

## **Logistics & Supply Chain Management**

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### **Lecture 24 : Principle Streams of Supply Chain**

So, hello dear friends welcome back to NPTEL online course on logistics and supply chain management. So, we started discussing the basic supply chain structure what are the different concept under supply chain management and then we divided this whole supply chain into three different streams right. So, first starting with your suppliers ending to the manufacturer. Second, within manufacturing facilities, whatever is happening, how we are streamlining all those operations. And third stream is from your manufacturer end to consumer end. So, in the last session, we finished our discussion on this first stream where we discussed about the procurement management, sourcing management, and supply management.

So, now today we will start our discussion on the second stream which is again within that manufacturing facility what how we are streamlining the operations. So, again I am drawing just for your just to recall that I am drawing that basic structure of supply chain where we have raw material suppliers, we have manufacturer here. and in the end we have that distribution network through which we are reaching to customer. So, today we will start our discussion on this second stream where we will take care of your operations management, how we are you know managing different activities under that.

Then, we will talk about material management, how the smooth flow of material can be ensured. Then, we will talk about how we are converting the raw materials into finished one. So, then we will move towards the thirds. stream which is taking care of your the final distribution from your manufacturing and to the end customer right. So, we will talk about the distribution management although we have discussed a lot all I think almost 18 to 19 sessions while discussing your third stream, but still quickly we will go through what is there if we will talk about the complete supply chain we will quickly go through that third stream as well.

So, operation management. So, operation management here we need to understand the basic difference between operation management and production management right. Sometimes we are using these terms interchangeably. operation management if the

difference lies with the scope right we will talk about under production management we are talking only about how we are converting the raw material into finished one so taking care of all those activities which are required to finish that good right so that is under production management operation management can happen anywhere right whatever processes activities you are doing in HR department that is also part of operation right how you are handling those operations even if you are interacting with the customer customer relationship management it's all always again you are into operations right how you are managing the records packaging again operations distribution again operational area so then we define operation as you know sub part of supply chain where the complete picture we can you know view as complete supply chain and as a part of that complete supply chain we are doing so many different functional, so many different functional units are there who are doing all those operations right. it is an area of business management that is fundamental to running a successful enterprise right so successful enterprise how you can ensure successful when you are ensuring the smooth supply of the raw material in most efficient way right whatever products and services are demanded from the customer end you are getting that information from the market accordingly you are designing your process designing your product and then accordingly you are sourcing the partners .

This is complete operation management right so how efficiently and effectively that means with minimum cost and highest quality how you can deliver that product so you need to take care of that so you can see .If a company is managing all those different it's not that only one part only manufacturing you need to ensure right even if you are doing packaging that is also equally important because it is the first phase if you are doing order fulfillment that is also equally important if you are concerned about the transportation management finding the optimal route best route with minimum cost optimally utilizing the capacity of the container optimally utilizing the capacity of the warehouse so all comes under that so you can see .If you are planned in that way how it can make difference so if we will see what are the responsibilities of business operation management first thing is you need to design the process right how you will ensure the smooth supply process not only your manufacturing process a manufacturing obviously you need to design all the stages required to convert that raw material may be if product is very simple kind of supply chain or manufacturing so may be 5 or 10 stages are there till the packaging if the product is a kind of may be you are manufacturing automobile you are manufacturing some home appliances where may be These stages can vary from 100 stages to maybe 1000 stages even up to the final finished product with the packaging. So, how you are designing the complete process? So, that is one. Again, if this is one manufacturing department if I am talking about, let us talk about the process design within quality there should be some process .

How they will ensure the incoming quality raw material right so that also you will come up with the quality standards you will develop all the check sheets you will prepare those check sheets record those data and then you will say finally lot is accepted or rejected how you will ensure the quality during the process so again you will define your different parameters ok. At the different stages critical stages you will define and then that is also process design right so under that different functional units how you are designing the process within HR how you are designing the process how one if any new entry is coming how is supposed to you know go through through all those stages of may be joining to the final may be induction placement introduction and all those things that is also complete process .The process flow chart of that particular functional unit right then we need to balance the resources revenues and cost now what are the customer expectations and demands that will obviously you know help you to gather what are the resources you need to gather those resources and then when you are acquiring those resources obviously there will be cost and then you will sell your product finally into the customer market so. Then you will be generating the revenues so you need to balance all these three points right and then continuously you need to ensure that you are evolving with your product and services design right like philips is always they are coming with the advertisement like innovation and you so that means whatever product they are selling today tomorrow they will come with better promises so they are somehow they are changing something with the product design product features process design longevity they are ensuring the smooth functioning of the product they are ensuring so this is how they are renovating every day. then you need to go with the overall operational strategy so that also if you are looking for expansion you are coming up with new model you need to set up new production line that is also responsibility of the manager right.

