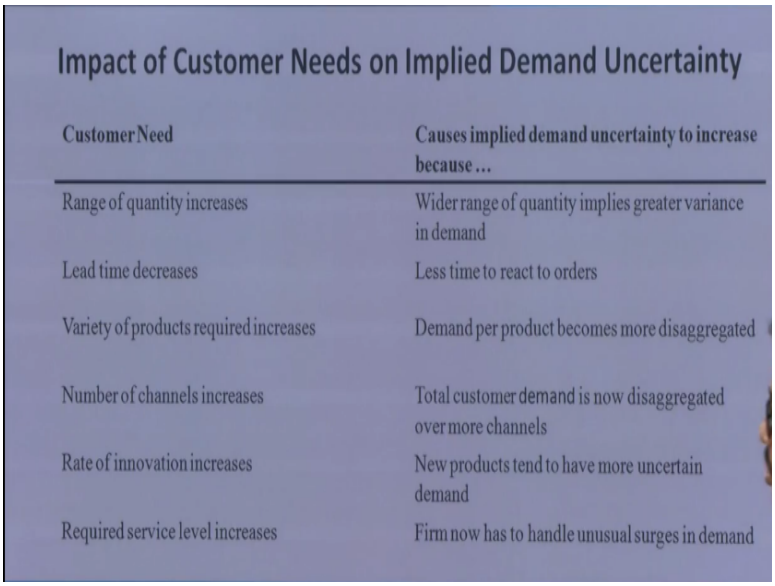
Supply Chain Analytics
Prof. Dr. Rajat Agrawal
Department of Management Studies
Indian Institute of Technology-Roorkee

Lecture-08
Developing Supply Chain Strategy

Welcome back, so now we are moving into the eighth lecture of this course and recently we discussed about the role of drivers in making a supply chain strategic. So now moving further into the discussion of supply chain strategy.

(Refer Slide Time: 01:06)



We will see that how the first process of the supply chain strategy management that we need to understand the demand and supply uncertainties. And you see the demand and supply uncertainty are related to variety of things. Now some of the uncertainties which are there from the demand side in a supply chain. Let us see a customer can vary the quantities demanded.

Now we see in the last discussion that how during a particular time of the day that demand of food products may increase, demand of seeds in restaurant may increase. How the demand of cinema tickets on a weekend show may increase. So quantity of products required at particular time may increase or decrease. So you have uncertainty is related to range of quantity increases.

And this range of quantity increase is increased or decreased by the customer the implied demand uncertainty as a result of that is that wide range of quantity implies that greater variance in demand. Mens if you have large number of excuse, so in that case this range of quantity will create for the higher various in the demand uncertainty. So that is one very important thing.

And now a days you can see a lot of product categories the uncertainty related to quantities are there and particularly if I take you to the side of humanitarian supply chain in that particular supply chain you have huge amount of uncertainty with respect to quantities. So quantity changes and this quantity changes is even more severe when you have wide variety of products to be offered in your supply chain.

Then you customer need is also with respect to lead time. Now customers are continuously expecting that lead time when I order the product and what I received. That difference that time gap is known as lead time. The time between you order and you receive the product, that time is known as lead time. Now there was a time 20 years 30 years back when I used to book a Bajaj scooter.

And I used to get deliveries after 4 years or 5 years or 6 years of that time. But now days what is expected I should have money in my pocket and I should walk to a retailer stop and immediately I must get the product. So now we are continuously expecting reduced lead times. I am not interested in waiting for my product and this particular aspect created a landmark change in the supply chain management of Dell computers.

Before that Dell was taking sufficiently time off around 2 to 3 weeks to deliver their products, but as Dell could understand it at a very appropriate time that now customers are not going to wait for the product and immediately they change their supply chain and went to the retail market. So lead time is continuously decreasing and now as a result of that when customers are expecting low lead times there is less time to react for the orders.

Today I am giving the order and you have one day or even less than one day to fulfill my requirement. So you do not have much time and you need to develop the capabilities in your supply chain. We all are looking is certain degree of responsiveness in my supply chain. And therefore this is creating another kind of you can say a stress in the supply chain that you do

not have enough time to react or to understand or to satisfy the customer requirement you have to do every requirement fulfilment on war footage.

