Logistics & Supply Chain Management

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Lecture 21: Fundamentals of Supply Chain Management (SCM)

So, hello dear friends, welcome back to NPTEL online course on Logistics and Supply Chain Management. So, now we will start our discussion on very basic concepts about supply chain management. So, I am Dr. Vikas Thakur, Assistant Professor, Department of Humanities and Social Sciences, IIT, Kharagpur. So, under this we will try to address some of the key concepts under supply chain management. What are the major stakeholders in supply chain management? What are the objectives when we are talking about supply chain management? What are the key performance area where we are targeting as supply chain manager? and then we will see what are the different decision area where we are making decision when we are designing our supply chains different types of models.

So, we will talk about those models and then how this concept of supply chain evolved we will talk about that also the process also and supply chain operation in the end we will end this discussion with one small case again. so in the very first session or second i think when i started explaining logistics i defined what supply chain is where we talked about i think bread supply chain from where it is coming let's take the similar example again and we'll see see if again another product customer wants detergent or soap so you are going to big bazaar right and big bazaar is getting delivery from maybe that outbound logistics distribution network is there. So, those are distribution centers are there or fulfillment centers are there or basically it is coming from one manufacturer and here we can see one manufacturer P&G is providing those products. Now, from this is the your outbound logistics like we talked about.

now let us talk about the backward integration backward supply chain from where that product is coming the raw material is coming now for this may be we are using plastic may be we are using packaging may be we are using for some chemical for manufacturing the soap or detergent right so different players will come into picture and different supply chains will start here let's say one packaging we are using now this is again packaging is one supply chain from where we are using packaging paper manufacturer we are getting the packaging from the paper manufacturer right and then paper manufacturer is getting the raw material from the timber industry now timber

industry again using so many different raw materials we talked about in that process also let us say they are using some harvesting machine to cut the trees and you know to process those now that harvesting machine is again using different components they are using engines they are using tyres they are using other steel components so many steel components they are using So, then again we talked about the tyre supply chain. So, then tyre supply chain two major raw material we are using for manufacturing tyre one is your rubber another one is your steel wire. Now, this rubber is coming from another supply chain steel wire is coming from. So, this supply chain will keep on going. So, we discussed the same concept.

So, this is complete one system where we are talking about the system approach when we are talking about here. supply chain management, but in case of logistics we were focusing on the distribution part in between these players, the transportation part in between these players, the warehousing part here what where we are storing, the packaging part we are talking about. So, this is the key difference when we talk about the complete supply chain structure. So, before going further I will show you one this small video how PNG is delivering different products. So, many different products are there under their umbrella term.

So, we will see what are those different products and how they are managing their supply chains. So here I have included some video links you guys can just quickly go through these videos. So you can see how P&G beautifully they are you know they have designed those six different baskets and providing so many different products under those baskets and how through communication through that culture of commitment and then creating the value for the customers how they are delivering those value. overseas it is not only one country they are serving with those products they are serving to all the players and the only key point is how we can add value to the end delivery. just will define the supply chain in more formal way as per Sunil Chopra and Peter Mendel consists of all the parties involved directly or indirectly so obviously who are those parties manufacturers suppliers transporters warehouses retailers and even customers are also part of your supply chain management right so come this supply chain another key point when we talk about logistics and supply chain that customer we are considering one of the stakeholder in our supply chain.

So, our supply chain will end with the end customer who is going to use that product right. Again another definition is by Daeal & Chen that as the group of interconnected participant companies those add value to stream of transform inputs from their source of origin to end product or services that are demanded by designated end customer. so how you are ensuring that through that integrated channel through the integrated set of

stakeholders that you are transforming from one step to other step if you are moving you are adding some value right and then those values in multiple stages with multiple stakeholders you keep on adding and in the end that value is provided to the end customer in terms of product and services right so that means this is a kind of network where we are trying to match the demand with the supply right and then when saying this that means the large implication of this is you will from where the demand will come obviously from the one end of your supply chain the down end right where your product is finally reaching so from there you are recording the not only the quantity demanded but in terms of what are the extra features they are looking for how the different values set of values you can add in terms of how your competitors are adding and thus this information throughout that upward supply chain is being shared some information may be use very useful for your warehousing partners who are taking care of your labeling or packaging if any issue related to packaging let's say some information is required to ah we need to amend in the product design or some feature we need to add that is in for information is valuable for manufacturer let us say some information where you need to change some part component raw material so then that information is required for your raw material supplier this is one kind of information where we are talking only about the product design specification features there are so many other form of information which are required pricing how much customer is ready to pay how your competitors are you know charging so that is also one kind of information sourcing this is another kind of information from where the other players are sourcing how you can source from those sources so that the overall the cost can be minimized right So, we in that supply chain will try to minimize the cost and improve the long run performance by implementing lean logistics, lean manufacturing, lean supply chains. So, those waste we can reduce. So, major objective of the supply chain are to relate and monitor the distribution, production, transportation of goods and services.