If you are looking for maybe acquiring some other functional unit like we talked about maybe we are into assembly part we are acquiring some molding plant of some other unit right so then also you need to align the operation strategy between two organizations right Then, streamlining and optimizing the production, obviously that is part of operation management. Production, under production also operation management how we are converting the raw material into the finished one with minimum cost. Minimum cost means improved productivity and efficiency and we should reduce the waste also when we are manufacturing the processes. So, under this operation management four different key concept we can again arrange these operational area into four different functional processes. You need to define all the processes like I define production is one process, ensuring quality is another process, storing your raw material is another process, packaging is another process.

designing is another process ensuring HRM is another process right .These all are different processes within that organization and under each process you have set of activities you are doing right to ensure quality to ensure production to ensure maintenance timely maintenance to ensure you know the right skills human skills required then capacity how you are developing the capacity like we are talking about let's some organization is focusing on maybe growth strategy right gross growth operation strategy so that means they are looking towards producing more obviously growth strategy they are looking in terms of some new markets they are looking in terms of some new products new offerings whatever it is but in the end they are going to enhance the capacity whatever they are producing right now maybe they want to enhance the capacity how they can enhance the capacity so that also you how you are designing expansion strategies whether you kept in mind whether there is enough space to enhance the existing capacity or sometimes whatever capacity you have you can go for double ships you can go for triple ships you can this is how you are managing up to some extent but if still the demand is roaring so how you will you know cope up with the demand it's not that you will not you will say to the customer that now after this we are not going to deliver because expansion everyone wants expansion if the growth is coming itself from the market why don't we go for that so that capacity utilization whatever the space is how efficiently we are utilizing the space right we have talked about warehousing utilization right we have talked about the truck carrying our inventory how we can utilize the full container capacity and then we can reduce the cost right so that is another functional unit of operation management and through this we need to ensure the smooth flow of all those activities see these activities are linked if quality control is not ensuring the raw material quality under IQC incoming quality control, you cannot ensure the production. If proper HRM is not coming up with the hiring process, placement process, who will ensure the quality? Who will be in the production department? Who will take care of the maintenance department? So, these all activities you need to ensure the smooth flow of these activities within that organization. so process of operation management planning what needs to be done and when it needs to be done that we need to ensure. How we will design this see whatever these planning phases or we are talking about the scheduling even the execution these all these kind of informations are coming from where from the market end from the customer right so first thing is how we are tapping our customer.

How we are tapping the market potential how we are recording the you know their requirements what our competitors are doing what other industries are doing in the same area right so that information is being supplied being processed within your R and D unit within your in house manufacturing unit and then you are developing a new product new offerings or may be you are renovating again the same product in a better way right. So, after renovating now again may be you are changing some of the components of the raw

material you are doing using right or may be you are using different design process you need to change. So, that means, that information need to share with everyone when you are going to do that. So, when you are planning to change your raw material suppliers obviously, they also need to change I am not saying that 100 percent components will be replaced, but may be some components will be replaced by others right. If you are seeking that may be if AC we are manufacturing without inverters or with inverter ACs are coming.

So, when invert with inverter ACs are coming that technology you need to ensure right. So, then that you need to collaborate with those raw material suppliers who are providing those components right. So, then scheduling when you need to perform the each task that is another important function of operation management and when you are taking these decision on time obviously, then only you can ensure the effective and efficient utilization of the resources right. Execution will consume your resources those resources may be in terms of we talked about always basic resources 5 M's. man, money, machine, material and methods.

