Hello dear friends, welcome back to NPTEL online course on logistics and supply chain management. So in the last session we started discussion on designing distribution network and we explored how picking any different type of distribution network will impact your services factors and as well as your cost factors, right. So, here we will discuss about some of the design options and then we will see how we can evaluate those different design options in depending upon the nature of the product, nature of the industry and then how we can select the best distribution network design. So, and we will end this discussion by one case study. distribution network design so obviously based on the firm industry or product nature or what type of services you want to deliver right .So already we are talking about one end is your cost parameter another end is your responsiveness right so if we are talking about we are hitting this parameter obviously we we need to you know consolidate the inventories we need to consolidate the orders, we need to utilize the economies of scale we need to club maximum orders during transportation right individual order we cannot process on the other hand if we are going for responsiveness so we are providing the customized services even we are delivering the individual product as well So, based on that we have these six options to design the different network with your very kind of routine you are dealing with you are going to the shop picking the product from manufacture storage with direct shipping from their end and then we will include the online store also where you are visiting online and then the products are delivered from the retailers or manufacturers.

So, we will discuss all these 6 network designs in detail, what are the parameters, what are the you know main points you need to consider as per as cost is concerned, as per as those performance parameters are concerned right and then we will finalize depending upon the industry nature which product you should, which design you should go for right. when we are saying manufacture storage with direct shipping first is here the manufacturing agency is or company is storing the product so storing the product that means they are maintaining the inventory when they are maintaining the inventory directly order is going to manufacturer and then they are processing that order and direct shipping is done drop shipping is done so this is known as concept is drop shipping so that means there is no need of including any intermediator in terms of retailer, distributor, wholesaler those you are not you need not to include those players so some

characteristics and consideration of manufacture storage with direct shipping so your manufacturer maintains its own storage facility hold the inventory right so inventory cost he is directly you know responsible for that having said that that means manufacturing location will be somewhere in the center so that means that Inventory cost can be minimized because you are not maintaining inventory at different locations, first point. Customer places order directly with the manufacturer and then manufacturer will process and fulfills the order, so you have more control, visibility about the customer information, when customer is visiting that product, when customer is placing the product and then quality of the product you have direct control over quality, over the delivery, over the packaging everything because you are doing in house, so having said that means you have to arrange the shipment. arranging shipment requires all that you know infrastructure where you need to you know go for the logistics expertise and then you will set up your own distribution network right and then when you are saying that what are the benefits so obviously you will be saving cost your margin will be more because now you are not sharing your margin with the delivery partner with that distribution network You have control over inventory, control over quality of the product, control over the delivery, control over the overall customer experience in terms of services we are evaluating.

So, this is usually the structure looks like. The dotted lines represent the information flow and solid lines are representing the product flow. So, customers are usually visiting the retailer and then they are getting all the information related to the product. So, like in heavy items, let us say if you are buying heavy appliances for your home or if you are buying, you know, let's say furniture or tiles or marvel for your home right so what you will do you will visit the retail shop and then you will see all the different designs right and then you will finalize the color the design the quality whatever marvel you want right As per that retailer will record the order and this information will be given to the manufacturer. Manufacturer will directly ship the product to the customer end.

Now because we are dealing with those kind of products where if we will ship the product first with to the retailer then from retailer to the customer then their handling will be there. We may break the marble pieces that will happen. we are loading and unloading different location. So, if we will record order at one location and we will serve that to the final to the from the manufacture to the directly to the customer, then it will minimize that cost as well right. So, we will see the different cost parameters how these will be impacted.

If we will talk about inventory, now inventory who is maintaining? Only manufacturer is maintaining the inventory. So, that cost will be lower down. because you are not setting up different retail shops or distribution network or order fulfillment centers so inventories

are centralized so cost will be reduced transportation very high cost will be there why because outbound logistic cost has increased now you are not shipping product from your retailer to the customer, but you are opting other model where you are directly shipping the product from your manufacturer side to the customer outbound logistic cost has increased. So, even if marvel pieces may be different demand is coming. So, individual order you are processing right.

So, if this is the network one order is coming from here that order will be processed individually 1000 kilometers you are covering the distance another product is coming maybe from 700 kilometers on the same route maybe then even then another delivery will be done. So, these many different individual deliveries will be done. So, transportation cost will be higher and because we are not utilizing the full capacity also the demand here will be different, demand here will be different, here will be different, here will be bigger. So, then that full economies of scale you cannot utilize. facilities and handling cost will be lower because you are not storing at the customer location nearby customer location and that way handling cost is also reduced because only you are storing the product at the manufacturer end information huge investment you need to make in the information system because you are not dealing with that you know physical infrastructure of that long distribution channel where the retailer is directly communicating with the customer but here your information is shared with the retailer ,retailer is passing the information so that same exact information should be passed otherwise if i will place the order for maybe thousand pieces of marvel and in the end i placed order for some other color and they wrongly place the order with the manufacturer with some other color.

