Logistics & Supply Chain Management

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Lecture 15 : Lean Logistics

Hello dear friends, welcome again to NPTEL online course on Logistics and Supply Chain Management. So, today in this session we will extend our discussion we have started on reverse and green logistics, we will go into next the lean logistics. which is somehow will contribute in ensuring the reverse logistics as well and green logistics and overall sustainable logistics right. So, the basic concept under lean logistics is how we can minimize the waste right. So, that is the basic concept of lean logistics. So, we will try to address the various aspects of lean logistics in this session, we will discuss about the history, we will discuss about three M's of how Japanese industries are doing that because major if you talk about the quality concepts or major standards performance matrices have come from the Japanese industry.

And then this lean manufacturing or lean logistics concept is also implemented by Japanese organization first and then obviously now word is following these quality practices. So, we will talk about the performance metrics and what are the key indicators, we will talk about what are different methodologies and framework, what are the challenges for implementing lean logistics and then obviously we will discuss about the case study. So, we will spend couple of session on this lean logistics as this is very very important part how we can go with more efficiency and effectiveness and ensuring that the every time we can be 100 percent on time if you are talking about delivery and if you are talking about quality also then 100 percent we should meet the quality as well as per the requirement of the customer. So, lean logistics is to streamline the flow of material.

So, streamlining means when it is required let us say this is the supply chain and here our raw material suppliers are there and this is production line, this is production line so many different stages are there and from here we are going for the distribution of the final product. So, raw material instead of storing the inventory here in your storage room if why cannot this happen that whenever I need 10 pieces. So, line wise 10 pieces are coming on my production line. So, one by one I will keep on processing those pieces and then the output will be there. So, how So, that will be helpful in avoiding the inventory not only avoiding the inventory, but also handling cost when you are storing in the store.

Also the damages when you can do with the components when you are storing the product and then the inventory you are maintaining all the time. So, that is also kind of capital you have invested which you will never utilize if you are maintaining that much inventory. lean logistics ah focuses on eradicating all the inefficiencies or you can say if you are doing something in that network in in any if you are doing some activity in warehouse if you are doing some activity during transportation or in manufacturing which is not adding any value to the end customer then that is something inefficient right so if you are saying that this for in inventory you stored this product for 10 hours as a customer whether you stored for 10 hours or 1 hour or you did not store you are directly shipping to me how it will you know add any value as a customer to me right. so your storing may be because your supply chain is not smooth to ensure the smooth flow of the material may be you are not ensure about your demand then you are keeping the inventory but you are keeping inventory how much you are keeping inventory as a customer as long as i am going to your shop or your website i am getting the product hardly matters for me what how much inventory you are keeping with your warehouse. Same is the case with the packaging.

If I am getting my product safe, quality standards are met, I will hardly bother about whether you are using single layer packaging, double layer packaging or multi layer packaging. So, these are some of the things we need to identify which are those activities which are adding value and which are non value adding activities. So, these are some of the definition you can just go through this lean logistics focuses on eliminating waste improving efficiency in that way streamlining processes creating constant flow enhancing collaboration and achieving quality right. So, collaboration among stakeholders will be there throughout the supply chain only then this lean logistics can be implemented right. So, if you are doing that, you are more efficient and cost effective in that way, if you are ensuring the lean logistics.

So, there is another definition which is describing lean logistics to recognize and eliminate wasteful activities from the supply chain in order to increase the product flow and speed. See, these wastage of activities or byproducts you are producing like packaging, this is not going to add any value. increase the speed of delivering the products and services. So, in that way you will be more efficient and then you can cut down the cost because you are not consuming those many resources. So, when if you are keeping the inventory for 10 hours, you are consuming the resources for 10 hours.

So, why to keep that inventory? So, there is one small video on just how you can utilize the maximum capacity in the container. This is one way of implementing lean logistics. The same concept can be implemented in manufacturing. and same concept during your

distribution and when you are moving through that distribution network right. So, here is another video link you can just go through this video and you can relate the concept more closely with this right.