Then variety of products required is continuously increasing. You can feel in your last 10 years of period or 15 years of period that how the variants of products are increasing. Because we all are living in marketing era. This is the era of marketing and in the era of marketing we say the customer is king and we are going to fulfill each minor requirements of the customer.

And therefore we are creating continuously more and more variants of the process. So the variety of products are increasing and this increased variety of products are creating another kind of pressure because when you have more number of SKUs the stock keeping unit, you have so many varieties of soaps, you have so many varieties, flavours, pack sizes of biscuits, you have so many varieties of nankeens.

So all these things are variety of products that is increasing and then you need to understand the demand for a product is becoming more disaggregated. So that is also a challenge to the supply chain and you need to when I am talking in strategic management you need to understand that how to fulfill this disaggregated demand. Because for each small product you need to develop the supply chain solutions.

Then numbers of channels are also. Earlier we used to have simple brick and mortar type of supply chain. But nowadays you have small Kirana shops, you have big balls and then you have E supply chains also. So there are different types of channels through which producer through which companies are reaching to the customer. They are following the conventional wholesaler, retailer and customer model.

They are following directly from manufacturer to big retailers those who are the organised retainers and then to the customer. And then there are companies directly from manufacturer to customer. So numbers of channels are continuously increasing and customers have option all the customers can go for different different types of channels. So these are also creating a type of pressure on the supply chain that you need to maintain, you need to manage the multiple channels which are available in the market.

So what is happening E-channel, E-channel like E-supply chain, the big malls and small Kirana shops. The overall demand of the product, overall demand of the supply chain is now distributed over these different channels. So you need to handle all these channels because your overall demand is now disaggregated over more number of channels. So as you evolve more number of channels you loose economies of scale.

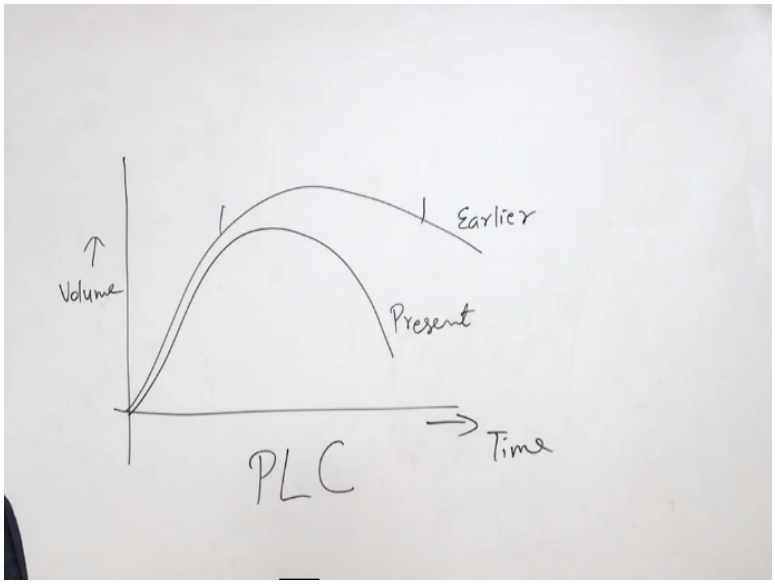
So that is another challenge because you have X number of customers total and now X number of customers are distributed over 3 different type of channels. So each channel will take care of if it is uniform distribution X by 3 X by 3 and X by 3 number of customer. So that total customer demand is now disaggregated to more number of channels. So obviously you lose some of the efficiency in managing the different number of channels.

Then you have another important area from the customer that innovation, customers continuously expect the innovative products and as we all can observe the rate of innovation is continuously increasing. The new products are coming at a much faster rate and we had a time when we used to have black and white TVs and black and white TVs remain into the market for more than 3 decades in Indian market I am talking.

But after 1980 when colour television came to Indian market we are seeing in last 35, 36 years a very fast change in the colour TV Technology. You had variety of colour TVs where casualties were there, then after that we have LCDs, LEDs, High Definition, full HD, then TV with Wi-Fi, a small TVs. So in last 35, 36 years you can see the rate of innovation in colour TV technology.

