Modelling and Analytics for Supply Chain Management
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Lecture 36
Transport Costing

Hello and welcome to modeling and analytics for supply chain management. We are in to week eight, lecture 36 Transport Costing. Now in the previous week, we gave you an overview of so many transportation systems and imagine when you are using all these modes of transportation systems, how much costs are you incurring? How to calculate those costs? These are all the things that you should be careful about now.

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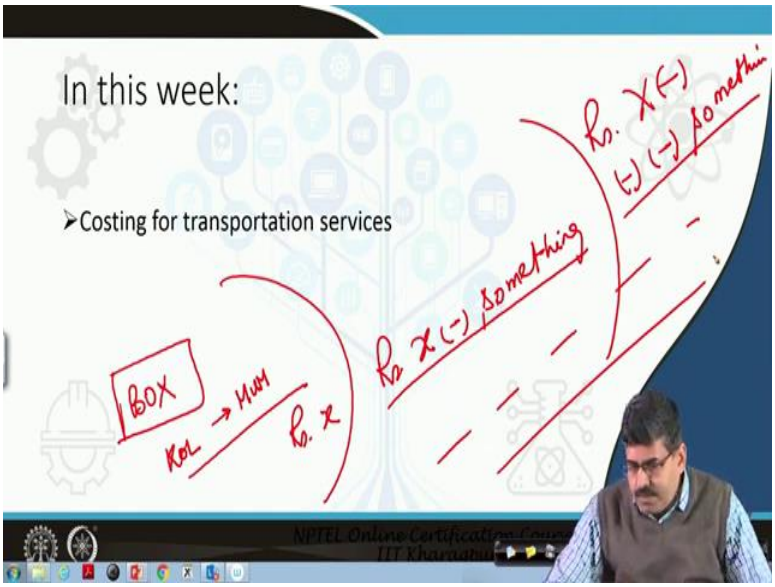

Now see, this transport costing is very easily said than done. So, we will cover this transport services. Now we will take this blind side say it is very easy to say, very easy said than done. For example, let us take you have a small box, you have a small box to be transported from let us say, Kolkata to Mumbai what do you do?

You go to a very costly courier service who travels who takes your goods by air and they are charging you rupees x. Now what happens, same thing, you go to a mediocre courier service and they are charging you rupees x minus rupees x minus something. Same thing you go to the post office and there, they are charging you rupees x minus, minus, minus something.

So, what you want to say is and if you go to railways it is minus, minus, minus, minus, minus, minus. So, what I want to say is that same product moving through different transportation systems, different supply chain systems are having different per unit

transportation cost and you have to be very careful, how to calculate these types of costs. That is our agenda today.

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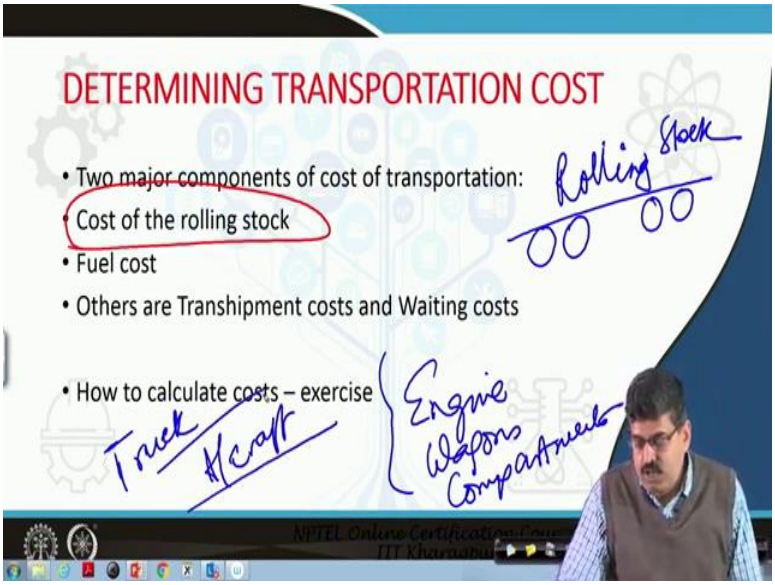

