Logistics & Supply Chain Management

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Lecture 57 : 21st Century Supply Chain

hello dear friends welcome back to NPTEL online course on logistics and supply chain management so we discussed about the latest trend in the industry with respect to supply chain management we discussed about e-commerce industries we discussed about what can be the different functional units within supply chain, the overall perspective of the supply chain. Now, we are towards the end of this course and obviously, when we are saying that we need to look forward what is going to be the next. So, we need to talk about 21st century supply chain, what are the challenges, what we are looking further, and how we can go for those dimensions. so in this session we'll just highlight about all those parameters which we need to take care when we are talking about our very highly competitive supply chain of twenty first century and after that right this supply chain is obviously characterized by continuous transformation is there right so every day we are looking for changes and these are obvious because of the technological advancement globalization and evolving customer preferences now these are the driving forces can we can say the impellers of our supply chain right so any technological advancement now if we are talking about any disaster right so how quickly we can get that information in advance that there is going to be any you know heavy rain or flood kind of situation or earthquake do we have those kind of software technologies with us those are going to predict these disruptions for us do we have software to predict the market fluctuations do we have software to predict the downturns recessions do we have predict to you know softwares to predict any political instability in future any social change cultural change that is going to impact our supply chain or our industry so that softwares how we can utilize the past records and then we can predict for the future so this is very important you know force which is you know when we are talking about the advanced supply chain the technological advancement is required then globalization as we cannot operate in isolation If you are saying that you are working here in Calcutta or Kharagpur, you are working in isolation and you are not impacted by global disturbances. Now very basic thing we are getting crude oil from where we are getting the petrol and diesel. Any industry is working obviously utilizing petrol or diesel in some or other way.

So if those prices are inflated, so obviously your... industry is also affected right and then this is something when we are talking about we can never delight our customer we can never keep them happy for longer period of time maybe today you are giving them 2%

extra they are happy delighted right tomorrow when they will be coming to you if you are giving again two percent they will be just satisfied they must be looking for three percent now then they will be delighted then they must be looking for five percent seven percent up to what you will go right so we as a customer obviously if we are getting something from one brand that is a kind of promise so we try to you know next time we want to enhance our experience and if you are not enhancing our experience someone else will get the competitive edge over you and will do that so having said that this competitive environment where our supply chain has to be very very competitive should we based on real time data and analytics so when you are getting that information on time obviously you can make the informed decisions and informed decision your complete supply chain can be streamlined in that way how much you need to source how much raw material is required in how many lots you will buy so that you can negotiate with the vendor right how much you need to store in the storage house how you will ensure the quality how you need to maintain the inventory how much inventory is required at the distribution end so that all decision making if you have the real time data about the market fluctuations only then you can design and then todays globalized and rapidly changing business landscape already we talked about one part of the world something is happening then it will be giving impact throughout and your supply chain should be integrated with the latest technology software so that you can meet these disruptions easily right you can overcome these disruptions so having said that interconnectedness is obviously positive also and negative also when we are saying that interconnectedness with your stakeholders required obviously you need to share the whole information throughout your stakeholders so that decision making can be aligned if you are supply chain is saying that or your manufacturer is saying that we want to be cost efficient so this should be shared throughout your stakeholders so that your raw material suppliers are also cost efficient your distribution network is also working on that so that can be aligned but yes if that interconnectedness is so high level right if anything goes wrong at one point will disrupt the whole supply chain and day by day when we are saying that so many stakeholders we are including in the supply chain so many softwares we are including so many different parameters we are embedding in that supply chain obviously we are moving towards very very complex supply chain where if we will talk about some human will be sitting on that getting the data counting on fingers and then making the decision it's not going to happen so some automated decision making should be there which can take decisions on our behalf right so we have to continuously evolve with our supply chains those are driven by technological advancements globalization changing customer expectation and need for the sustainability this sustainability parameter is also very important and we had separate session on this so talking about 21st supply chain key aspects are We will go through these key aspects one by one.