So, earlier we were not considering this as part of supply chain. your logistics, but now whenever we will talk about this production is very much part not only production routine production, but R & D you are developing new product is also very much part of that. So, inventory, shipment, internal sales and productions are part of your supply chain network. So, this is what how this concept evolved we were initially I talked about we were focusing only on logistics part and we realize that this should be a separated department and then for 15 to 20 years we kept on you know optimizing those networks and then we logistics matured and then we realize that this is not enough. We need to come up with the comprehensive view where we can handle all those activities in the supply chain.

We talked about one example where I am just designing the product and then marketing

the product. so R&D part is done in my lab and rest marketing team is working on to generate the sales and all those things rest I don't want to go into manufacturing I don't want to go into sourcing raw material finding the stakeholders distribution network I don't want to go into that right so then i need that complete supply chain solution we talked about hitachi different kind of packages services. They are providing related to sourcing where they will ensure all the smooth availability of the raw material related to packaging they will ensure the smooth packaging of your whatever finished product is if you are talking about some other uh or outsourcing some other functional area warehousing manufacturing everything you can outsource right so then came the concept of supply chain management in manufacturing so earlier we were talking about only we can you know distribute the products so major part we try to focus on the product industry and then now this concept of supply chain management has come into your services industry as well but yes when we talk about services industry no services industry is complete without the support of your product industry If we are talking about educational services or now we are talking about mostly we are talking about health care services or we are talking about emergency services. whatever disaster management related services so even if we are talking about educational services we need some equipment now this is pure service I am providing you nothing physically is flowing from one this end to your end but then I need this pen I need this screen where I am writing I need that screen camera lighting everything these products are required you know only then this recording room has been developed and now we are delivering the services so this supply of these products are also required in healthcare also we are delivering the services may be doctor is doing that checking you and all those things but that is only the diagnosis part how will treat the patient is again you need some products in terms of medicines vaccines injections or all those things right so So, this pure services industry is very difficult to find out and whenever you are talking about those solution may be consultancy is one kind of service industry where you are talking about that this is pure services industry right, but in then again if you are taking those advice and then you are implementing purchasing something and it is related to purchasing or it is related to purchasing property or may be you are going for building house or something like that so again that come with the product industry right so this is how the concept of supply chain management evolved and As given by Dewei and Chen, this is very basic supply chain model we can understand where the suppliers of suppliers are there in the backward supply chain. now we will talk about whenever we will talk about supply chain backward supply chain is one and forward supply chain.

forward supply chain means the supply chain which is distributing the product from the manufacturing original equipment manufacturer to the customer is forward supply chain right outbound logistics and supply chain we are from when we are talking about supplying the raw material from the suppliers to other suppliers to the manufacturing unit

then it is your backward supply chain right so this whole thing we are designing how depending upon the demand of the customer and then as per that we are creating the value and we are delivering that value and when this complete supply chain is ready this is very basic concept we try to explain in the very first session when we talk about supply chain that there are three things very important which are flowing through any supply chain. First is your information, information is flowing on all these are bidirectional, these flows are bidirectional earlier some of the flows were unidirectional only we will talk about that but let's see this information now information from manufacturer to customer is flowing in terms of educating about the services about the products what is this product all about how it is going to solve your problem right so that is coming in either your advertisements or boarding holding whatever you are using electronic media or you are using print media to advertise your product right and sometime you are providing the information to the customer in terms of how to use that product how to install that product or maybe sometime your engineer is visiting the customer side and then they are installing this is form of information coming from the manufacturer to the customer in terms of sometimes the manual also how you can use that product then from customer this is very obvious link in terms of feedback very important. How customer is rating your product or services after taking dinner in your hotel how customer is rating your services related to your own time delivery of the food related to hygiene related to how you have prepared the related to raw material related to all those parameters are there right so this information is also very important to continuously you know improve your services level So, you have designed some parameters matrices. So, where you are recording the data from the customer and then that information is helpful to redesign rethink your delivery system. So, that you can deliver in better way.