So, then you can see the cost and then the customer satisfaction level. Now, these are the services when we will pick this manufacturer storage with direct shipping. Response time will be huge because manufacturer is here and you are at 1000 kilometer. So, this will take time 4 to 5 days. So, response time is very very long in case of manufacturer storage with direct shipping.

Product variety will be very high because there is no retail shop who is going to maintain your inventory. If today you are manufacturing 1000 units, all 1000 units are available. Different varieties are available at one location. product availability will be very very high because if I will set up different locations may be one location I am having 10 items 10 models other location I am having 5 only here I am maintaining 50 models here I am maintaining 13 models so product availability different at different locations but if I am maintaining at one location may be all the 50 models are available in that location it is manufacturer location customer experience good in terms of because home delivery you are getting but but if you are dealing with the product where you your customer wants to

interact with the product before buying then experience is not good because if you are buying your furniture so then experience is not good if you are placing order you are just picking some photographs and then you are placing order how this will happen that's why in online industry furniture industry the penetration is only 1 to 2 percent right Time to market very fast very less time it will take why because if today I launch the product today it is visible through my website that this model has been launched. Order visibility that IT platform you need to develop where you can track every single individual packet.

expensive and difficult because now thousand kilometer that product travel to the customer location and now customer is not ready to accept that so it will not be stored at the retailer location it will go back to manufacturer so then in that way it can be expensive but again We are thinking about the pure strategy scenario right if i will say if any return product is coming nearby location i can maintain small inventory of the return products and if any order comes from ah nearby location in future i can meet those that demand so then there is certain deviation with that, this design distribution network but here we are talking about the pure this manufacture storage with direct shipping network But obviously, when any player will pick the strategy, they can mix some positive points of some network, other positive points of some other network. Second is manufacturer storage with direct shipping and in-transit merge. it is similar to the first one but the difference is in transit merge means let's say if i have placed 50 grocery items order on amazon fresh right so maybe those 50 item amazon has taken from let's say four vendors So, now these items will be you know reaching at the fulfillment centre at different time ok. So, what my fulfillment center will do as long as he is receiving from vendor 1 he will process to customer then it is it has received may be from vendor 2 and vendor 3 at the same time almost same time it can consolidate and will send the other order to the customer. So that means one order I got three multiple deliveries.

So that way customer experience is not good. If I'm talking about that aspect. So what in transit merge will do in transit they will wait for all the order here they will merge orders coming from different sellers and finally one order delivery will be done to the customer it's not you are visiting the customer location multiple times that means still you are maintaining the quality still you have control over the inventory right but you can minimize the transportation cost why because now you are consolidating different orders in your fulfillment center ok so that way customer experience is also enhanced but for ensuring that you need to set a very strong communication and collaboration network one your manufacturer one is transporting when your manufacture two is transporting that complete information you must have because you are waiting for the fourth vendor manufacturer and then the you have received the item from first three, but you are still waiting for fourth you have no updates on that so then that those items are also delayed

so in that way customer experience will be affected right negatively affected so real time tracking obviously is required because you need to console consolidation of orders the basic point is you need very strong information channel So this is the system will look like your design network. What customer will do? Customer will process the information with the retailer. Again the same network, different customers are there.

They are placing order with the retailer. Retailer will channelize these orders to different manufacturers right if grocery items are there will be routed to some grocery manufacturer if clothes are there will be routed to some clothing industry if toys are included in that toys will be routed to some other industry home appliances are there anything so will be routed to different factories different manufacturers and in transit you will merge all the orders and then will make one delivery to enhance the customer experience so in that way inventory Cost will be similar to drop shipping because manufacturer is still maintaining the inventory. You are not maintaining a different location. Transportation somewhat lower. Why lower? Because you are combining multiple orders and then making one delivery, not multiple deliveries.