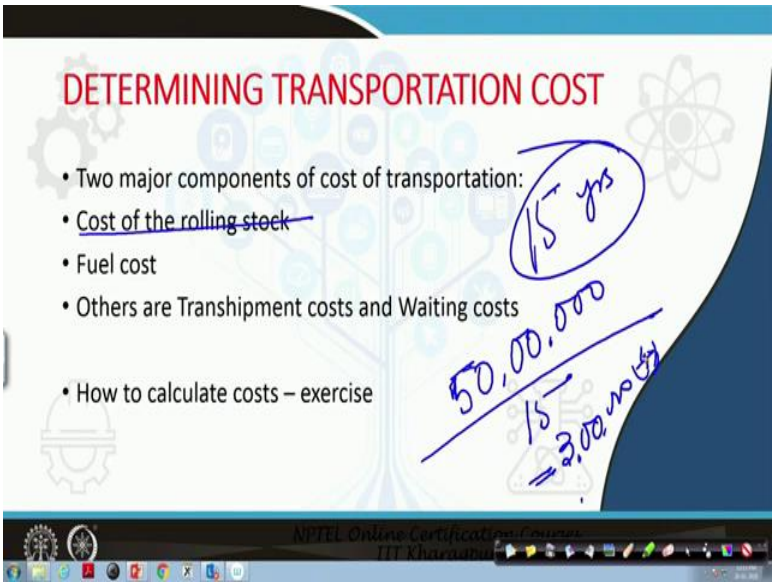

Now let us try to understand this, there are two major components of cost of transportation. One is the cost of the rolling stock and other is the cost of fuel. So you see when we determining the transportation costs we find that there are two major transportation costs, one is the cost of rolling stock, one is the cost of fuel and the others are very, very minor sum, little bit of other costs like your workers, your maintenance and waiting costs etc, etc and of course, we will do an exercise as mentioned in the last point. Now, you see two major cost components. Let us try to understand one is cost of the rolling stock.

Let us see what is cost of this rolling stock, what is rolling stock? What is the meaning of the term Rolling stock? Rolling stock basically means anything that rolls on a wheel. Anything that rolls on a wheel is called as rolling stock, anything that rolls on a wheel is called as a rolling stock.

Now, this rolling stock will mean what, this rolling stock will mean for railways it will mean it will mean an engine, for railways it will mean the wagons, for railways it will also mean the compartments. For roadways it will mean the truck. For airways it will mean the aircraft. So, in this way you are you can this is what is called a rolling stock.

Now see the problem, this Rolling stock as per government of India orders no vehicle beyond 15 years, no vehicle beyond 15 years is allowed on road that means what? Whatever your cost of the vehicle, let say 50 lakhs has to be recovered by how within how many years 15 years. So roughly, roughly about 3 lakhs plus money in terms of profit you will have to recover not revenue.

So, in terms of profit you have to recover every year. So, cost of rolling stock is very, very complicated. Now, let us take railways what is happening with railways one wagon cost you how much? About 1.2 crores, you will have to recover that within the fix lifetime as given in the, if you see a railway compartment only there else it is given, returned to workshop by returned to workshop by means that wagon is out of the railway tracks back into the workshop for major inspection overall thorough check etc, etc, etc.

So, this cost of rolling stock it is high and it has to be recovered and that is why there is tremendous pressure on your marketing and your other teams to generate more and more revenue out of the stock. So, that is what is your cost of rolling stock.