And it is not only limited to colour TV technology you can see in the information technology in the area of your mobile communication, in the area of automobile, in the area of your household appliances everywhere you talk you will see that rate of innovation is continuously increase and this rate of innovation is putting another pressure because the life of the product is not much and as a result of that new products tend to have more uncertain demand. When a product has passed or when product has a longer maturity cycle.

(Refer Slide Time: 11:32)



This is not a class of marketing so I will not going in much detail. But you can understand or you should know that this is a generic kind of product life cycle. We normally abbreviate it as PLC project life cycle, on x-axis we have time and on y axis we have volume. Earlier in previous time we used to have a sufficiently long maturity period, where during this period demand was almost very certain, it was almost static kind of demand.

But nowadays because of this innovation you will not find a longer maturity period, a product comes and reaches to a particular level and immediately declines. Because a new product comes into the market. So this is the earlier time and this is the present time. And as a result of that you have more uncertainties in handling the demand of new products. That how a new product feature in to the market.

You have the example of iPhone 5, iPhone 6 and iPhone 7. So Apple is continuously introducing new iPhones into the market. But we all know this response of the market towards iPhone 7 is not as good as it was for iPhone 5 and iPhone 6. So you cannot take decisions on the basis of past data. You need to see that each new product will come with its own uncertainties.

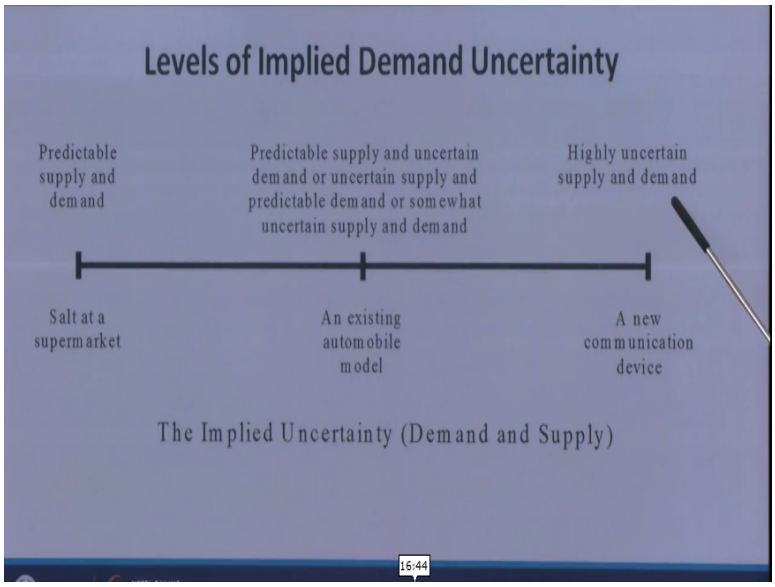
And this is happening because of rate of innovation and customers are becoming lover of innovative products, but more innovative products are putting it different type of pressure on the supply chain uncertainties that you have uncertainties related to demand of the new innovative products. Then you have expectations from the customer about increased service level.

We want as soon as products demand comes to my mind as soon as I walked into a shop retailers place I must get the product immediately. So I want a very high level of service for my expectation. Now because of this high level of service requirement companies supply chain now has to handle unusual increase in demand. There is all of a sudden a very high increasing demand and all the customers are expecting same high level of service labour.

And therefore it again becomes a challenge for the supply chain that how do we handle that sudden increase in demand and all the customers are expecting same level of service. Because they all are ready to pay extra premium, they all are ready to pay the additional cost for getting the higher service levels. But you have limitation of supply chain. So all these things all these customer needs ranging from quantities to the service label.

All these things are creating different type of implied demand uncertainty and these implied demand uncertainty is to be handled for developing a proper supply chain strategy. So now moving further into this because of this implied demand uncertainty now you can understand from the spectrum of this implied demand uncertainty.

(Refer Slide Time: 15:40)



That on this site you have a very predictable supply and demand. And this is like my earlier PLC, the previous PLCs. Some of the products like I take the example of salt, the common salt it is still like earlier PLC. So you have a very certain demand and supply of this type of product. So it is coming on this side of this implied demand uncertainty where the implied demand uncertainty is very very low or almost absent.