So, dear students I am again I am assuming that whenever I am referring these video links you are going through because sometimes I am including examples from there. So, you can refer these videos ok. So, just you go through this link and we will continue the discussion. by using software or technology you can ensure the full utilization of the capacity of the container and how easily smoothly you can move the you know pellets inside the container. And you just imagine when you are doing it manually how many hours you are taking to you know load that much capacity pellets those many pellets inside the container.

And then if you are talking about this kind of this is just simple arrangement of whatever these lifts you are using those they have arrange just lift in that way that they are keeping inventory on that and within less than 2 minutes you are loading one full container right and then you are ensuring the maximum utilization of the capacity of the container, but inside that pallet boxes whether you are utilizing fully those boxes or not that is another point. So, there also there is opportunity whether we can reduce the packaging, whether we can make it more compact, so that you can in that way you can save some space inside the container. This container travelling long distance, so instead of may be you are shipping 1000 items can I ship may be 1050 items. So, then I will be more efficient so that per unit cost will come down because earlier whatever cost was we were dividing by 1000 now we can divide by if you are shipping 1050 items and then per unit cost will come down right. So, if you will implement lean logistics your efficiency will be improved you will reduce the cost and when you are efficient and reducing the cost obviously the customer is getting the product within less time and because you have having more margin in that so those margin can be used may be you can keep some part as profit and some part you can share with your customers and may be the customer will be more delighted with some offers and all that so that you can use or may be you can provide some advance services on that and then increased profit overall profitability you can ensure so and obviously more agile and responsive you will be in the market because now customer whatever customer is expecting in terms of services you are very quick handling all the disruptions you have flexible supply chain distribution network and you are responsible also at the same time you are efficient because you have eliminated all the waste so this lean term was coined by John Crackwick and he discussed about this in his master thesis in 1988 where try to you know implement this lean concept in manufacturing, in warehousing, shipping and various other functions, but this was just the theoretical concept and the just instructions were given how we can go for this what

can be the different steps right, but The properly this lean manufacturing concept was used by Toyota Taiichi Ohno engineer in Toyota who is well known in you know setting up the new quality standards and you know this lean manufacturing as well.

And there they try to you know eliminate the waste, enhance the safety of the product and also touching the bottom line for the improvement where you will be more efficient and sustainable right. So, if we talk about this history now IT organizations are also using lean logistics right and because obviously, this will happen only when just in time. So, just in time means again another tool which will help to ensure the lean logistics. So, in that way we will try to optimize the value adding activities and will eliminate the known value adding activities. Like I told you, you are keeping your inventory in your refrigerator, in your warehouse, in your cold storage, as a customer I will hardly drive any value out of that, you are putting double layer or triple layer packaging on your product I will not get any value as a customer out of that what value I will get how many features extra you are adding into the product how is the quality of your product how quickly you are delivering the product and then how you are cost efficient in terms of what is the price right So, talking about lean concept, why we are talking about lean in logistics, this is quite obvious.

So, the share of this logistics expenses somewhere 5 to 15 percent in some industries, somewhere 25 percent also in retail, right. And we have talked about the reverse logistics concept also which is adding more, you know, burden on the logistics industry to be more efficient in terms of, you know, cost efficient. So, these are three quick pictures, if we will first see this, I am just giving you 2-3 seconds, you can just think about these pictures and what is happening and the terms are explained because these are again Japanese terms. So, muda, muri, mura. So, quick view, first is you can see waste is happening, overflow of the water, second is the person is over burden, what is his capacity, he is taking more than that, third is it is not balanced uneven.

So, these three terms are muda, muri, mura. How we can avoid these will lead to lean logistics. First, we will take about muda. This is the total capacity and we are utilizing this much only. So, rest of the capacity is waste.