Facilities and handling cost will be higher. Why? For consolidating the orders, now you need one storage house where all the orders are coming, you are tracking those orders, putting orders together and then again making it one order and processing. Information, strong investment is required because you need to track the orders. Response time, similar response time will be there as we were getting the manufacturer storage with the direct shipping because those many days it will take directly it is coming from the manufacturer. Product variety, similar to drop shipping.

because still manufacturer is holding the variety product availability will be same high product availability because manufacturer is storing the customer experience is enhanced like I told you in way of they are getting now single delivery instead of multiple delivery time to market same order visibility same because still manufacturer is there now you are producing something it is ready to be sold in the market. And returnability, obviously returnability is similar to your drop shipping only because there is still the direct inventory is coming from the manufacturer. So, if you are returning it will go directly to the manufacturer. The third option we have is distribution distributor storage with the carrier delivery. Now, instead of manufacture here distributor is storing the inventory.

Now, that manufacture is losing control over inventory and little control over the delivery and quality right. So, services they are providing to the customers right. So, for carrier delivery may be distributor is doing the carrier delivery or you are hiring the third

party to make the end miles delivery. So, what are the some key consideration under this? Obviously, inventory will be held by now the distributor. So, product are transported to customer using package carriers or logistic provider.

those can be third party logistics provider distributor manage the logistics of receiving, storing and shipping the products because now distributor is managing the inventory and then benefits will be now because earlier manufacture was somewhere in the center now distributors may be we have many distributors nearby to the customer so inventory will be maintained at different location response time will reduce and inventory cost will increase right order fulfillment will be better so when you are considering the cost parameters warehouse management inventory cost this coordination cost with coordination means with carriers right who is going to make the final delivery right and then distributor may add some value adding services in terms of consolidation kitting packaging that can be done right and this design option allows for efficient distribution across different geographical reasons right because now you are you need not to set up your own distribution network because third party is doing that or your distributor is doing that local distributor and then you can maintain higher level of product variety availability so how it is different Earlier product was directly coming to customer. Now it is not the case. Again information is going to retailer. Retailer is replenishing the inventory or retailer or distributor. They are maintaining inventory here.

So from here the orders are shipped to the customer. So, this is simple structure inventory cost will be higher because now we are maintaining inventory at multiple location, but as long as your fast moving goods are there you can maintain the inventory there is no problem with the inventory cost, but if the goods are taking time you know for the final consumption demand is not that high so then inventory cost will be high transportation cost lower than the manufacturer storage because now the outbound logistic cost is reduced because the distance has reduced facilities and handling will be higher compared to the last two network because now we are locating the inventory at near the customers at the distribution location where handling will be done right information you need not to invest that much because simple information structure will do because you have introduced one or two more players in that network right. response time will be less faster delivery will be there product variety will be reduced availability will be reduced because now you are not maintaining the variety at the manufacture location you are maintaining variety at the distributor location and sometime you are getting all the models sometime you are not getting all the models so that availability is question customer experience better than the first two because if you want you can go to the distributor location can feel the product can touch the product right time to market it will take higher time to you know to market that product because today you lost the

product it may take 10 days or 15 days to maintain the same inventory in throughout all the markets order visibility is easier because now many as you will keep on adding more intermediators so the visibility is more because you can check with whom the product is right now returnability will be easier because now you will not return 1000 kilometer back to the manufacture, but it will be returned to the local distributor. The fourth is distributor storage with last mile delivery. So, usually last also we discussed and this one also last mile delivery usually like Amazon you can see.

where distributor may be storing the product and then you are delivering the product they are placing the order you are delivering the product to the doorstep so again inventory is held by the distributor so your main target is how efficiently you can store and manage the products and then distributors are only responsible for picking packing recording the order and processing the order so that means the last leg of the delivery process is also ensured by the distributors only it is up to the distributor whether they are going for their own distribution network last mile delivery or they are going to take the services by the third party logistics provider So, in that way faster order fulfillment will be there because you are placing order online may be and then the order will be processed not from the manufacturer from the local distributor. And a reduced transportation cost because outbound logistics distance has been reduced because response time will be lesser customer satisfaction will be there. So, here what decisions we need to take? We need to go for efficient route planning, how we can maximize the order delivery in that way that on particular route we can deliver the maximum orders. Managing delivery personnel, maintaining delivery infrastructure and ensuring the customer communication through the end mile delivery. So distributor may offer some value adding services like we told if you are taking some home appliances, so installation, assembly, product customization can be there.

And then because you are locally maintaining the inventory so that long distance transportation outbound distance that logistics cost will be reduced right. And then usually I talked about Amazon you can use that if it is you know retailer storage or distributor storage inventory they are selling when they are tying up with the local vendors. Strong coordination between the distributor, delivery personnel and customers required. Now, as we will keep on adding more players like retailer, distributors, customers, manufacturers are there, then we need to talk more about coordination. When only one or two players are there, coordination can be done easily.