First is your digitalization and automation. So, digitalization, having the digital twin or

whatever physically you are doing, you are replicating in digital platform or records you are maintaining digitally obviously will help you. But just digitalizing the record will not help unless those records are shared at the same time when you are recording that. that means it should be automated right so throughout that supply chain it should be shared any information you are recording from those touch points so that should be shared so that the real time data collection can be done we can analyze that data and then the decision making for all the players can be done based on that and how this is possible when you have artificial intelligence when you have machine learning when you have big data analytics internet of things you are using you have virtual world of all the physical equipments resources the markets you are connected with right so when you have that information you can quickly process that through automation and then automatically decision should be taken supply chain visibility and transparency see now i told you uh There may be we are using road transportation, let us say, as 60% share is going to that. So something goes wrong on that route and maybe the supply is interrupted.

We are predicting maybe next two days we cannot go by that route. So, there is no other option. So, how we can explore the other alternatives? We will explore the other alternatives when we have the complete visibility exactly how many hours it will take to address that situation. if the information is transparent enough that where the threat has happened where the cyber attack has happened just that information we need to share so that visibility and transparency throughout that supply chain should be there that's why we are talking about blockchain embedded supply chain where all the stakeholders are connected records are immutable cannot be destroyed so you have maintain the full records and full visibility is there globalization and outsourcing in 21st century supply chain we started discussing about outsourcing and offshoring so why we went for off locations offshoring because we were getting cheaper product we were getting cheaper labor we were getting extra raw material availability is there we were getting some time the latest technology there right there can be so many reasons when you are shifting your manufacturing from your country to some other country or you are shifting your raw material supplier to other country so we were talking about over sourcing and off sourcing but yes this is important to understand during the era of globalization that if any global event is happening in that country from where you are getting the supply so then your supply chain is also interrupted so now we are talking about near shoring where we can set up our vendors near to our manufacturing unit and we talk about just in time, we talk about zero inventory, we talk about customization of the product that is only possible when our vendors are nearby to us. Whenever any change in the demand pattern, any other feature or any other product characteristics are required by the customer, how easily you can implement that when your vendors are very closely associated with you, right? So, then you can easily do that, right? Supply chain resiliency is important as we have seen that.

now earlier we were seeing that maybe 8 or 10 years this cyclic recession was coming so that period was for 8 or 10 years but now you see how frequently this is happening after 2008 recession it went for 2 or 3 years and then 2018 this COVID-19 pandemic in between so other pandemics were there but COVID-19 was something that interrupted the complete supply chain because of the shutdown of the operation and then after you just see the series of event russia ukraine war then you see what happened in sri lanka then what happened in bangladesh then these all political instability are going on right then there is means war in iran as well so many other countries the disruptions is happening and you can see if we talk about the fuel we are using petrol or diesel and we are importing from those countries so that supply is also interrupted or in that way the price is increasing so how we can withstand with those disruptions right so only thing is how redundant you are with your resources redundancy you can develop you can develop the alternatives if any cyber attack is there whether you are maintaining the record somewhere else that you can easily recover that right so these are kind of strategies we discussed in the supply chain resilience session as well right then we talk about sustainability and corporate social responsibility Now earlier because there was debate now going on over climate change and many conferences events are happening just to make people aware about this right. so government has also coming with these regulations they are you might have seen they are banning BS4 engine they are coming with the updated version in some location where the cities are more polluted like Delhi, Calcutta there they are if your vehicle is more than 15 years old you cannot allow those kind of vehicles heavy vehicles right in Delhi specially it is going on right so that means Government is coming up with the rules and regulation. This is one thing. We are forcing others to follow the rules. But the recent shift, the awareness that has come to the customer is also forcing now major brand manufacturers to go for sustainability measures, right? so the very example big example of myantra where they moved from poly bag packaging plastic packaging to paper packaging right and then i quoted one case study in europe if the in europe if you are doing the end mile delivery using your bicycle or electrical vehicle customers are more delighted they are placing more orders on your website right so in that way now this demand is coming from the customer that they want complete information while delivering the product how much carbon footprint you are leaving so earlier we were providing on packaging the information related ingredient very soon you will see when we will provide the information related how much carbon footprint we produced when we packed this product we produced when we manufactured this product we produced carbon footprint when we transported this product from our location to your location every stage how much environment we are depleting that information is also demanded by your customer now so you have to be socially responsible as well customer centricity and omni channel logistics obviously customer is aware about sustainability measures but customer also wants speed convenience