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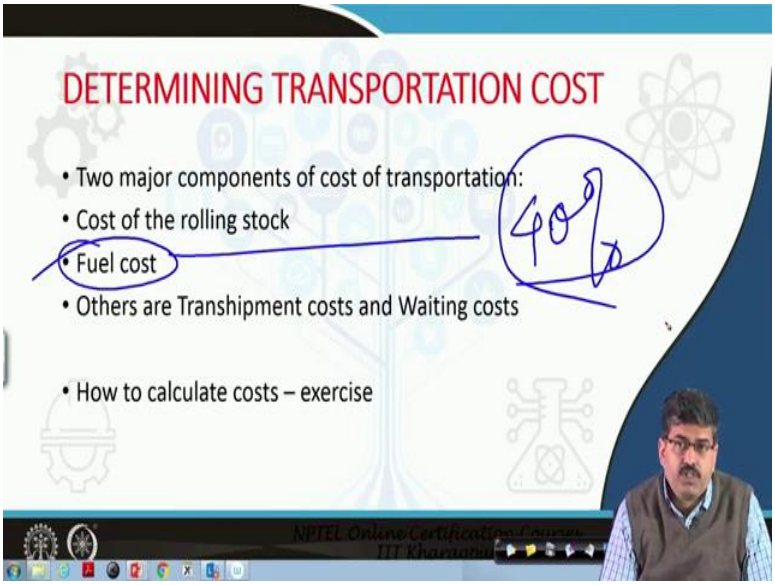

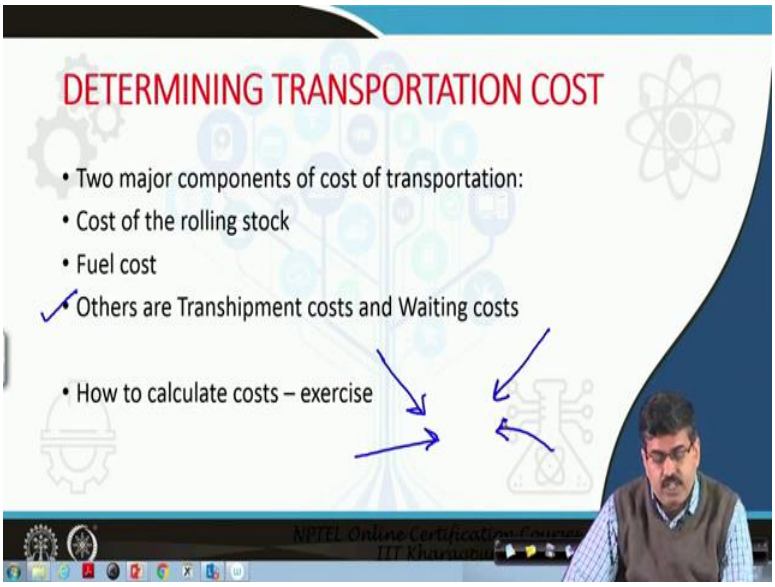

Now, other another major cost is another major cost is your fuel cost. We will see in the next week's class what different countries, different countries have their own estimate of how much is the fuel cost for running a vehicle? Trucks have a particular percentage of fuel costs, public transport systems.

For example, buses they have a particular percentage of fuel cost, railways have a particular percentage of fuel costs so fuel cost is a very and roughly, roughly the estimates show that if you are going by road the fuel cost is roughly about 40 percent of your total cost. When you 40 percent of your total cost is fuel cost, then you will have to be very, very careful about his efficient and effective management. So, fuel cost is another very important factor and there are others other costs which are transshipment costs and waiting costs.

In, in transportation what happens in our, in this one, this point, others are transshipment costs and waiting cost. See one, one vehicle is coming from this direction another vehicle is coming from this direction. Similarly, number three is here and number four is here and both will just exchange goods and go back to their own destination that is what is the job of a transshipment center.

Now, this transshipment is a cost, because big trucks will not run the entire journey. So, big trucks will work will move up to only a certain point this transshipment is a cost. Similarly, there is a waiting cost involved, that is that is what is mentioned by others are transshipment costs and waiting costs. So, these are your costs.

