels and reorder points, we in effect multiply the estimates of the average and standard deviation of the daily customer demands by the lead-time. Thus, with longer lead-times, a small change in estimate of demand variability implies a significant change in safety stock and reorder level, leading to a significant change in order quantities, which in effect leads to increase in variability.
- **Batch Ordering:** The impact of batch ordering is simple to understand. If batch ordering is used by the retailer, as happens while using min-max inventory policy, then the wholesaler will observe a large order, followed by several period of no orders, followed by another large order, and so on. Therefore, the wholesaler sees a distorted and highly variable pattern of orders.
- **Price Fluctuation:** This can also lead to bullwhip effect. If prices fluctuate the retailers tend to stock up when the prices are lower. That is another reason why stocks vanish from the market prior to budget month. This is accentuated by certain manufacturers and companies of offering promotions and discounts at certain times on certain commodities.
- **Inflated Orders:** Inflated orders placed by the retailers during storage periods increase the bullwhip effect. Such orders are common when retailers and distributors suspect that a product will be in short supply, and therefore anticipate receiving supply proportional to the amount ordered. When the shortage period is over, the retailer goes back to the standard orders, leading to all kinds of distortions and variations in demand estimates.

After having seen the factors leading to the bullwhip effect we now go on to how to reduce the bullwhip effect by centralized information.

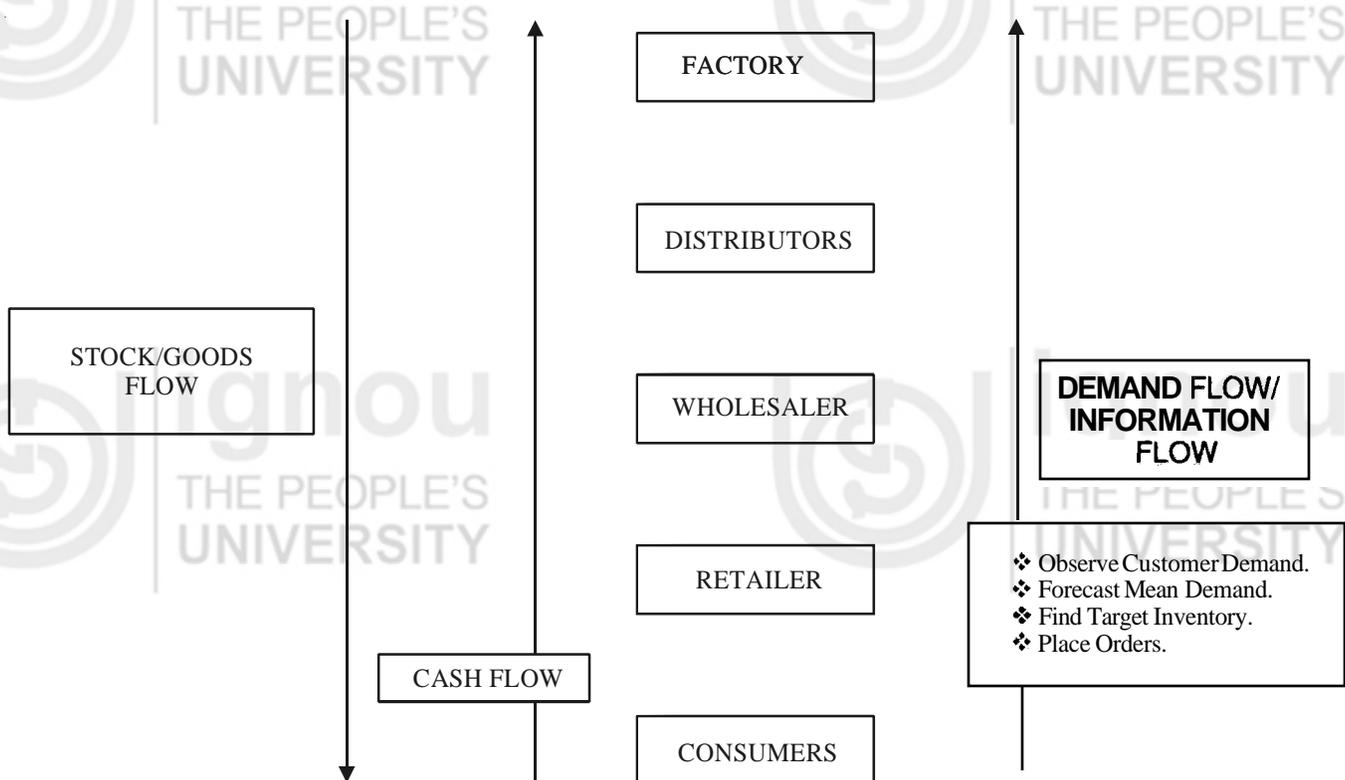
### **Impact of Centralized Demand Information**