personalization quickly they want the delivery forget about how you are meeting that you are spending extra fuel extra energy extra resources they want quick delivery convenience also they want right so if today delivery partner is coming calling me i am here in recording or in my office i'll say you come in the second half right again he has to come and make the second attempt then maybe second time also i'm not a available so third attempt right then they will send back sending back there is no loss for me right so then again you just see those resources are consumed on that process right so that is there so how you can obviously customer is demanding but you need to minimize on that parameters also omnichannel logistics this is something now reshaping your supply chain because customer is not placing order from one channel Either you talk about the traditional brick and mortar stores, you talk about e-commerce platform, you are buying simple air ticket.

How many options you have? You can buy from that Indigo website or whatever airline you are picking, Air India. You can buy from Make My Trip, Go Avivo, so many social media apps, right? So many other informations are there. IRCTC is there, iXIGO is there all those platforms are there so then you have limited capacity so you need to manage that as well maybe you are not having limited you can produce much right you can produce more quantity but even then how much you need to produce segregated way your demand is coming from multiple channel then in that way your information system should be very very strong to configure all those parameters what are the supply chain trends in 2024 so these are some of the latest studies so we are talking about your integral visibility we are talking about sustainable brands we are talking about regionalized supply chain near shoring supply chain we are talking about RPA adoption how robots process automation we are talking about AI driven decision making we are talking about quickly we will go through so that visibility we talked about it should not be nice to have now it is the time we must have this and there should be unified data platform where we are getting the complete information and then we are processing that information through data analytics we are predicting and then we are sharing that through our iot setup network right with all the stakeholders so that everyone can be updated so when we are talking about any event is happening inside or outside environment how quickly you can respond it's not only you as manufacturer you as transporter you as warehouse or vendor only you will respond your complete supply chain all the stakeholders have to respond right so in that way only you can quickly address that situation in hand and then optimize your cost improve the overall customer experience so why this visibility is so important because now your supply chain is so complex and customers are always they were king they are king and driving force they want all the things and they are putting so many complexities on that supply chain compliance and then i want the environmental information also i want to meet all the legal parameters also so i need to track right i need to make the supply chain transparent visible to anyone who wants to record what i'm doing how much carbon