On this side of the spectrum the implied demand uncertainty is almost absent. Now coming to the side of the spectrum to the right side of the spectrum, hear you have very high level of uncertainty in the supply and demand like as I mentioned about i7 iPhone 7 and it is a new phone just launched into the market and this product has a very high level of uncertainty that how customers will respond to this type of new product.

And therefore I have placed this i7 to the right side of this is spectrum. So now you have these two extremes where on the left you have no uncertainty, suppliers are also having a very routine kind of demand and they are habitual, they have developed a good infrastructure to meet that kind of demand. Here you do not know what type of demand it will be. So all the suppliers are in a state of confusion that should we produce large volume, should we produce low volume.

If we produce large volume and customers do not respond that, you have huge inventories. If you do not produce enlarge only had customers are also expecting high service label, they want product immediately i7 is launched today and I want today the product. But since I very much cost conscious so I have not stored in of inventory of i7 so most of the customers will not be happy because I am not able to provide the required service level.

So you have lot of challenges on this side of this is spectrum where you see that all these products will have to face and therefore we will talk of flexible supply chain that how initially you need to have a very responsive supply chain, a flexible supply chain. So that you can make changes as per the requirement of your uncertainties. Then somewhere in the centre, not exactly in the centre somewhere in the centre place of this spectrum.

You have some work sudden it is somewhat uncertainty, you have a balance type of place where you have some kind of predictable supply and uncertain in demand are uncertain supply and predictable demand or somewhat uncertain supply and demand. So you have possible combination of uncertainties and predictability of supplies and demand. And therefore from routine kind of models like you take the example of Scorpio.

You take the example of Alto, you take the example of Wagoner, and these types of you take the example of CD 100 motorcycle of Hero. These types of examples can fit in at this type of

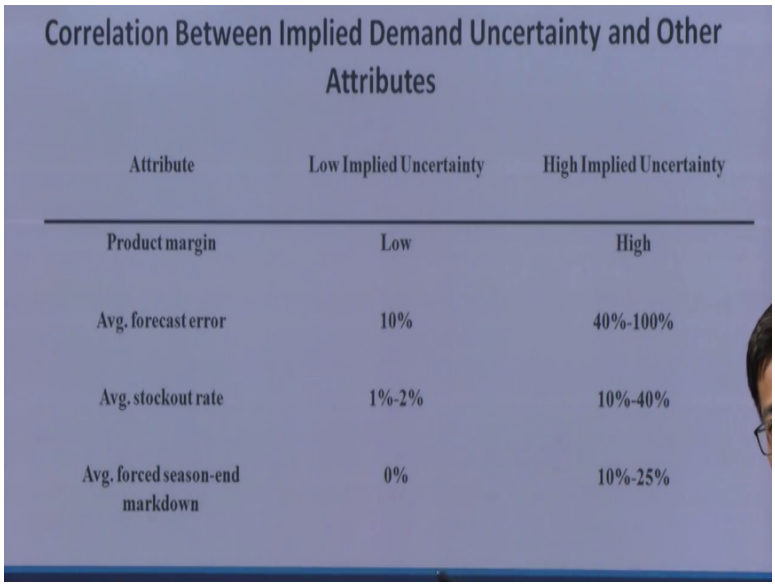
place where you have some existing routine kind of model which is already popular in the market. So that product will fit into this place. So where you have a very predictable supply and demand obviously you cannot make huge profits.

Where you have very unpredictable situations either you can made huge profits or you will go down. Because of not able to achieve the desired level of you because not able to answer the desired level of uncertainties. But here in this case in the central location where uou have some uncertainty is in your supply chain may be either because of supply side or because of demand side.

But this is a position which is very hard on position. Because in current environment of innovation where PLCs are continuously sinking even in this stage you are able to maintain a longer PLC for this products and then only this type of positioning is possible for your product. So it requires a very integrated effort from all the functional area, not only from the supply chain.

But from the product development team, from the marketing team, from the distributors point of view, from the after sale service point of view. All those who are involved in delivering value to the customer their important role is there to get this position on this implied demand uncertainty spectrum. After understanding the concept of this implied demand uncertainty you can see that as a result of some of the researchers.