Centralizing demand information within a supply chain can reduce bullwhip effect considerably. This would entail providing information on customer demand in each stage of the supply chain. How and why? If demand information is centralized, each stage of the supply chain can use the actual customer demand data to create more accurate forecasts, rather than relying on the orders received from the previous stage, which can vary significantly more than the actual customer demand. To determine the impact of centralized demand information on the bullwhip effect, we have to distinguish between two types of supply chains: one with centralized demand information and a second with decentralized demand information, as described below.

<sup>14</sup> Value of Information in Designing & Managing Supply Chain, pp. 104-106.

- Supply Chain with Centralized Demand Information:** In this type of supply chain the retailer (who is the first stage) observes customer demands and forecasts his demands with moving average method finds his target inventory level on the forecast mean demand, and places orders to the wholesaler. The wholesaler who forms the second stage of the supply chain, receives the order along with the retailers forecast mean demand, uses this forecast to determine its target inventory level, and places the order to the distributor. The distributor who finally places the demand to the factory, the fourth stage in the supply chain, follows the same process.

In this particular chain, each stage of the supply chain receives the retailers forecast demand and follows an order-up-to inventory policy based on this demand. Therefore, the demand information, forecast technique and inventory policy in this case has been centralized.



**Fig 5.5: Supply chain with centralized demand information**

- Decentralized Demand Information:** the second type of supply chain is the decentralized one. In this case the retailer doesn't make its forecast mean demand available to the remainder of the supply chain. Instead, the wholesaler must estimate the mean demand depending upon the orders received from the retailer. Here once again the wholesaler uses a moving average with  $p$  observations of the orders placed by the retailer in order to forecast the mean demand. Thereafter, it uses this forecast to determine the target inventory level and places an order with the distributor. The distributors target level is utilized to place orders in the fourth stage of the supply chain. Again, in this stage as we move up the supply chain the orders become larger and the variable increase with every stage.

Actually, in both the types of the supply chain the variance of orders become larger as we go up the chain so that the orders placed by the wholesaler are larger than those placed by the retailer, and so on. The difference in the two types of supply chains is in terms of how much the variability grows as we move from stage to stage. It is seen that the orders move additively in the centralized system and multiplicative in the decentralized one. In other words in the

decentralized system where only the retailer knows the customer demand can lead to higher variability than a centralized one, in which the customer demand is available at each stage, particularly when the lead times are large. Therefore more often than not the centralized system can effectively reduce the bullwhip effect.

It's also important to note that even with the centralized system the bullwhip effect remains, since the complete system is based on demand predictions and this is a variable factor. Therefore, it will be correct to say that it can only reduce the effect but not eliminate it completely.

### Activity 2

Understand the aspects of Bullwhip effect and analyze the same with a practical case study. Try and visit a firm to understand the effect of Bullwhip on SCM systems and how does the company plan to negate the effect to some extent.

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## 5.8 A NEW PERSPECTIVE TO COUNTER BULLWHIP EFFECT

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We have seen that bullwhip effect continues to stay in spite of our relentless efforts. Hence, why don't we put our minds together to find some solution to counter this effect and remove it almost completely? It can be considerably reduced, if we gave it a fair try. Let us take into cognizance of the various environmental factors, consumer behavior, market research and area study into effect to counter this problem. For a moment let us get into a model called *direct information system* (DIS), in which we allow the manufacturer to get direct information from the consumer bases rather than the retailers and wholesalers or the distributors. It will require the following:

- A thorough knowledge on the consumer behavior, to include peculiar habits as available in the Indian context and differs state-to-state, region-to-region
- A detailed market research
- An area study compendium to know about the area per se, this will ease out transportation, warehousing and material handling activities
- Last two to three years consumption report analysis
- Last but not the least, an integration of these factors under one common head the DIS.