footprint i'm leaving what resources i'm utilizing that information should be visible and competitiveness obviously if you want competitiveness information this era is only the game is based on information how quickly you are getting the information processing and then taking the decision you will be first so right now it is better to be first than it is to be better right so to be better obviously subsequent stages you will be there but it is better to be first to respond to that situation sustainability becomes a key brand differentiator as i talked about in europe if you are doing that end mile delivery using your bicycle you are brand differentiator that is becoming your usp if as myntra you are doing paper packaging recyclable packaging you are brand differentiator right and then circular economy models how you are implementing this is what i was talking about life cycle assessment so using this software you you need to put this information on your packaging how much environment you depleted during that complete process let's say these many stages were there to produce that product right how much environment you depleted at the first stage second third fourth fifth right in terms of how much energy you consumed right so life cycle assessment software will help you to find out how much energy you consumed how cost efficient you was economic parameter environmental parameter and what impact was there on the society that you can calculate if per unit of electricity you consume to produce that product on that particular stage per unit of electricity to get that much electricity how much environment was depleted that life cycle assessment software will help you to calculate right and then rating agencies and consumer request is there you need to meet those environmental sustainable goals right whatever are there environmental social and governance these three parameters you need to touch right and you have seen that now we are talking about electric cars green business green packaging so and awareness is there that's why people are picking most of the now the scooters are coming with the electrical bikes only electrical bikes they are selling huge in numbers right so this concept we need to understand circular economy let's see that this is raw material which is entering in our that circle we are manufacturing we are distributing and we are consuming here and we are producing the byproduct as based this is linear economy but see linear economy is not the long term solution whatever byproducts we are producing in that process how that byproduct can be we can reuse that reutilize right remanufacture may be in the same industry we cannot utilize may be there is some other industries we can find out the industry 1 2 3 4 where we can utilize that byproduct waste after the end use so this is the circular economy model we can implement talking about, again, the supply chain trends in 2024, regional supply chains are required just to, you know, meet those disasters in better way, right? So, we talked about near-shoring, nearby our vendor should be, and we should have multi-node networks, localized production should be there. So, if we are depending upon our vendors, which are situated overseas, so, obviously, if economic activities are shut down due to covid 19 in china your supply will be interrupted right so ah then we need to go for multi sourcing we need not to depend on ah minimum number of suppliers one or two few suppliers you should have

many suppliers so that in that way the supply chain can be smooth supply chain can be ensured right So, now there is trend now again we are coming back to regional models we are earlier we were doing same when we talked about the barter kind of system we are regional supply chain what we are producing here in Kharagpur or West Bengal we are consuming here only right. So, again we are looking for we are taking some parameters out of that model only and just to avoid that and implement these kind of zero inventory and just in time inventory models right.

obviously we cannot deny from the benefits we are getting from the global supply chains in terms of the quality we are getting the technology we are getting the raw material supply we are getting the price we are getting right but yes then you have to make the trade off looking into these kind of ventures whatever is happening in the outside world so the supply chain risk management steps already we discussed in the last session quickly overview first establishing the proper governance for the process identifying who are your critical suppliers now may be you are sourcing thousand different components raw material right all those thousand raw material do not require equal attention in terms of you know we talked about a b c model where we talked about c type of components near about 70 to 80 percent so 70 to 80 percent which are only contributing 5 to 10 percent so that means even if i will maintain the inventory for longer period of time for these 70 75 component only cost is 5 to 10 percent so maintain why i'm thinking to maintain long term inventory because i want to outsource to offshore to some overseas vendor where i'm getting the location advantage where i'm getting the technological advantage price advantage quality advantage whatever it may be right so i am ready to maintain the inventory but on the other hand we have those 20 to 25 percent those small number of items which are contributing huge in terms of value right so then those products should be very very near to your setup because that inventory is very difficult to maintain because they are carrying almost 80% of the cost right so this is how you can implement this supply chain adopt robotic and autonomous system which i was talking about already we are facing shortage of manpower we already talked about warehouse management software we talked about warehouse robots which can easily place the products on the shelves easily identify retrieve the inventory anytime online order is placed quickly they can identify pick and pack the product and easily we can ship the product right so this is automated kind of warehouse how efficiently we can utilize this technology in this 2024 next generation ai when we are talking about generative ai which can generate data for future replicate the data can predict the future in terms of if you are talking about future maintenance of the plant maintenance of the machinery absenteeism rate of the people disruption in the raw material supply disruption in the external environmental forces whatever are there we can predict that when we can predict those forces right we can plan our supply chains in that way so that we can meet those disruptions right so we can take those tactical decisions and we can optimize the overall