Product obviously, finished goods are flowing from manufacture to the customer. Semi-finished goods are also there. from sub manufacturer to manufacturer from suppliers to manufacturers so that is forward flow very obvious reverse flow is now very important when we are talking about recycling of the product, when we are talking about reuse of product, when you are talking about refurbishment of the product after once it is done we are talking about products coming under warranty guarantee. So, then the product will again flow back to the manufacturer. right and if you are talking about the packaging is the responsibility of the manufacturer so you have to collect the packaging when the product is delivered so then again the reverse supply chain will be in use so product is flowing in both the direction right then funds earlier fund was flowing in reverse direction only from the customer to the manufacturer but now with one click you can return the product so that way fund has to be return back refund you have to ensure from manufacturer to the customer so in that way now these three resources whatever flowing through that supply chain will use both bidirectional flow will be there right so we can code many many examples where you can see these things talking about this flow of

these three things now this is the network so we talked about suppliers are there and then manufacturers are there then warehouses are there and then customers are there so let's talk about how the cost function is designed so when we are talking about supply of raw material to manufacture so first cost component will be your material cost raw material cost this is the first thing that is going to add to your cost then you are talking about transportation of that so this is your inbound logistics cost then you are talking about manufacturing that means converting your raw material into finished one again the manufacturing cost will be there then you are talking about the outbound logistics you are shipping your product from your manufacturer and to the distributor your fulfillment order fulfillment center or warehouses.

And then in warehouse you are managing the products this will carry some handling cost. Again, the very important part and then in the end you are doing the distribution part. So, obviously distribution cost will be there. In terms of you are maintaining raw material inventory, finished goods inventory, semi-finished goods inventory that will also carry some cost. So, this is how you can design the cost function.

where material cost is there inbound logistic cost is there manufacturing cost is there outbound logistic cost is there handling cost is there distribution cost last mile delivery cost is there and inventory cost is there and then some few things you can add is may be your packaging cost which is again consider sometime part of your final product only but then if you are talking about Let us say the returns that is also adding cost, returns in term of end of life product or may be under warranty period. So, these are some of the extra cost which you need to take care and if you are saying that you need to be sustainable in your practices. So, sustainability measures will also add some cost initially may be in the long term will help you to reduce the overall carbon footprint as well as your cost will be reduced. you this whole network these many elements are there we need to take care when we will say we want to minimize the distribution cost you need to look at this function of cost what are those components which are adding to your distribution cost and how you can obviously if you will say inventory i will not manage so that cost you can reduce but then what will happen customer is coming to you and you are maximum time out of stock you cannot compromise that on this promise that you are minimizing the inventory you are more efficient but what you will do when you are efficient but you are not having any product to offer to the customer right so that also you need to availability also you need to take care so somewhere you need to maintain the balance between efficiency and responsiveness if you want to keep the quick product to the customer you have to maintain the inventory if you want to deliver quickly then you have to spend huge on outbound logistics another one part which I missed here is information which is very very important part information cost so you are designing information

platform how you can your customer can share the information your stakeholder can share the information how quickly you can spread that information throughout that supply chain that will also add some cost right so these are some of the elements you can just go through so when we are talking about how we can address those elements are you know adding to your cost functions obviously we are dealing with those cost criteria so why we need to you know add into cost is these are some of the reasons timely delivery only will happen if you are maintaining inventory nearby to your customer how many times you are delivering the product on time if you said within one day delivery how many times you are keeping your promise effective inventory management only two things you need to take care you should not be stock out you should not keep the excess inventory only then you are effectively managing your inventory. Flexibility and responsiveness, if I am coming to you asking for 5 units, you are readily shipping the 5 units.

If I am asking 500 units, you have that capacity to scale up that you can provide 500. If I am asking for 5000, you can provide 5000 items as well. and responsiveness if I am saying that I need these different models A, B, C, D of those products how quickly you can find deliver those models efficient and cost effective that cost function you need to take care how you can lower down the inventory cost how you can lower down the inbound outbound logistics cost how you can lower down the inventory warehousing cost handling cost distribution cost that you need to manage in effective way that is another objective of the supply chain when you are saying that your complete supply chain is one system you need to ensure that this is one family of all the stakeholders so that you know your stakeholders are very much part of your strategic decision making so this is not something that you cannot share or you don't want to share with your stakeholders if your strategy is you you are going to be cost effective in that particular market that should be shared among all the stakeholders in your supply chain if you are talking about responsiveness then you need to share with your retailer who is finally reviewing the product that you need to maintain that much inventory because you cannot say no to your customer we are all the time we are providing the inventory may be inventory cost will rise up but then we are not caring about the cost we are more responsive improve logistics management system in terms of minimizing the cost and effectiveness you how you can be more effective optimize delivery time cost amount right Then if you are talking about same day delivery, but are you able to you know ensure the enough order, so that you can enjoy the economies of scale, so that you can lower down the cost, but if you are running you know every time your private fleet to fulfill one order, two orders, so then it may not be cost effective. Increase the overall customer value, how you can reduce the value adding, non-value adding activities and add more value adding activities so that the customer experience can be enhanced. you need to spread your network obviously one today if you are working in one region may be you are covering 10 pin