(Refer Slide Time: 21:23)



When you have low implied demand uncertainty, your product margins are low as we saw just now in the case of salt, you have low product margin because it was position on the left side of the this implied demand uncertainty spectrum. When you have high implied demand uncertainty your product margins can be very high as evident in the case of i7, which is position on the extreme right side of the implied demand uncertainty spectrum.

The average forecasting error is very low as low as of 10%, in case of low implied demand uncertainty. But if you are positioned on the right side of this is spectrum your answer forecasting errors can be as high as 40% to 100%. So that is very very unfortunate just to coat you some data. When in Bombay now Mumbai this Bandra Worli Sea Link was conceived. So the initial forecast for that Bandra Worli Sea Link was about 12 lakh cars per day 1200000 hours per day.

But if I give you the present uses it is just 45000 cars per day. So that is the type of errors which are possible in case of high implied uncertainty product. So this is a kind of I can say blender in calculation or in the forecasting. But it is always possible when you are dealing with a product having very high implied uncertainty. Then stock out, the number of times products goes out of stock and a customer wants that product.

So in case of low implied demand uncertainty products it is just 1-2% very low. Most of the time is the opposite of this is you are able to achieve 98 to 99% of service level, a very high service level you are achieving in case of low implied uncertainty products. But in case of high implied uncertainty products your stock out rate is 10% to 40%. It means your service level can decrease as low as up to 60% in case of high implied uncertainty.

And if the service level is 60% you can correspondingly understand the customer satisfaction level, means out of hundred times only 60 times customers get the products, 40 times they are not able to get the product when they are visiting the retailer or retailer is visiting the wholesaler or wholesaler revisiting the manufacturer. So that is the reason of low customer satisfaction in case of a new product because of this low service levels.

Then because of forecasting error and because you are piling up the inventories you need to clear those inventory and end of season marking down pricing is now a days we see very often. So in case of low implied uncertainty you hardly see this type of activity. So it is

almost zero, you never find any kind of end of season sale on product like salt or grocery items or wheat items. There is no such concept.

But you find lot of end of season sale for garments, for shoes and for so many other product, because of forecasting errors and because of these reasons you are piling up inventory. So 10 to 15%, 25% of the time you have this type of marking down of the prices. So you can see only thing which is favouring the high implied uncertainty is the high product margin. But you have correspondingly very high risk of forecasting error, you have very low service level of 60%.

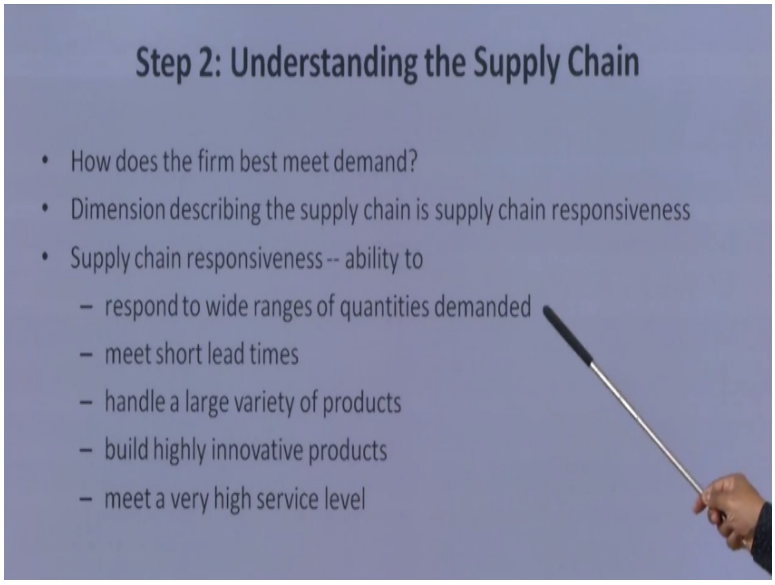
And you also can go up to 25% of end of season marking down. So all these things are big challenge for high implied uncertainty. But it is almost unavoidable. The reason is because whenever you are launching a new product, the implied uncertainty is always very high and since it is the time of innovation, it is the time of sinking PLCs. So to remain in to the market, to remain competitive into the market you have to be launching new product.