This is waste. How we can ensure that this? the room is that 100 people can sit and we are ensuring the AC facility for those 100 people but only 10 are sitting at that time. So, then even the cooling facility is going in full way right. So, that way that small room can be used. So, that is unutilized capacity which is waste. So, we have identified 7 types of waste.

in lean under lean first is your transportation t stands for transportation i stands for inventory m stands for your motion w stands for waiting your o stand over production over processing and defects so anything you are doing here inventory again i told you the example is waste if i am waiting for my product that waiting time is waste if let us say two workers are sitting on stage one stage two right now he is processing the product taking two minutes and for that time he is just waiting because once he will process it will be shift to the that person so that means for two minutes he is sitting idle so that is waiting if you are waiting in your maybe distribution network if you are waiting your courier partner is waiting you are placing the order through zomato so then zomato person courier partner is standing outside the restaurant for 10 minutes or 15 minutes at that time you are preparing the food and it is taking time so how we can reduce that time how you can you know half cook item should be there that as soon as you are clicking on the order and your courier partner is reaching at your restaurant your packet should be ready so how we can minimize if that can only happen if you have quick information sharing system right so if you are producing anything defect obviously is waste you cannot utilize that even if you will say we will repair we will replace if as a customer i am paying for new product why i should get the repaired one right so that is simple concept over production if you are producing something extra which is not required then it is waste motion if you are moving here and there in the work station that means it is not designed properly i have included some examples also quickly we will go through yes these are examples are there transport already we talked about if unnecessary movement is there during transportation that is waste customer is not going to drive any value out of that inventory you are keeping in terms of raw material in terms of work in process in terms of finished good that is complete waste as a customer for me I cannot drive any value how much raw material inventory you are keeping inside that. Motion this is what I was talking about. waste of motion now this person is moving sometime to this bin sometime to work station sometime he is carrying the product so zigzag motion is there so that means while moving he is wasting time that is kind of extra motion extra waste this person is waiting for the call only then he will respond to that so that is waste how you can ensure that smooth channel so that everyone every work station should have some work to do and as a producer if you are producing more and then you are expecting that your customer should wear more than one cloth at a time that will not happen right if it is designed in that way only one t shirt you can wear at a time so if other accessories you can wear over t shirt or shirt you can wear some other stuff but you cannot wear two t shirts at a time so even if you are producing more that will not help you Then over processing let us say if you need to treat something at may be 100 degree temperature and you are using 150 degree right. So, that is something extra waste if you are cooking a simple example if you are baking your bread more than that temperature even in that

process you are damaging that product as well and even you are wasting the energy. So, you consumed more energy than required.

defect if anything is passing through your line which is defected so is kind of waste. So, some few based kind of waste have been included over the time if talent is not utilized in means talent is also one kind of resource in the organization that is waste any resources I am moving out of this. recording room and still AC is on lights are on that is waste. So, how we can ensure that? So, sensor based lights you can use sensor based AC air conditioning facility you can use as long as you are there that will be functioning and after that it will be automatically turned off. By products if you are producing anything that is waste and if I am saying I am doing nothing in this organization still I am getting salary is not something to be proud of that means you are not aligned to the goal of that organization and the problem is with the designing of the roles and responsibility of the that particular worker who is feeling that he is idle not getting enough stuff to work right how we can implement this in inventory how we can minimize the inventory just to meet the demand we should not ensure the excess inventory right so just in time you can do that warehousing in warehouse how full utilization of the warehouse in terms of capacity of the warehouse you are ensuring right and then minimum handling you can ensure right how you can ensure the proper stock rotation in the warehouse so that it should not be obsolete and expired in the warehouse only right so those are we have discussed in warehousing session that what are the key performance indicators so all those indicators if you will manage properly in that way you can be efficient how in your warehouse you can use sustainable or renewable sources of energy to lighten your warehouse right those kind of initiatives you can do trucks how you can ensure the full capacity you are utilizing the truck while routing during your transportation how you can ensure the minimum distance your truck should cover right so those many things travel if you are traveling somewhere for any work that travel time is wastage right so how i can reduce the travel time If I am coming to you personally somewhere to your place, so addressing those many audience will be time taking right.