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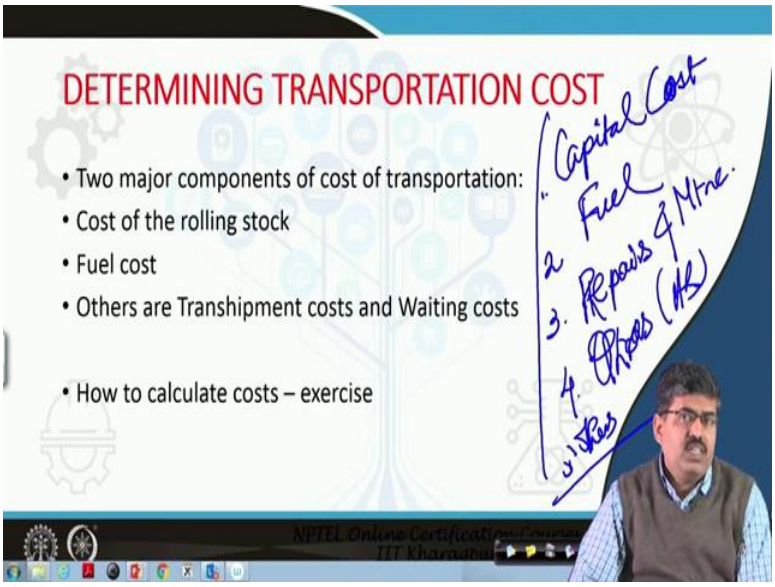

Now, we see we will do it when we do the next exercise, but then let us also try to see, so what did we say major cost is my capital cost, next is fuel third is repairs and maintenance it is a very, very important cost once the vehicle moves beyond a certain lifetime and the fourth are your workers cost HR and the fifth are others other costs.

So, you see these are your cost components. Now just to know this that my most important cost components are capital, that is the price of the vehicle then your fuel and the thirdly the other costs. So, now let us let us try to solve the problem how to calculate costs exercise.

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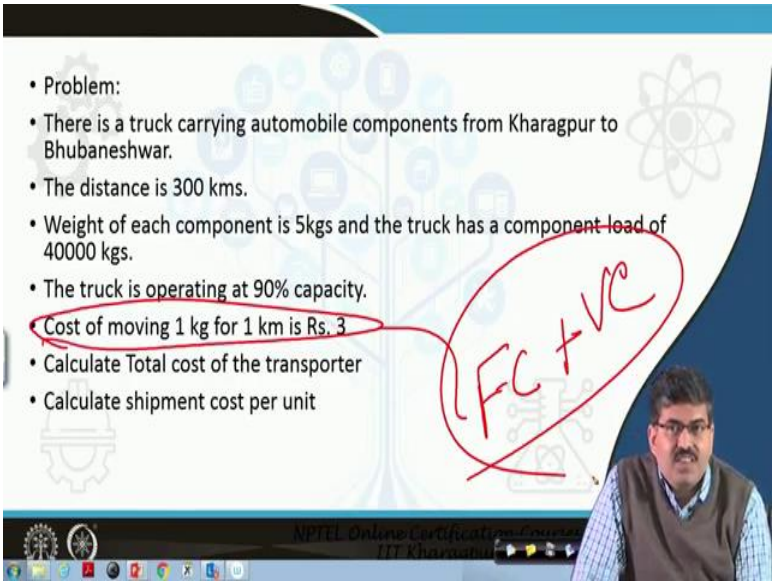

Now let us look at the problem there is a truck carrying automobile components from Kharagpur to Bhubaneshwar, distance is 300 kilometers do not know we will have to check. Weight of each component is 5 kg in the truck as a component load of 40,000 kg. So, how many units can it take 8000 units. The truck is operating at 90 percent capacity. Cost of moving 1 kg for 1 kilometer is rupees three calculate the total cost of the transporter and calculate the shipment cost per unit.

Now, what have we just now learned that the major component of cost for a truck is capital cost, than the fuel cost, capital cost and fuel costs. Now in this problem, do we have a capital cost? We do not have a capital cost. Now, do we have any fuel cost? No, we do not have any fuel cost then what do you have? We have the other costs.

But you should have asked me, what is this number doing here? What is this number doing here? What is this number doing here? This is taking care of your fixed cost plus variable cost, this is taking care. Now, we will do a detailed calculation How did we arrive at this rupees 3? How did we arrive at this rupees 3? we will do a detailed calculation now.