codes how tomorrow you can go for 12 pin codes 20 pin codes 30 pin codes that you need to cover right so increase demand fulfillment whenever order is recorded you should be able to fulfill that from your fulfillment center Quality, you are delivering the right product with the right quality at right time that is the main objective and improved integrated technology that will you know help you to make that integrated system of all the stakeholders where all can contribute one point.

So, talking about supply chain decisions. we are taking at three different stages and if I will divide those three different stages first is top level management is involved here here is middle level management here lower level management obviously when we are talking about top level management what strategic decisions will be there and when we are saying strategic decisions that means long term commitment of your resources if today I am taking some decision it may have effect for next 10 years 15 years 20 years down the line So, in that way your investment will be for that longer period. If I am talking about middle level management, so may be medium terms decision we are making may be for 2 years or 1 year that depends upon the nature of the industry as well. If you are talking about automobile industry may be top level this long term decision may be for 10 years to 20 years. If I am talking about entertainment industry.

so long term may be for 5 to 6 months and short term may be how you are going to launch that within first 5 weeks then next 5 weeks so that is a kind of industry entertainment industry if today you are launching coming up with one web series or movie so tomorrow it is outdated whosoever has seen will never visit if that much appealing it is not. So, these decisions will change as per the nature of the product and industry. Lower level management usually deal with day routine decision. How you will meet the day orders whatever is coming. So, talking about your strategic decision.

So, I talked that long term effect whether you will do in house or outsource it is very long term decision. So, for next 20 years that supplier is going to be part of your supply chain and will supply you right or if you are doing it in house so that you need to ensure that you have that expertise and facilities to produce that in house. location where you will locate your suppliers just in time your supplier should be very near where you will locate your warehouses your distribution centers your manufacturing centers if you want to reduce the outbound logistics cost your manufacturing center or factory should be near to your markets. product to be manufactured what type of product you are manufacturing should be the very first question strategic decision today you are coming up new with new product tomorrow you cannot phase out easily right so that is again long term mode of transportation what type of mode you will use again long term decision and how you will set up your information system will affect the performance of your organization for

longer term And when you are talking about supply chain planning, middle level planning quarter to 1 year. So, which market we have so many different markets and may be 2 factories.

So, first 3 market will be supplied by factory 1. next 2 markets will be supplied by factory 2. So, depending upon the capacity of these facilities, depending upon the demand coming from these markets, depending upon the availability of the raw material at one point, depending upon the supply chain cost, how much distance they are covering, all those things you will take in care. plan inventory how much inventory you will maintain at the raw material level at the semi finished level or the finished level and then subcontracting if you are outsourcing for some time may be packaging right now you are not doing in house you are outsourcing it right and then timing and size of the market proportion as per that also you are making the decisions third stage is the lowest level where we are taking the lower level management is taking the routine decision how you can handle the date routine orders coming right how you can allocate the orders how you can set the order due date right and then pick up list you will generate means related to day routine activities today we will manufacture these many units of model A, these many units will ship of model B, these many units of model C like this. So, that you know that this much demand is coming from that particular market.

So, that way you will set the delivery schedules, you will place the replenishment orders, day routine activities how you are ensuring the smooth supply chain of those activities. So, quickly we will go through what are the different types of supply chain models depending upon the requirement of the products continuous flow model. This is a kind of supply chain where there is continuous flow of product and you have nothing much to do with the you know variation adding more features let us say talk about steel industry. So, what you will do extra with the steel roads? right if you are selling steel sheets what extra you can do that right so that as long as i am taking that particular thickness sheet so it will be almost same throughout all the brands so then you need to be efficient in that kind of supply chain because only thing is you are operating you are competing in the market based on cost only because there can be no other usp because variation is very less agile model when you will be having unpredictable demand of something. So, then you need to prioritize those things.