### Let us see this with a live example

An area 'X' has a vibrant population and uses 2 popular brands of toothpaste 'Y' & 'Z'. Say 50% uses 'Y' and the other 50% uses 'Z'. Keeping the trends of our present day advertisements people can sway from Y to Z and vice versa. How do you find that out? Through your retailers/wholesalers who tell you this month people are asking for more number of Y to Z? Can you actually believe them? Since you believe them you aggravate your problems of existing Bullwhip effect. Resultant to this is over stocking and if not sold you land up with a clogged inventory, since the demands were more predictive than actuality. In

order to nullify this effect you could get your DIS activated and find out the actual on ground situation and believe your 'eyes to the ears'. Let us see this mathematically. Out of 1000 customers in an area, 700 under presumed ideal conditions uses 'Y' and the balance 300 uses 'Z'. That has been the trend for the last 3 months plus minus 10% here and there. This month things were different and you find your brand 'Y' has dipped to a low of 300, i.e. this month you got 400 toothpastes that never sold. What do you do now? Think of a sale gimmick and rush out your stock? Under ideal conditions, Yes! But how long could you afford to do that? Another 3 months? It's better you tide over this persistent problem once for all by activating the DTC (direct to consumers) method, wherein your own representatives are on the move continuously taking direct feedback from the consumers, in site. This will give a more realistic figure than a predictive one. These inputs can then be compared with that you received from the retailers/wholesalers/distributors, and you reach a common average of demands from one particular area. Looks simple on paper, requires tremendous coordination to implement. Let us see this with a figure to remove any ambiguity of sorts.