supply chain so this is how this generative ai can be very very helpful they can track the patterns and then even if you are talking about the route optimization so last 10 times what route i have taken how many times i have faced the disruptions traffic jams all that ai can you know predict all those things and then can suggest the best route or maybe can suggest sometimes that if i'll change the mode of the transportation maybe i'll get the economic benefit environmental benefit sustainability so these are few points you can see significant benefits of ai if predictive maintenance is there that means there will be no breakdown in the machine we can cut down the downtime of the machine by 35 to 45 percent it's not only we are cutting down the downtime during this time also we can produce and when the machine is breaking down we are producing some rejection and that also will not produce now right so that means overall production quality will improve the production quantity will improve and this you can see is well reflected in the figures and overall increased productivity in hand we know that now machine this is going for repair we have the alternative option we can design that and in that way we are not producing any rejected material earlier what we were doing anytime machine first will break down we will produce the rejected material for some time we will keep on producing the rejected material then we will realize oh something has happened and we need to repair that machine ok let us go for maintenance and then we have no alternative plan so you can just imagine with this technology how we can be more effective and this is the report highlighted by mckenzie digital ai driven forecasting reduces error by 50 percent in the supply chain you can be more efficient in meeting your supplies and demand right so Logistics obviously considered as the backbone of any trade talking about the product manufacturing industry. So when we are talking about that you have to implement all the technologies, all what concepts we are talking about in your logistics framework. so technological integration should be there automated like i talked about the route planning how you can go for auto route automated route planning artificial intelligence data analytics in order to streamline your operations reduce errors and increase the overall efficiency of your vehicle e-commerce boom is another very big factor which is you know affecting your evolution of overall your logistics and there was one session on e-commerce industry right we have seen that where we are saying that half an hour delivery we are saying one day delivery we are saying two days delivery right so then we are talking about end mile delivery using drawn and auto autonomous vehicle drive deliveries right what challenges we are facing in 21st century obviously disruption is one right coming from the environment internal external environmental sustainability because these measures are changing very frequently right so we have to take care of those and this is one thing it's not that labor intensive jobs we can replace by robots but to run robots to run technology still we need to maintain few manpower and that manpower is highly qualified professionals are required to maintain the software to maintain the robots and technology right. so what can be the solution best solution for major problems we are facing in supply chain data sharing transparency visibility where

is my product what happened on the way how i can share the information demand fluctuation predictive analytics that all will work how quickly you are sharing the information and the obvious solution is blockchain technology once you have the blockchain technology you can go for the predictive analytics you go what happened how this happened and what will happen in future and how will we can make it happen in our own way so that it can have minimum impact on the our supply chain and then we talked about the collaborative platform where all the stakeholders should be on one platform unified data should be provided to everyone so that one planning can be done so esg environmental social and governance supply chain dynamics also we need to consider we talked about now as this is the requirement from the regulatory body this is the requirement from the customers as well and your competitors are also moving they are providing information so myantra is highlighting 100 recyclable packaging so obviously that is helping you to build the brand and you know um move the crowd towards your brand because you are more conscious in that way so when we are talking about environmental parameter energy efficiency and greenhouse gas emission de-forestation this they have ensured a mantra when they they use they are using paper packaging obviously that can you know enhance the de-forestation but they collaborated with one organization NGO where they are going for more and more plantation circular economy waste management when we are talking about society how you can contribute how you can improve the overall quality of life give them more opportunities and how you are meeting the all the you know whatever your environmental regulations are there or if you are talking about your cyber security or if you are talking about any reports you are generating you need to disclose with the government this is another web based supply chain management which is totally internet based kind of platform right where we are placing order like e-commerce platform right and we are distributing we are tracking that system and obvious examples and amazon flipkart ebay myantra what they are doing right so some benefits of obviously we have enhanced collaboration with the suppliers or like jd.com we discussed about directly putting the material from the manufacturer to the customer improved visibility anytime you can track the order cost saving because all the intermediaries are removed you can reduce the cost you can scale up and down the operation because that much you will buy from your buyers your vendors enhanced customer services whatever they want customized product you can deliver data driven insights you have data all the time you are generating data from the touch points artificial intelligence and then generative ai is helping you to take the decision so this is how overall it will improve so talking about the scenario of indian supply chain obviously one of the largest globally which is obvious population wise Anything you start selling, you will get the market here in India for sure.