But you have to be very very careful and now it is very important to understand that the data analytics. The data analytics can help us to change the figures. These figures of forecasting error can be reduced from 40% to 10% or 15% if I use proper forecasting methods. The more adaptive forecasting methods, more adaptive forecasting methods if I use probably I can reduce the forecasting errors.

If I can reduce the forecasting errors both these things, the stock out rates and the marking down will also be reduced. Because when I am able to correctly forecast, so I will talk only that much product with me and this correspondingly will help me to achieve higher service levels and to reduce by marking. So both these things are actually related with the forecasting errors and with the help of data analytics with the help of adaptive forecasting.

I will be able to somehow reduce this value of 40% to 15 or 20% so that is one big advantage which is going to have with the help of data analytics into the supply chain management.

(Refer Slide Time: 28:05)

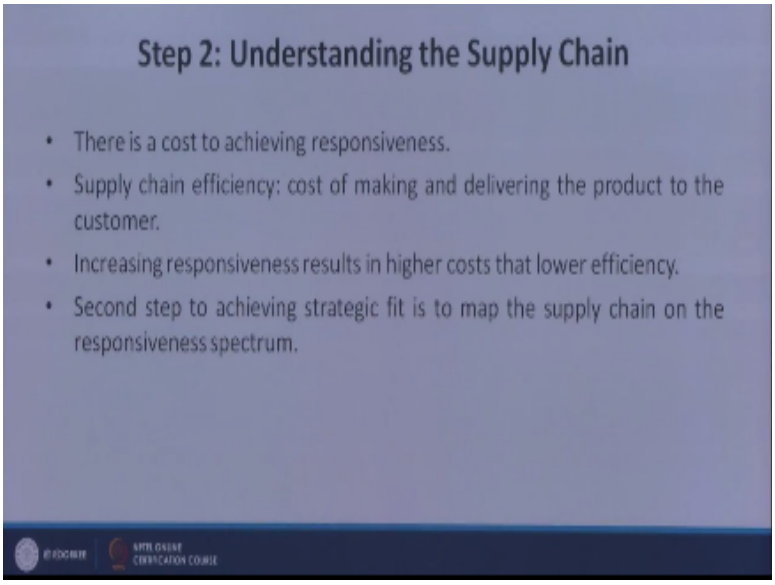


Now once we understood the uncertainties related to demand and supply in my supply chain the next important point is to understand the supply chain. That how my supply chain is going to answer this uncertainty, how I am going to full fill the gaps which are there in my supply chain. And that is the second step in developing the supply chain strategy canvas. So now let us see that how does the firm best meet the demand?.

What are the different typical you can say coping mechanism available with the firm through which firm is able to meet its demand, like in the class of drivers we discuss that pricing is one such mechanism through which firm can meet the demand and supply, when the dimensions which are describing the supply chain and how it is responsive supply chain, those dimensions whether it is through pricing, whether it is through facilities, whether it is through a distribution, whether it is through the inventory etc.

And supply chain responsibility to respond wide range of quantities the number of products, the how much you are demanding, so how my supply chain is responsive to that. When reduce lead time, then variety of products, then ability to innovate new production and to meet a very high service level. So I need to see that how my supply chain is able to answer all these abilities which we require from the step one of our strategy development process.

(Refer Slide Time: 29:58)



Now it is also very important to understand that to achieve a particular level of responsiveness there is a cost associate to that. When you want to achieve a particular level of responsive you need to invest into developing the supply chain capability. So there is a cost associated to develop the particular level of responsiveness. Efficiency we have already discussed that it is inversely proportional to the cost of making or delivering the product to the customer.

And as we just discuss that increasing responsiveness results in higher cost and it lowers the efficiency of the supply chain. So efficiency and responsiveness are somehow inversely related to each other and now we will see that to develop a strategic fit of the supply chain, we need to put the supply chain capabilities on the spectrum of implied demand uncertainty. So today we close our discussion at this point.

And in our next lecture we will see that how do we map the supply chain on the responsiveness spectrum that and later on we will see that how this responsiveness spectrum is imbedded in that imply demand uncertainty. So thank you very much for this eighth session of our supply chain analytic course.