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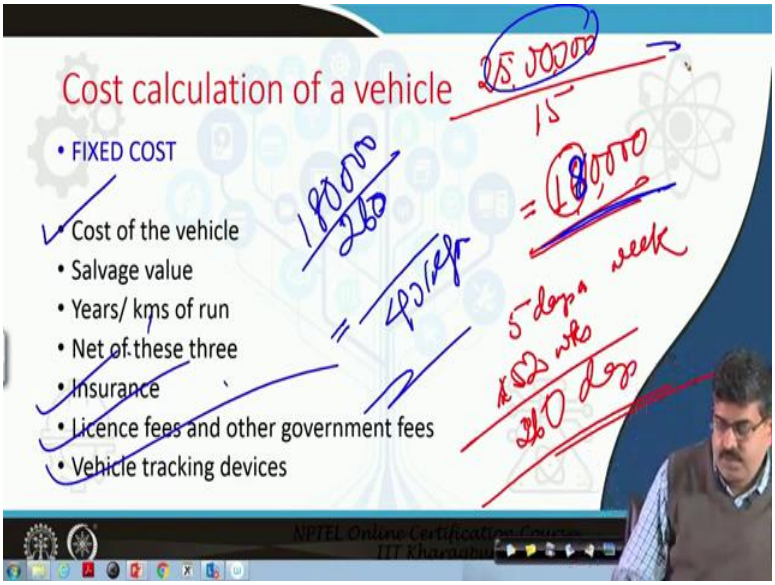

First is what cost a vehicle, now we will have to do some maths here what is the cost of vehicle? 25 lakhs. How much is the vehicle life? 15 years. So, what is the per year cost for this vehicle? Per year capital cost? Something like 160,000 is the per year cost. Now, in 365 days in a year, how many days is a vehicle running? Approximate estimates say that a vehicle runs for 5 days a week and you have 52 weeks. So, you have 260 days a week, 260 days a year your vehicle runs, but our studies in the field has shown that a vehicle runs normally 250 days.

So, this one 160,000, 160,000-170,000 whatever amount comes here this 160,000-170,000 whatever comes. This amount has to be, this is a capital cost. This is your capital cost per year, this is a capital cost per year, total capital cost is 25 lakhs, 15 years is the life of the vehicle. So, what is the capital cost? Capital cost per year is 25 lakhs divided by 15

I think it should be around 17 or 18 and it should be somewhere around this. So, I have not calculated exactly. So, your per year cost, per year capital cost of the truck is 180,000 and per year how many days are you running? 260 days. So, what is the cost per day 180,000 rupees divided by 260 days that is your cost per day. So, 180,000, 180 divided by 260 days. Now, this is your days. In one day, how many kilometers does a truck run? In one day a truck runs how many kilometers? Let us say 40 kilometers.

So, whatever results come you will have to divide by 40 kilometers. So, what will you get? You will get a cost per kilometer, whatever amount you get is cost per kilometer. Now, the cost per kilometer, how many metric ton is the truck, the truck is 20 metric ton. So, whatever

cost per kilometer you were getting is to be divided by 20, that 20 metric ton is the load capacity of the truck.

So, whatever cost you are getting, you should divide by 20. That gives you a cost per kilometer. Now, this is what? First one, but when we do it we get stuck because we are now coming to the second point this truck has a sale value. This truck has a sales value so there is salvage value to it.

So, from the original cost of 25 lakhs you will have to deduct the salvage value and then do all these calculations. Add to it what insurance, add to it what license fees, add to it for the vehicle tracking devices so, maybe one thing you can do to keep it simple this this is one way simple other ways, 25 lakhs minus salvage value plus insurance license fees vehicle tracking devices. Total divided by 15 years. So, whatever cost you are incurring fixed cost that has to be divide by 15 years and then kilometer wise.