But yes, we in supply chain struggling lot and then competitiveness gap, if you talk about 180 billion US dollar because of we are spending almost 12 to 13% of our GDP

compared to only 8% the developed nations are spending on their supply chain. so there was one conclave held on supply chain transformation for efficiency and capability where from all part of the world many CEOs and directors experts in supply chain they participated and they also discussed that Indian supply chain because the market potential is huge in terms of raw material suppliers are also in numbers right whether if you are setting up your factories may be in your countries but yes then if you are getting the raw material supply from india and getting cheap location cheap labor or may be some other advantage location advantage so why not to go for that but you need to improve on technological based and integration is required so that more visibility can be there right so indian supply chain need to focus obviously vision 2030 is there where we will be focusing on more on logistics cost optimizing the mix model which we are not utilizing properly right now because sixty percent share is going to only road transportation and we need to digitalizing our records omni channel approach we need to opt for and we need to go for more green supply chains right having said that So, you can see that still this is the size of our industry this is how we are growing 10.5% annual compound annual growth rate is there and when we are so much promising why there is unbalanced logistics model mix why there is so high indirect cost poor infrastructure on the road you see the infrastructure conditions right on the road to travel one mile how long it is taking if we will talk about train also we are travelling only few kilometers 15 to 20 kilometers per hour can you imagine this is not that speed cannot be maintained with that weight yes we have the tracks we can maintain at least 60 to 70 kilometer per hour but that we are not able to maintain why because huge traffic is there so that is one so other parameters are there so covid 19 pandemic also exposed our supply chain and you can see this we need to how we can cope up digital solution right and obviously we have seen this that during covid 19 also that there was a huge demand for online grocery store and how we faced this with our limited resources right so key issues which were discussed at cii supply chain leadership as well which was held in 2020 september and which set the agenda for vision 2030 so this this was the point i was highlighting we were we are spending 14 percent the developed nation are spending only 8 percent so uh We need to adapt to the industry 4.0 and then we can go for predictive kind of analytics where we can take decision in advance based on AI, blockchain, internet of things. And then Indian supply chain, if you want to make more competitive, efficient and resilient, obviously that logistics part we need to work on.

we need to cut down that cost by at least 5 to 6 percent right so we need to work on that so obviously some barriers are there unbalanced modal mix that is 64 percent by road and you can see 6 percent of gdp rail 30 percent water and air only 5 and 1 percent underutilized high indirect cost is there poor infrastructure this is what i was talking about train speed is 20 25 kilometer only per hour right limited technology adoption because initial investment is high and the small players are there small medium micro enterprises

are there which cannot afford that that those technological you know platform right and then fragmented trucking network that is also there not regulated so when not regulated fragmented way so if it is organized we can how many times they are traveling without any fry so if they are travelling from kharagpur to calcutta they are taking some lot on the way back from calcutta maximum time they are travelling they are not utilizing that container capacity so this these are some of the challenges you can see transportation 40 percent is the share if we will work only thing is we need to work on this parameter of logistics either we need to go for intermodal transportation or we need to improve the connectivity infrastructure right so yeah we can conclude that twenty first century supply chains must emphasize on innovation collaboration and sustainability talking about these things obviously five major components we need to take care insight driven enterprise digital customer engagement digital enabled workforce digital service optimization digital ecosystem so we need to digitalize the supply chain is one point how quickly we are sharing that digital information throughout that visibility transparency if one decision we are making at let's say distribution point how it should be shared throughout the supply chain with all the stakeholders even with the supplier of supplier first supplier right so holistic supply chain perspective we need to take care and when we talk about supply chain margin or profit it's not only the profit of your retailer distributor or warehousing agency or transportation or manufacturer or any vendor it's the complete margin for all the supply chain players stakeholders and obviously will be shared among them So that's all for this session. These are some of the references. Thank you very much.