So, it is better way that we can record the lectures, we can have the interactive sessions as well and then sitting at different places we can share the knowledge and information right. people if people are there who like I told you waiting for their turn and for getting the product to be processed. So, that is waste if you are not using the you know skills of the of your manpower even then that is waste. So, electrical vehicles how electrical vehicles obviously can help you to develop the sustainable transportation solution. So, this is all about muda waste how we can reduce the waste.

This session will talk about what are the different types of issues are there when we are

talking about lean manufacturing or lean logistics. In the next session, we will talk about what are the different methodologies we can use where we can ensure the lean practices within the organization. so overburden so this is because of why you are feeling overburden because maybe last two days you did not work so now you are over occupied that is one reason right or maybe there was no demand for if you are barber or you are doing some giving some services right so for 2 hours there was no customer for next 10 minutes may be 10 turned up right so then how you will manage that you are overburden then right but in services you cannot avoid those things right so if you are doing overburden kind of thing there will be breakdowns there will be absenteeism rate will increase because your employees are now feeling overburden and these are some of the example when you will feel overburden when you are doing those processes you are not trained for you don't know how to do that poorly laid out workplace where the workplace is not designed efficiently and because of that you are lacking with your work unclear instructions out obviously if you are not clear about the job how you will feel you will be feeling all the time overloaded right lack of proper tools and equipment obviously will lead to pending of the work fluctuating demand is mura right so If fluctuating demand is there even then sometime demand there is no demand and then there suddenly demand will come. So, overburden will be there lack of proper maintenance will lead to overburden unreliable processes poor communication routes in terms of because you could not identify that how much demand could be for may be the next few months so then you predicted it wrong for the season and then now you are overburdened doing extra shifts and double shifts and all that in that way you are putting extra load on your system your capacity is this much but if you will stretch beyond your capacity so then wear and tear and burnout will be there third point is unevenness now unevenness is sometimes because I did not work so now sometimes I'm not working at all and then maybe for next two days I'm all on the work from morning to evening so if that thing is happening so that means that you are inconsistent in that way so you should smooth out this right the very basic reason why you should smooth out your production process because when you have overburden in that process you will quickly you know process the things and then you will produce the defected items you may damage the products. So, quality will be compromised and this is very common example or obvious things if I am giving you assignment and I am saying that may be after 4 weeks you need to submit it.

in the very first week you will be just thinking about the assignment oh we have one pending assignment second week then you will start calculating these many days are left I need to you know work out little bit for that what is that topic what can be there in that we will think just third week now you are approaching next week is the submission date let us start something working on that let us start at least the introduction part of that and in the last week we are targeting 70 to 80 percent. So, this is the human tendency. So, we

are usually stretched up in the last week of the month when we need to meet the your whatever targets were set in the initially and because this is happening with all stakeholders even we will feel the shortage of the raw material supply because raw material suppliers are also behaving in the same pattern that hockey stick kind of graph you are getting that in the first week. So, in that way we need to smooth out the production throughout right. So, in that way we can avoid the unevenness.

Principles of lean logistics eliminating waste is the basic principle. if you are doing something you do not know how it is adding value that is waste improving efficiency if you will eliminate the waste obviously the cycle time will be reduced if you are keeping the inventory minimum inventory or you are making minimum stoppage in the warehouse center you are just doing the cross docking so that means that much time you are not wasting you can make the quick delivery so one step is related to the next step if you will improve the suppliers automatically your next chain will be improved your manufacturing will be smoothen out if you will ensure the smooth manufacturing your next distribution network will be in that way streamlined so you need to streamline the full distribution network so this is what i talked about streamline the processes all unnecessary steps which are not adding value so for that which are not adding value you need to improve the visibility what is happening if hundred people are coming in my organization daily i need to analyze what the people all those people are doing what is the work on their workstation i cannot design workstation for a one person who where he is heavily loaded and the other person he is enjoying all all the day right so that cannot happen So, then creating constant flow. So, if those many stages are there all should have almost equal work to work on the workstation right. So, that constant flow we need to ensure and I told you this will start with your supplier and if your supplier is in that way smooth your manufacturing will be smooth and if your manufacturing is smooth your distribution network will work in a smooth way and in the end on time delivery will happen to the end customer right so that way you need to enhance the collaboration with all the stakeholders so lean concept cannot be implemented with one particular organization within manufacturing only right achieving quality so because very simple example if you are storing any product for two months or the product you are storing only for ten days obviously the quality will be degraded if you have not used that product for two months if you are handling you are moving in the warehouse here and there just to manage the space even then you are damaging the quality right so as long as so you have the demand your distribution network is efficient enough and you are ready with the product in quick view so then it should be shipped to the market as soon as possible right Only when you will ship the product to the market only then you will be able to generate the revenue out of that and when you are not storing for longer you can maintain the quality of that. So, these are some of the performance key metrics already we discussed these terms in terms of when you talked about the logistics performance, but in terms of