So, to maintain that, we have some root optimization software, real-time tracking system, we can track the products. This is how it is happening. distributor storage with last mile delivery distributors are storing at different locations and then to one market

they are serving through their local distribution partner who are doing the last mile delivery right so talking about inventory cost will be higher because at different location you are maintaining transportation cost very high because individual order you are processing but if you are if we will talk about the outbound logistics cost that will be reduced right but customer experience is enhancing by doing the last mile delivery facility handling and cost will be higher because you are consolidating the order in your local facility hub and then you are processing information that strong information network is not required, but yes because now many players are there to you know transparently process the information you need to set up that information channel. Response time very quick because locally you are maintaining the inventory, product variety will be lesser than the first, second, third option because you are storing at different location somewhere product may be available sometime product may not be available customer experience is very good because you are shipping product directly to the customer location time to market will take more time because you are taking time to ship the product order visibility you can easily implement that if you know you have implemented like Amazon, Flipkart, Walmart kind of system returnability is easy you need not to visit to the shop just you return on the platform you click on the return and then it will be returned back to the distributor or retailer wherever you are maintaining the inventory the fifth option is manufacture distributor storage with customer pick up now what will happen in this case here retailer are storing the inventory now they are doing the cross talking and here we have some customer pick up sites for kharagpur there is one center in kharagpur and customers will because sometime what is happening customers are not available on their mentioned address they never know whether they will be at home during that time they will be in office they will be somewhere else right in the market so what they want Anywhere if you are consolidating my orders may be within 2-3 days I will go to that convenient store where I will pick up my all the packets. So that way you are not getting the home delivery.

 So the customer experience will not be better in that way but yes because any day I can go there and then I can pick my product. So, inventory again you need to maintain the inventory transportation cost will be lower because no customer is picking the product facility and handling cost will be high because you are maintaining now nearby pickup locations also where you need to maintain the inventory and information you need to invest into information infrastructure because you need to consolidate the orders and then keep updated your customer that your orders have received at the pickup location. Response time similar to the last one higher right, because it will take time to reach to the pickup location, product variety will little lesser, product availability will be lesser because now you are not storing at manufacturing location, customer experience will be lower in this kind of network because you are not getting home delivery, time to market it will take more time because again you are not storing it at the manufacture location then

order visibility will be difficult but yes throughout distribution your network you are maintaining that virtual network where your product is so you can track that returnability will be easier given that pickup location can handle the returns as well if they are handling it So, last one is retail storage with customer pick up sites and the local routine item how we are buying we are going to shop and then we are picking up the product that is how retailer is maintaining the inventory sometime he is out of stock sometime he is having excess inventory. The best thing is the cross selling opportunity you might have seen when we are going to buy any item if you talk about clothing industry so then they are saying that if you will shop for 3500 so you will get coupon for 2000 and next any time you can you know get the concession on that right Or maybe if your order will raise up to 5000, we will give you one bag free, we will give you this item free, that item free. So that cross selling can happen when you are going for retail storage.

So all those parameters we discussed about the last one where the retailer or distributor is storing, it will be same. But customer pickups, when you are talking about the consolidation center or customer pickup sites, similar to your retail shops where you are going and buying the product, right? but yes here the one difference is maybe you are visiting the retail shop and then you may face the out of stock item but in case of customer pick up site last one you are sure that your order has reached customer pick up site and you will get your order definitely right so these are all options we have right so when talking about selecting particular distribution network Obviously first we need to figure out what are the demand from the customer. Demand in terms of those services level, response time, variety, quality and then the cost and then time to market, then order visibility, returnability, all these parameters we keep in mind. then we need to keep in mind the other factor which is cost factor where we talked about the logistics cost inventory cost warehousing cost transportation cost storage cost facility cost handling cost right so you need to make the balance between these two parameter and then specific dynamics of the industry if you are dealing with the kind of perishable items so then you forget about the cost immediately you need to response time should be very very less so whenever customer is placing the order your order fulfillment center should be very near to the customer so that immediately the delivery can be ensured right so Whatever design you are picking, you need to make sure that it is aligning with the overall strategy. If Amazon Fresh is saying that within same day delivery, that has to be because Amazon Fresh, right? Fresh means if you are saying that today you place the order, tomorrow you will get that, what is fresh then, right? So then you need to have that kind of distribution network where your facilities are very near to the customer from where you are delivering the product.