These are basic resources we usually talk about, but yes technology, other skills we are using, manpower we are using. So, there are so many other inputs, but these are whenever we are talking about execution that means we are consuming now resources. So, this is a kind of process which ensures the execution and carries the maximum cost, because actually we are doing that operation. so let's talk about different types of operations we are doing first is manufacturing everyone is aware about what we are doing in manufacturing we are designing the prototypes .Then we are creating then we are commercializing after commercializing we need to deliver those goods and products services whatever we have promised in the market we need to do that right so for ensuring manufacturing you need to ensure all the raw all the five m's right minimum those five m's other than that capacity floor production floor all those things are also required right your quality tools or all description sheets documentation everything is required as a resource right and those resources you will be consuming while converting your your raw materials into finished one services this is we talked about services versus manufacturing right here only basic difference is that your customer is part of your delivery process right so that means that in that way services industry is very heterogeneous kind of industry where every service delivered is unique in its own way right because continuously customer intervention is there.

I'm arranging the png inventory in my shelf right i'm then managing the inventory when we need to replenish the inventory i'm placing the order with p&g or any intermediary if wholesaler distributor is involved in that way right so this is kind of services. I am

providing that I have located my retail store near to the customer where customer can come and enjoy the products and my services of retail services right talking about hospitality so. How you are in directly interacting firstly with the first desk housekeeping how they are taking care of the cleanliness standardization and then sustainability all those 5s housekeeping approach we talked about (Seiri) (Seiton) (Seiso) (Seiketsu) and Shitsuke) right so those 5s approach of Japanese term how we can sort .How we can set in order so those things are sustainable shining right cleanliness so we talked about under hospitality logistics again kind of services because you are not carrying any physically any product with you so. If i'm shipping your product from point a to point b i'm not doing any value adding activity just i am dropping the product at point b so complete supply chain how will take care of the operation different functional units under that complete supply chain raw material acquisition is one operations placing order with the placing order and execution of those orders with the vendors is another functional unit.

Inventory management is another functional unit, storage house is another functional unit, your manufacturing floor production floor is another functional unit, distribution is another functional unit. So, how we can take care of the complete supply chain. So, strategy of operation management obviously first thing is how we can reduce the cost. See, these if I will talk about first three, they are very very interrelated. quality if i am saying that if you are producing less rejection that means you are very efficient with the process your process capability is very very high that means you are not producing any rejection and whenever you are processing the final product or whatever components you are integrating in that final product that also ensures the quality because your process design is of such kind that is ensuring the quality itself when you are ensuring the less rejection obviously productivity will improve .

Earlier what we were doing let's say the FOR we will talk about fall of rejection rate was 5% that means every 100 pieces we were producing 5 we were rejecting because of the faulty operation processes handling whatever we were doing during that manufacturing so now. if I can reduce this to 2% so you see I simply added 3 more product into that now I am delivering instead of 95 now I am delivering 97 products quality products in the market and how I can ensure that whatever 100 products I am manufacturing all are quality products so in that way so see productivity will be improved obviously and then we will reduce the cost also this is one way how we can reduce the process rejection during manufacturing and will because if we are damaging the product that is also cost to our company and will not generate any revenue because already we damage those process those components during the process right so then optimally utilizing the data see to ensure the smooth operation you need to first collect the data collect the data from the market survey trends whatever you are doing whatever way your sales team is generating

the data and then you need to figure out for that particular market this is going to be the demand as per that demand function then you will start your operation what operation you will acquire the raw material you will convert the raw material into finished one and then finally move to the market to meet that demand right. Setting goals and forecasting like I told you forecasting all techniques whatever we will use we will use that data right and then we will set the goals accordingly. Enhance collaboration this is important operation management see if we are saying that we want to be very productive efficiency is our main parameter. So, reducing cost is the primary concern if we are talking about the efficiency and then if you are putting extra packaging that means you are behaving in a wrong direction you are operating in a wrong direction because our manufacturing is the USP whatever we are carrying right now is the minimum cost how we can ensure the minimum packaging cost by reducing the extra packaging or maybe by but not at the cost of you know destroying that product right then human resource management already I talked about how we can ensure the smooth flow of this resource which is very very important long term asset if you are maintaining those resources with you so this will improve the overall supply chain and internal collaboration as well because this is total integrated system one person cannot be efficient the other person is saying we are not competing on cost and then if BMW they are competing just high status product the class is totally different so then .