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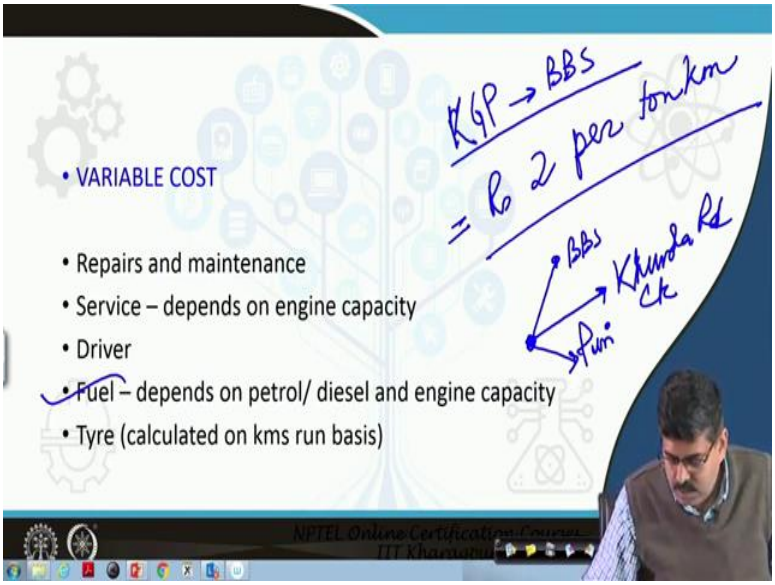

Now, next is your, next is your variable costs. The most important one is as we mentioned most important one is fuel cost, what is the vehicle efficiency fuel efficiency of a truck 2 kilometer per liter. So, what is the cost per liter of fuel? Assume, assume fuel price is 70 rupees, what is the cost per liter of fuel? 2 kilometers, so per kilometer is 36 rupees that is 35 rupees let us say. We took that take 72 but let us take 35, 35 rupees is a cost per kilometer. How many tons is the truck carrying? 20 metric tons.

So, 35 rupees divided by 20. So, roughly 1.6 rupees, rupees 1.67 or rupees 1.66 is your cost of fuel per ton kilometer that is your fuel cost, cost of fuel for per ton kilometer. Now tires

again, tires is an another thing, calculated in kilometer run basis, most of the tires, how many kilometers it is running cost same thing like your cost of the truck. So, truck the tire value divided by life depreciation and you get the tyre value. The driver salary, service etc, etc all are based on kilometers.

Now, so in this way if you calculate you will get a particular value, let us say we are getting that the problem was Kharagpur to Bhubaneswar based on some numbers we get rupees 2 per ton kilometer is the cost based on some numbers you get rupees 2 per ton kilometer as the cost.

Now, take a situation that from Kharagpur you are getting Bhubaneshwar you can go to Khurda, you can go to Puri etc, etc. Now it is 2 per ton kilometer there is a return load from Puri, full return load. So, how much will it still is return charge? 2 rupees, anyway you considered that 250 working days in a year.

So, return load 2 rupees, what is the return load is only half the truck carrying capacity then what will happen to your charges? Instead of rupees 2 becomes 3. Instead of rupees 2 it becomes 3 because 2 rupees is the full truck charge and your truck is coming back half empty or half full. So, you add a 50 percent to the 2 rupees. So, whatever the percentage is you just keep on adding it. So, this is one aspect that we were trying to say.

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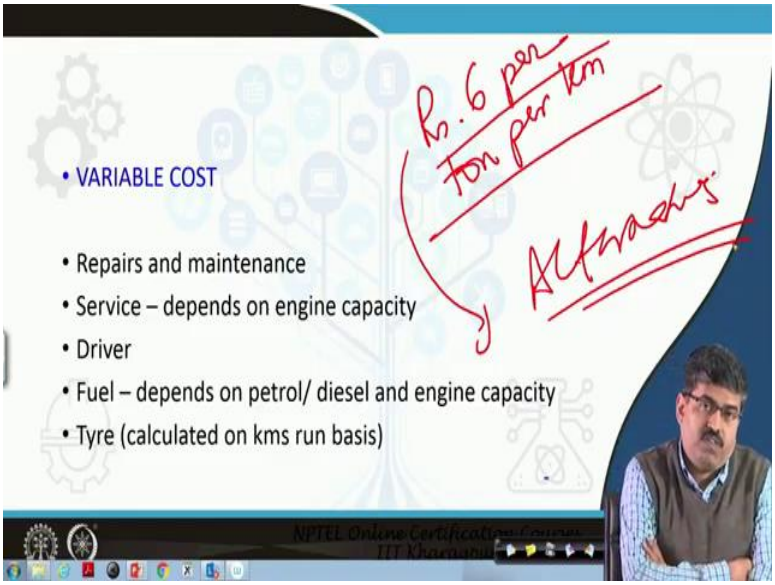