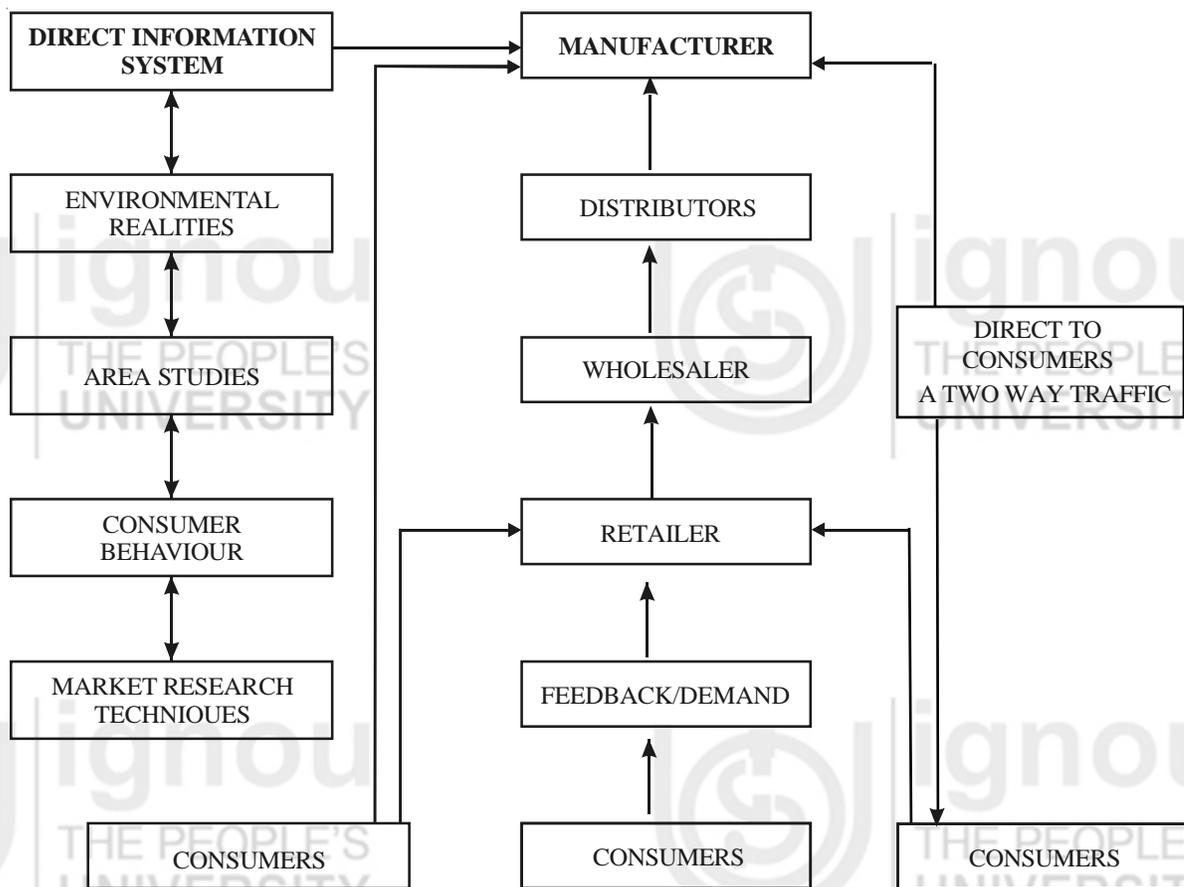


Fig 5.7 : DIS model for negating bullwhip effect by DTC link (Direct to Consumer)

## 5.9 DRIVERS OF SCM

SCM is indeed the most dominating paradigm in contemporary business and is slowly emerging as powerful creators of sales and revenue growth. In the 21<sup>st</sup> century, the rapidly exploding liberalized global market is creating enormously diversified customers, products and services. Organizational, informational and managerial demands are being redefined. The new millennium is creating conditions and an entirely different type of challenge, which are being manifested in innovative supply chain developments. The first driver is the behavioral changes in the top management of global companies. This has dramatically

altered the way people think, learn, decide, act and believe in how they can improve their responsiveness towards their clientele groups. The second is concerned with making quality products to retain customers, the third driver is discipline of supply chain cost economics, fourthly is creation of a value innovation process and fifth the decision making process, so as to make every stage of the management accountable and responsive.

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## 5.10 SUMMARY

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In this unit we have focused on the concepts like models for SCM. You have learnt about value chain system. You deliberated the stages of integration of supply chain and learnt about integrating supply and demand chain to include demand management. You discussed the relationship of goods flow, information and cash flow. Bullwhip effect and measures to reduce this effect were also deliberated.

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## 5.11 SELF ASSESSMENT QUESTIONS

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- 1) Integration of supply and demand chain will go a long way to build and effective SCM system. Discuss with examples.
- 2) Explain with examples demand and demand management.
- 3) Explain the various models of SCM.
- 4) Explain push-pull model with relevant examples.
- 5) Discuss the role of Internet in SCM. Explain e-business and e-commerce.
- 6) What is Bullwhip effect? Explain the various permutations and combinations to reduce this effect in SCM.
- 7) What are the reasons for variability in the supply chain? Explain in detail with relevant examples.
- 8) How do you link goods flow, information flow and cash flow in SC integration? Explain with appropriate diagram.

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## 5.12 REFERENCES AND SUGGESTED FURTHER READINGS

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- 1) Burt, Dobler & Starling, *World Class Supply Management*, Tata Mc Graw-Hill
- 2) Deshmukh & Mohanty (2004), *Essentials of SCM*, Jaico Publishing House, Mumbai-23 (should be included in compulsory reading, since the text pertains to Indian context, simple and easy to comprehend)
- 3) Simchi-Levi, David Kaminsky, Philipsimchi-Levi, Edited (2004), *Designing And Managing The Supply Chain*, Tata McGraw-Hill
- 4) Mentzer, *Fundamentals of Supply Chain Management*, Sage India Publishers
- 5) Gentry, J. J,(1999), "The role of Carriers in buyer-supplier strategic partnerships: a supply chain management approach," *Journal Of Business Logistics* pp. 35-53, cited in Amelia S. Carr & Larry Smeltzer, "The relationship of strategic purchasing to supply management", *European Journal of Purchasing and Supply Management* 5 (1999) p. 44.
- 6) Kevin Werbach, "Syndication: The emerging model for business in Internet era", *Harvard Business Review*, May-June 2000, pp. 85-93.