If someone is coming with the idea of maybe some engine which will you know be more efficient in fuel efficient in that way but compromising somewhere with the pickup or somewhere with the top speed right so that means the basic purpose of BMW or Mercedes or those kind of F1 racing cars is defeated right so .We need to integrate collaborate with every partner and this baseline common thread should be there on what particular operation strategy we are working right so second part under this is material management. so material management means whatever material we are using in the manufacturing unit we need to ensure the smooth supply and while doing that we need to ensure that optimum stock should be ensured so that means see this is we discussed about once I am taking the inventory let's say this is the total inventory right now I1 is the point right so when I will start producing the finished goods I will start depleting the inventory and there must be some safety stock level this is safety stock level that when I am reaching at this point automatically my purchase store department should give the indication who is maintaining the inventory to the purchase department so that purchase department can place the purchase order so at this point they will again replenish the inventory it will reach at this point so this will come again down and again will be replenished so this is how we will maintain the safety stock even sometimes if it comes down may be while receiving the product we need to ensure that it never touches the zero point because then the whole production line will sit ideally so while ensuring this smooth supply of the raw material one thing is time we need to ensure and cost also and

quality as well right so the fight here is how much quantity we should buy now let's say i don't want to keep much inventory because that is cost to me so i am feeding only hundred units to my raw material supplier you supply me hundred units in one lot but the other person like walmart what he is doing walmart is supplying instead of hundred they are asking for 10,000 units so the purpose here is maybe Walmart is maintaining the inventory but the cost the negotiation power Walmart is having over the other players because they are feeding large order to their suppliers so they can negotiate on that they can negotiate not only on cost but quality also and the timing also when they want the delivery right so that much market also you need to ensure when you want to be you know in that cost efficient way when you are enjoying the economies of scale right. So, that is the main function of material management to ensure the smooth supply of the material with the minimum cost quality time constant is there always. So, that your production line should not stop working.

So, main objective already we talked about lower how we can lower the acquisition price of inventory like walmart is negotiating with the players high inventory turnover means average sale what is average sale and average inventory you are maintaining so if it is high it is better that means sales you your holding cost is very less because frequently you are ensuring the consumption of that inventory into you are converting into sales right continuous supply of material, consistence quality and overall whatever cost direct indirect cost is there when you are you know acquiring that material and favorable supplier relationships when you are because Walmart in that way is managing the good relationship with the suppliers because they are feeding large order in that way suppliers are also happy to you know lower down the cost because they can also increase their margin because number of products they are producing so these are some of the points we can go quickly so material management how you can ensure the make or buy decisions product improvement on that way how you can ensure forecast is another very important technique we are using to ensure the smooth supply of the material so material management components MRP you might have heard we have some software like ERP which are you know helping for ensuring the quantity and timing of the raw material under raw material requirement planning right and purchase planning So, ordering cost and holding cost are two major components we need to take care when we are talking about the purchase. So, economic order quantity we talk about when we should place the order and how much quantity should be ordered. So, usually the graph is if this is the quantity you are purchasing, this is the cost on the buy axis. So, obviously holding cost will increase like this. If you are holding 5 units that much cost will be there.

If you are holding 50 units that much cost will be there. But ordering cost will reduce like this because if you are placing 5 units order and then Walmart is placing 500 units.



So, per unit cost will reduce. So, somewhere your economic order quantity will be this total cost where you are getting the minimum price. This is economic order quantity.

this is how we are calculating the economic order quantity where your holding cost and ordering cost are at equilibrium right. So, inventory control again we need to ensure through material management how we can minimize the cost and three types of inventory we are keeping with us right material supply management timely delivery of the quality material that is the main motto of material management department and quality control. So, major function here is incoming quality control. the department which is ensuring the raw material quality incoming quality control has to ensure that whatever material as raw material is coming to the department should be defect free so. already we discussed about significance of material management cost reduction in that way how we can minimize the waste and we are not keeping extra inventory we are still ensuring the smooth supply improved quality already i related cost quality and productivity so then timely delivery timely delivery when you are executing your plans and those plans are based on the forecasting based on the in information based decisions so obviously then timely delivery can be ensured because you are timely informing your raw material suppliers when it is required how much quantity is required right so and then the variety of the raw material required inventory optimization how you can minimize you can implement just in time for material management is this the basic approach we are doing efficient supply chain by reducing the waste, reducing the cost of producing the things, storing the things, minimizing the inventory your supply chain will be efficient.