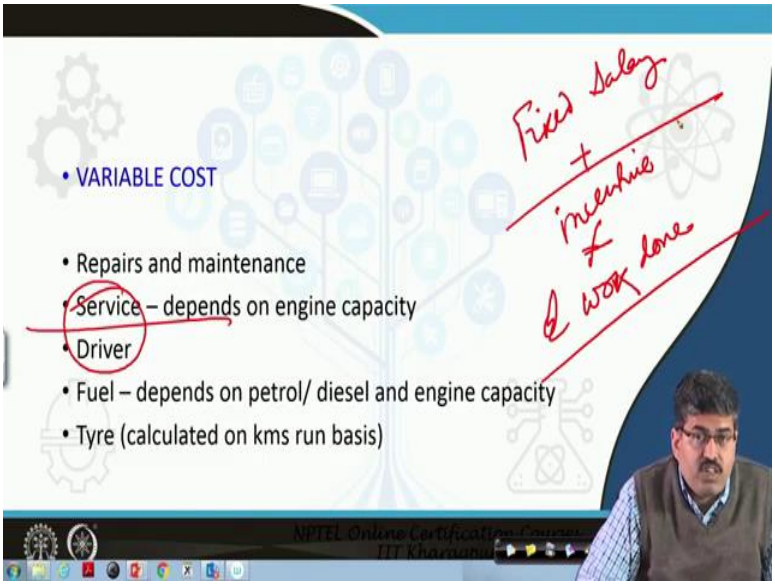

Now, the third aspect, this is a normal costing and assume that in that way your price has become, your price has become, your transport cost has become rupees 6 per ton per kilometer your transport cost has become 6 per ton per kilometer. You will have to find out alternatives that is how your entire transportation system are now taking a relook and rivers are becoming an important part of the transportation system. So, this is your variable cost dimensions.

Now, this is the commercial aspect, this is the commercial aspect. We will look at the other aspect of public transportation system that is fixing the fare of a public transport says these are for your goods, what about passengers that also needs modeling. How to set a passenger fare for bus services. So, that is something that you will have to also know and understand.

So, now what is the difference between a commercial bus fare tracking system and a public transport bus fare calculation system, see public, private bus, private vehicles, it is your money. But if it is a public transport it is whose money it is people's money. So somewhere down the line that you are answerable for public money that comes in.

So, pricing so companies do not want to increase fares that easily. So, pricing a public transport is also a major aspect in supply chain modeling and analytics. We seldom covered this, but this is very, very important because as we mentioned that as an analyst, your job is to analyze situations. Not just giving in some numbers and getting some output. Your analyzing situations will tell you exactly what to do. So, that public transport fare public transport fixation of fare is another aspect that we will have to look into.

Now, the next, the next the next. So, the next item is your service and driver. Driver, when this driver charges, driver charges is a very, very easy thing some companies pay a fixed salary. Some companies pay a fixed salary plus incentive and some companies say you pay based on your work done.

So, there are two, three versions of this driver salary. Honestly very careful which costing method you are using, which costing method you are using and how you are arriving at this particular cost of transport services of having a calculating driver salary.

Now service, service as we mentioned in the 6 Sigma this thing, if you want good service, fast speed, you pay more money, it depends on the engine capacity whatever, change the engine, do a fast service get more one. So, it need to balance you need to balance. So, this is part is your variable cost.

Now, if you can model these things, if you can take care of the return load, you are pretty much set for trans for pricing of transport goods. This one you can also this calculation mechanism you can also use for systems, when there is a tender bidding, If you know the costing, you can easily bid for a tender. So, that part also is there.

Now, with this what we will do is with this we will end this module and in the next module means in this lecture and in the next lecture we will pick up issues in public transportation system. How to fix fares in public transportation systems, thank you.