lean logistics we will see how these things are adding towards the lean logistics.

On time delivery, how many times we are on time? so if you have reduced the based activities you will be on time lead time how much time you are taking to deliver the product if you are having shorter lead time that means you have streamlined your processes and you are consuming the minimum time during the distribution network Inventory turnover, if you are keeping minimum inventory that means quickly you are replacing the stock, you are moving the material in the market and quickly you are replacing the stock that means your minimum time your inventory is making the temporary stoppage in your warehouse. Order accuracy, how many times you are delivering the accurate order, accurate order on accurate time with accurate quality right, so that is means complete order. Transaction cost per unit, if in one truck you are carrying 10 items and cost is 100. So, obviously, carrying 1 unit your cost will be 10 rupees. If I am carrying may be 20 items in the same truck, same cost will be there may be the cost will be 5 rupees.

may not be same if may be it will increase little bit even then per unit cost will reduce may be from 10 to it will reduce 6 rupees per unit or 7 rupees per unit. So, you need to ensure the complete you know utilization of the capacity. this is warehouse utilization how much space is utilized cycle time for any activity cycle time is when you are starting and when you are ending so you need to record the cycle time of all the activities you are doing during your distribution network dock to stock time how much time you are taking you received the stock and then it is on the invent your warehouse shelf for selling purposes right so how quickly it is moving that return rate high return rate that means your products are meeting not meeting the expectations defects are there so that means your manufacturing is somewhere in the question if you are damaging the products during your distribution then there is a question with the packaging with the handling so that return rate you need to analyze So, order fulfillment cycle, how quickly you are fulfilling the order, when you are receiving the order and how quickly it is fulfilled. Perfect order rate, perfect order rate is not only on time delivery, on time delivery complete order fulfillment intact product i told you on time with quality right and your complete order should be delivered right and then back order rate back order is something if customer is coming to me i could not meet the demand because insufficient inventory was there so then i will that is a kind of back order So, may be I will take some time may be next few hours I will deliver next few days I will deliver.

So, that is back over rate. So, how we can reduce this back order rate that will help when you will analyze you know perfectly your market conditions and perfectly your demand. supplier on time delivery performance how many times your suppliers are delivering on

time. So, you can develop the schedule for the suppliers and you can record the performance. So, the next time when giving orders you can keep in mind as one of the parameter that this supplier is mostly on time 90 percent on time 95 percent on time. So, we should give maximum order to this.

order lead time variability if one supplier is like that in one order he delivered order two days before for next order he is delivering may be five days late. So, all there always there is inconsistency. So, in that way that supplier is not reliable. you can never rely on that if it is consistently late we can take that margin that instead of five days he will take six or seven days so we are ready for that those many days but sometimes he is delivering in three days sometimes in ten days then we cannot plan for that shipment damage rate during distribution how many products are shipped how damaged how many what is the percentage so that you can see sustainability matrix you need to record the carbon emission during your distribution warehouse transportation energy how much you are consuming, waste how much waste as byproduct you are generating. And then you need to engage your employees, you need to provide the training to your employees only then motivated employees will work properly.

So, this is all about the various concepts of lean logistics right. and we have seen how we can what are the different types of waste how we can address that in the next session we will continue this discussion we will be discussing on the various methodologies to overcome these waste. So, these are some of the references. So, that is all from this session. Thank you very much.