So, material management best practices you can see. so develop a comprehensive material management plan so that it should be shared throughout the supply chain from the distribution network to the manufacturing house and then to the raw material supplier so that all can share that one plan and then implement inventory management best practices maintain strong relationship that will only happen when you are doing the payments on time and whatever you are you know your you are grooming your product or processes you need to help your vendor also to groom their you know a product basket and ensure that may they are supplying those minimum orders so that they can also ensure the minimum profits for what they are doing right So, continuously monitor and analyze data so that matrix we develop you need to track that matrix and then you need to record the data how we can perform on that data and then ERP kind of software enterprise resource planning we can use those kind of technology to you know plan our materials. so what are the challenges for material management because we are having complex supply chain it's not that easy so if you are talking about sugar industry or steel industry directly getting the ore from the core and then processing it melting it and converting into steel road very simple supply chain but then distribution network is also

very simple right so all the retailers you are feeding those retailers and they are supplying to the customers but let's talk about automobile industry car where different products you are using you are using glass you are using rubber you are using tyres you are using engines you are using so many different metal components right so different leather you are using so many different you are using wood also you are using so many different components more than 1000 vendors are associated with you so in that way keeping the record keeping the information data management also very big challenge for those kind of you know managing all those vendors if you are using more than 500 components 1000 components if you are keeping minimum 3 vendor for each component so directly 3000 vendors you are managing. So, cost control when you need to negotiate with the suppliers that depends upon how much you are purchasing you can negotiate. Quality control already we discussed that you need to provide the specification to your raw material suppliers so that they can supply you as per that.

So how they can improve the profitability? Cost they need to reduce, logistics cost that operation management need to reduce the logistic cost, inventory carrying cost. Already we discussed that graph, how if inventory is more, holding cost is more waste cost if you are producing rejection if rejection is coming from the distribution and retail chain retail shop is sending back the material because it is defected during damage during the transportation that also it is cost manufacturing cost of converting raw material into finished one how you can minimize that how you can be more productive right so and then reduction of working capital working capital required how you can reduce that because if you are keeping 10000 inventory, 10000 crore inventory always in your stock you can see that is something lying idle with you, you are not generating any revenue out of that because as long as you are depleting that you are refilling that. So, that how you can minimize that so that the working capital required can be minimized. Last is production management in the second stream which talks about how quickly with quality you can produce the finished goods and services.

That is production. Now, we are core talking about the production floor which is responsible for converting, transforming raw material into finished one by taking all those materials. 5 or 6 M's market here is added because it is providing you that information when and how much you need to produce and what quality what features you need to add so these are couple of the definition you can go for what are the different production units so I will just go through in detail I will give you another diagram how we can read these types of manufacturing processes so just we can understand when we are talking about the manufacturing processes we can divide into three types continuous manufacturing process semi continuous manufacturing process or intermittent process it will help you to you know understand in a better way like the diagram i have given in that

ppt so this will help you to understand and then in project management. continuous is a kind of like steel industry continuous we are producing right sugar industry salt industry continuously we are sure about the demand we are sure about the supply so continuously day and night we are producing there is no variation right when we are talking about semi continuous supply semi continuous means In between we are doing the changeovers. So, changeover because we are coming up not with the standard product, but here what is happening? We are coming up with the so many different models. If you talk about automobile industry, Maruti Suzuki is coming up with you know all the vehicles with the petrol version may be ten different variants are there diesel version ten different variants are there so maybe on three production line you are manufacturing these twenty models not only twenty models then different colors so if you are providing five colors so just imagine hundred 20.

So, 100 different models will be there. So, on 3 production lines you will run 100 different models. So, that means you need to change those model in between. So, in between you are stopping. Intermittent process is either you talk about your job shop production or batch production.