let us say you have one car one car option is you can operate it as normal taxi you can operate it as ambulance so when you are operating as ambulance you have to be you know opt that agile model right where the demand can come anytime and you have to quickly respond that so that is the kind of example but if you are talking about taxi so routine rides are coming to you so then that way you can handle fast model kind of

products which are perishable today you are packaging only by today or maximum tomorrow you need to ensure the consumption of that milk products so if milk supply you are talking about so that is kind of this supply chain fast model supply chain is required flexible model if your supply product demand is affected by seasons. So, then you need to opt for the flexible model where for the peak season you need to you know scale up your supply chain and for when the season is not there then low volume requirements will be there. So, you need to scale down your supply chain. So, how you can do that? So, sometimes if you are keeping the inventory extra inventory and you are moving with the same kind of continuous flow of supply chain so you can see in the end you have to come up with some promotional offers that you are selling the same inventory at 50 percent lesser price or 70 percent 75 percent so that is extra cost right efficient model again is required for those kind of products which are very uniform right like we talked about steel let's talk about the sugar industry let's talk about the salt industry their profit are very less what extra you will do with salt or sugar you can change packaging only maybe some quality difference very that will be there depending upon the size of the grain but yes then again what extra you will do but if you are talking about some you know automobile industry bike two wheelers you can do so many things with that product right you can add so many different features but these kind of the products which where we can't do much so in that case efficiency is more required you can compete only based on the cost and then custom model when we have those luxury brands and BMW or Mercedes or Rolex we are talking about so then you know specialized customized services we need to provide if you are purchasing BMW so why don't they give us the option to design the interior to design the how you want to you know if you want to boost up the engine capacity if you want more boot space if you want those kind of things you can add right so that is customized model So, talking about the concept of supply chain management, we can define under three concepts configuration, relationship and coordination. So, configuration will define the overall architecture of the supply chain.

Now, we talked about the backward supply chain or your forward supply chain. So, what type of model you are opting for? Are you a kind of Dell supply chain who wants to interact directly with the customer, direct supply chain, no intermediary involved so that whatever customer wants they can give their configuration and directly will provide them the customized product. so that will happen only when you have vertical integration that means you are producing your raw material of your own and then you are delivering the final product of your own so that way you are your supply chain completely you are having the control you can control the quality delivery schedules everything right but that expertise is required in that way but on the other way if you are including so many stakeholders, different suppliers, co-manufacturers, manufacturers, distributors so then you cannot control the quality at every stage but yes then it will be more efficient and may be then you can use the expertise supply chain relationship like i talked about your

stakeholders whether you are keeping at arms length or you are keeping very close relationship with them so you are sharing every you know secret recipe of your business how you are doing how you want to do as financially how you want to improve your services how you want to renovate quickly renovate your product if you want to quickly renovate your product your suppliers also have to quickly renovate the supply of the raw material components So, that is only possible when you are keeping your suppliers intact with you. and then talking about supply chain coordination again functional area where coordination with all the stakeholders if there only then you can go for continuous material flow throughout the supply chain right if there is any lag with the information or demand is not accurately predicted right by the sales team then that much inventory you will not store that much manufacturing will not happen and then order fulfillment centers will not be able to fulfill the order on time and your capacity everything will be hampered in that way. So, here we can conclude that as if we will talk about the basic fundamentals of supply chain management, we are somewhere targeting the streamlined operations through your from the origin of that product to the end delivery right and how in between that how the procurement is happening how you are converting the raw material into finished one and how we are distributing and we talked about how this these all small activities are adding up into your cost function so you need to take care of that cost function but yes any activity you cannot phase out packaging you cannot phase out storage you cannot phase out inventory you cannot phase out yes but he can manage that level of inventory which will reduce our cost like walmart is doing they are they are having this beautiful system of centralized store distribution centers from where they are supplying all the markets.

So, in that way instead of storing the inventory at 10 different locations they are storing inventory here only. So, that means inventory cost you can reduce. So, we have different techniques in the same way during transportation also you can reduce the inventory. So, during packaging also if you will design the packaging in that way the minimum packaging material you are using and ensuring the quality also of the packaging. So, then we can you know minimize the cost of the operation.

So, this is the overall objective of the supply chain management any supply chain management whether you are talking about the complete vertical integration where dell is completely owning their supply chain or you are talking about kind of P&G supply chain where so many stakeholders are involved but this overall concept is one system concept where if we are making profit that that will be shared through all the stakeholders if we are making loss that will be shared through all the stakeholders so obviously the adoption of technology collaboration with partners and focus on sustainability will be now these are some of the challenges also and opportunities as well coming as

opportunity so obviously regulators are putting more stress on you know sustainable practices and your customers are demanding those kind of services where you need to technologically you need to be very strong. So, that way you have to implement these are kind of drivers which are driving your innovation platforms providing you those platforms, but yes once these things are implemented streamline standardized then the overall cost of supplying the products and services can be reduced. So, these are the references for further reading. So, thank you very much.