So, you can see one you can rate different kind of you know delivery designs distribution

network with respect to all those parameters one respond to the highest preferred and four is means six is means very poor performance. If you talk about response time highest performance will be given when you have the retail storage with customer pick up you are going to retail shop within 10 seconds you are getting the product. within 10 seconds because you will just ask the shopkeeper I want this product if the product is available within 10 second you will get that but talking about online or where you are placing the order it will take minimum 2 days 3 days 4 days it will be higher so you can just go through all different parameters product availability if we will talk about or variety retail shop minimum because retail shop chances are there you are visiting in the evening you may get milk packets or you may not get but if you are placing order online always availability and variety is there right so different parameters are there already i discussed all those parameter you can just go through this is a kind of survey they have included in their chapter right so mandel and chopra So, another thing is depending upon the products if it is high demand product. So, which type of location you should pick? You should pick means prefer location is retail shop with customer pick up. If it is high demand that means you can store high inventory because you know that anyhow you will consume that inventory, but if you are you know talking about that product negative score is given because those designs are not suitable for high demand product.

 Likewise, you can see if low customer effort is required or quality wise or variety wise or the size of the product, different types of configuration of the products, you can pick different networks and you can see some of the design networks are giving you positive point on some parameters and some are giving positive on other parameters. so this is the case study we will just go through how dell is selling the computer hardware and through online we will just focus on online system where you can record your specification and then they will provide you through their online distribution network right so response time if it is customized hardware so that means in that case any delay in the delivery should not be accepted and customer is not ready to accept that because it is very you are placing order for a PC which is very you know very standardized if it is standardized so customer will not wait they want immediate delivery but if it is customized so then they can wait because now you have given your configuration then accordingly they will assemble it you can wait two three days because you are getting the customized product Product customization, Dell leverages the internet to offer a variety of customized services because through their internet they are directly recording the order. Just take very simple example. you are placing order to through zomato and you are giving instructions cooking instructions to the kitchen so directly it is going to the kitchen sometime they are doing it sometime they are not doing it because or if very standard if they are placed customer has placed order without any cooking instructions so that means it is very easy already whatever you are doing you need to continue the same way same is the case with the dell when they are selling through online Time to market obviously, we

discussed about when you are selling through online introducing new product anytime you can do even in the midnight if you are launching the product you can launch through online. Cost efficiency only centralized location you can maintain cost efficiency and then you are providing services 24 by 7.

cash flow quickly you can get the cash because order will be delivered even if it is COD order will be handed over once you receive the cash talking about impact on online sales on cost inventory cost because aggregation at the dell store manufacturing house so centralized inventory cost will be minimum postponement until I am not getting the order I am not processing the manufacturing so that means ,that order I am processing once I will get the order only so that is a kind of reactive process so in that way you can minimize the inventory cost facility cost those many facilities you need not to set up because you are maintaining the inventory at Dell store or manufacturing location or assembly location But, yes you need to invest significantly by setting up that information channel because customer will record their preferences there only, their configuration there only. Transportation cost will be very very high, outbound logistics is increasing. because directly coming from the manufacturer dell so then transportation cost will increase information cost obviously you need to if you are using that reactive process once customer will record the order then you will start the manufacturing that means their inputs are important to note you need to invest heavily So, impact on online sales on performance at Dell, high valued and customized hardware advantages, online sales significantly improve responsiveness and reduce cost, right, because you are maintaining inventory at the store. centralized location and you are providing the customized product and then postponement and aggregation of the inventory can happen. But the challenge is the online sales are less pronounced and the main strength of the inventory reduction is not as impactful while poor responsiveness because why poor responsiveness because you are placing order today you will take minimum two three days to deliver that order.

So, when we are talking if we can conclude this Dell online sale model offers substantial advantage for high value customized hardware. where you are going for customization when you are talking about the standard products you can go through your retail offline stores where you can maintain the inventory because you know that that inventory any day can be consumed in the market so you can just see on response time what is the impact means on all the parameters impact of all online sales on performance response time negative because you need to wait product variety availability experience will be very high customization because directly customer is involved in that so you can customize your product right so those services you are getting but transportation and all that again negative experience because logistics cost will be higher so we can just conclude here is setting up any distribution network obviously we need to So, consider two aspects one is your cost other aspect is to deliver those customer services the

different cost are there where we consider logistics cost and manufacturing cost obviously we have not included in that right. So, those cost are also there. I will not suggest any pure strategy for any product or any industry but yes somewhere the mix of these we can take where customization is required where we can go for standardized product where more variety is required accordingly we can blend the combination of these you know different design options and we can leverage on different distribution design networks and can be a very strong strength of any company any product who is selling through online or offline when you are ensuring that the quality and timely delivery of the product and services so this is the reference again the same book so that's all for this session thank you very much