In pharmaceutical industry you have seen we produce in batches where the ingredients changes, but the machinery we are using to convert those raw material into finished remains the same. So, steps also remains the same. So, tablet if you are producing tablets so only thing is you are changing the ingredients and then through the same machine through the same recipe you are doing that. Job shop may be restaurant is the best example for job shop where may be different orders, different recipes, different equipment sometime oven is used sometime stove is used sometime some other thing you are using. that means that is job shop and project is a kind of big project where you know it's only one product we are not producing in quantity like if you are talking about road construction if you are talking about real estate industry if you are talking about ship building so those are kind of examples where we talk about you know project management so these are you can understand this manufacturing processes depending upon how much quantity we are producing So, that different manufacturing processes we can define right.

So, objectives of production management ensure right quantity of goods and services to meet the customer demand, maintain the right quality standard throughout the production process you need to ensure and delivery of the product services at the right time as per the customer expectation and deadlines and you need to ensure the overall profitability as well right. as production manager what are the function responsibility product and resource selection first you will select the product you will design the product as for that

you will select the resources. Then production planning ppc production planning and control department is there which will you know help you to identify that model one will be this much units will manufacture today model two then will ship to model two these many units will manufacture so ppc is helping all the production schedules when particular model should be made how much it should be made so depending upon that data it is performing and then machine maintenance and replacement how quickly you are responding to breakdowns if something is happening so that is important because that will shut down your production line temporarily and will you know lower the productivity So, these are some of the strategy for effective production management. Continuous improvement you need to ensure it is not that one level if you have reached at this level go for the next level, if you have reached at this level then go for the next level. This is how continuous improvement and just in time is one example where we can ensure the inventory smooth inventory whenever it is required without maintaining inventory within your house.

Total productive maintenance already talked about and supply chain management is important you know for effective production management to ensure the smooth supply. This is a kind of example you can see if you are a furniture manufacturer so type of furniture you are producing and what are the sources required you are checking those with the market demand and then you are meeting those you know whatever standards are what type of good customer demands and then as per that quality durability also you can go for. So, now we will quickly go through the third steam because already we discussed about logistics and distribution management. So, we talked about when we talked about logistics management transportation as one part warehousing second inventory management fulfillment and distribution fourth part. So, this is complete the basic objective of logistics management is to ensure the right product, right time, right quantity, right quality, right customer.

at right location so that is the basic purpose of logistics management and benefits of if you are managing your logistics in a better way so you will be high profitability will be there productivity efficiency will be there enhanced customer experience they will be more satisfied and If you are doing the inventory planning, warehousing cost can be reduced, transportation planning, transportation cost can be reduced by picking the optimal routes and right wise you can be adding more into your profits right. Component of this warehouse management, transportation management, distribution management. We have discussed in the initial sessions in detail what are softwares we are using to ensure these things right. so warehouse management picking packing and shipping again how you are managing the inventory barcode scanning radio frequency identification automation warehouses we have automated equipments we are there those robots are

managing the inventory .During transportation management software which will help you to identify the you know the best route depending upon the road condition the distance you are traveling so that it will help you to minimize the overall cost So, last function is your distribution management and distribution management how you are recording the order, how you are distributing that order.

So, between that you need to manage the data that is being recorded from the customer in terms of order. how you are ensuring the inventory then sale analysis also depend because this distribution team is directly interacting with the customer market so they will be their data will be helpful to you know analyze the sales managing the stocks how quickly you can fulfill the order depending upon that only if you are predicted through your distribution network how the demand going to behave in the next month you can again go for that right So, then price circulation and control through your proper minimizing the inventory and minimizing the distribution cost centralized centralization of data this is important because this data should be centralized, but should be shared throughout only that integration and collaboration through all the players can be ensured and the minimum time with distribution can happen. So, these are some of the advantages of distribution management because already we talked about in detail distribution function. So, challenges we do not have that much manpower and skilled manpower required these days to handle the updated automated warehouses. inadequate capital in that way we sometimes we don't want to invest into the new technology even if it is available and for better version it is available even then we are you know hesitant to adopt that technology so these are some of the challenges right so now till now we have seen that these this supply chain can be divided into three different streams and how the first stream if you are ensuring the smooth functioning the second stream is depending upon the first stream unless they are not ensuring the supply of the raw material that cannot be processed in the second stream.

Second stream will process the raw material on time with quality with less you know cost efficient and effective way then only the customer experience can be enhanced through the distribution network. So, these are some of the references. you can go through so that's all thank you very much