Operations Management
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Lecture – 11
Sales Forecasting

[FL] friends welcome to session 11 in our course on Operations Management. We have completed 2 weeks of discussion and currently we are starting the third week of discussion on the course. Till now, we know that what are the basic requirements, needs, scope, functions, objectives of operations management.

In first week, we have tried to cover the basics of operations management; we have seen that what are the different operations strategies? Why do we need to do management of operations? What benefits we derive out of operations management? And in week 2, we have focused on a very important aspect in which the government is also giving lot of focus these days; that is innovative product design.

In week 2, we have covered the product life cycle, we have covered the value engineering concept, we have covered the design for x concept, we have covered the ergonomic design, we have covered rapid prototyping.

So, basically we have tried to focus on those areas which help us to make a successful product design. Product design cannot be covered in a discussion of two and a half hours only it requires very elaborate discussion, but we have tried to equip our learners with tools and techniques which help engineers as well as researchers to come up with successful or efficient and effective products.

Now, once we know that our product is ready we have designed the product keeping in mind all the important aspects that can be covered during the product design stage everything, has been taken into a count and now the product is ready for full scale manufacturing. We have done the prototyping also we have seen that the prototype is functioning properly it is a working prototype or working model. So, we see that yes the product is now ready, what can be the next stage. We have a product we want to sell it in the market we have done all market analysis initially during the product development cycle only we know that these are the important markets we are targeting.

So, we have the market data available with us we have a product available with us. Now the question is how much we must produce? We have to forecast that how much products are what is the volume of the product? What is the number of the product? That can be sold, that can be manufactured and sold in the market.

Now, you can yourself imagine; if we start producing without a forecast we have no number in mind we are producing, producing and producing, but later on we feel that there is no market for the product. On the contrary, as soon as the product is launched in the market there is a we can say deluge there are people are rushing to buy our product, but we are not able to supply. Why? Because we have not forecasted properly, we thought we will be able to self may be 1 million in the world, but the demand is 3 million in the world; so, maybe we are lacking.

So, the forecast therefore, is very very important making a forecast some people say it is an art others believe; it is some science some people believe it is data analysis. So, different people look at forecasting in a different manner.

We have to see that how we can make a accurate forecast rather I must say that it is very difficult to make a very very precise and accurate forecast, but yes we can try to achieve the target, we can try to match the actual demand by the use of may be certain mathematical tools certain we can say the data that is already available with us.

So, based on the previous data based on the mathematical tools, based on the intelligent tools sometime; these days people use many artificial intelligence tools also for making a forecast. So, based on the scientific logic we can try to develop a forecast and forecast is very very important for any organisation, because as I have told you it is directly going to influence the success or failure of the organization.

Moreover it helps in the planning activity; the decision making activity of an organisation. One example that I usually give is that suppose a company is manufacturing cars; it is an automotive company which is manufacturing cars. Now if the company is forecasting may be 10000 cars per quarter, for 2018. Suppose the forecast for the year 2018 first quarter starting first January 2018 till 30 first March 2018 is 10000 cars. And this forecast is done in the month of September 2017, they can plan everything based on this magic number of 10000. How because they know 10000 cars will require

10 multiplied by 4 maybe; 40,000 tires because each car having 4 tires plus 1 in the reserve also.

So, they know that how many tires they need to procure, they know how many steering systems they need to procure, they have to take all these decisions and this number will help the company, help the operations in such a way that they can now decide that how many number of tires we have to order? How many number of steering systems we have to order? How many number of seat covers we have to order? So, accordingly the decision making process will be influenced by the forecast.

So, we know we also know that our work force can produce maybe 9000 cars in 1 quarter, but we see a huge increase may be a 10 percent increase from 9000 we are having a demand of 10000 in the first quarter. So, we need to have more number of people, more number of work force, which will help us to meet that target of 10000 cars. So, we have we can do manpower planning also, we can do material planning also, we can do our financial planning also based on the forecast.

So, it is basically going to help an organisation to make judicious decisions and to be successful and competitive in the market must I address here that all the time it is not possible to make a very accurate forecast, because if we see these days this is moun this is monsoon season most of the time we will see a forecast of rain only, but many times we see the mobile phone is showing that it is raining in your hometown, but actually it is quite sunny outside.

So, you see that the forecast is not matching properly similarly in operations management also in business environment also in various companies the forecast sometimes are not accurate and companies need to be dynamic in nature to adjust to this type of fluctuation in the demand in respect of the forecast. Forecast is maybe giving a number x plus the actual demand can be x plus minus delta x.

Now delta x is what we try to minimise we try to go to the target that is x as we can say accurately as precisely as possible, why I am emphasising on the concept of forecasting; because this week our focus is on forecasting only and once you are able to understand that what is the importance of forecasting why forecasting is important for any organisation then the tools and techniques that we are going to cover do not involve much mathematics or differentiation or integral calculus only it requires simple plus

minus type of mathematics just addition subtraction and we are able to make a forecast. So, the techniques are not that difficult to understand, but the importance of forecasting is important to digest important to understand that if we are making a forecast why we are making a forecast. And if we are able to make a successful forecast how it can help us in running or in managing the operations of our organisation.

So, with this background I am now switching to the presentation where we will try to understand the basic concept of sales forecasting and we will try to understand the concept of forecasting with the help of an example also.

So, let us quickly switch to our presentation sales forecasting this is a definition given by M. J. Moroney this is in a book on elements of production planning and control.

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So, is forecasting a black art. So, as I have told it is very difficult to make accurate forecast. So, this sentence completely explains or explains it clearly that forecasting can be we can say a failure also it is not always possible to make an accurate forecast. So, economic forecasting like weather forecasting in England is only valid for the next 6 hours beyond that it is a sheer guess work.

So, these days it is possible to accurately forecast the weather maybe for the next 2 days or next 3 days. Similarly M. J. Moroney says that economic forecasting is also maybe a forecast can be made fairly accurately if the duration is small or if it is for a week or 2

weeks' time only, but beyond that if it today say that after may be 2 years this technology in mobile phones will still hold good we are I think not true to ourselves we know that the technology is changing at a very fast pace. So, we cannot accurately predict that what is going to happen in the telecommunication market in the next 2 years.

So, it is difficult to forecast, but yes the expertise the experience the past data the technology know how people who have all these skills or this type of skills help us to make a forecast, which can be fairly accurate we cannot say it will be absolutely accurate.

But yes it can be fairly accurate people who are able to make accurate forecast are really precious for the organisation are really indispensable for the organisation, because such people are able to take the organisation to greater height because they have that we can say skills or skill set which can help them to make them accurate forecast. So, it is we can from this definition we can conclude that we di difficult to make a long term forecast.

Now, numbers of definitions are there for sales forecasting.

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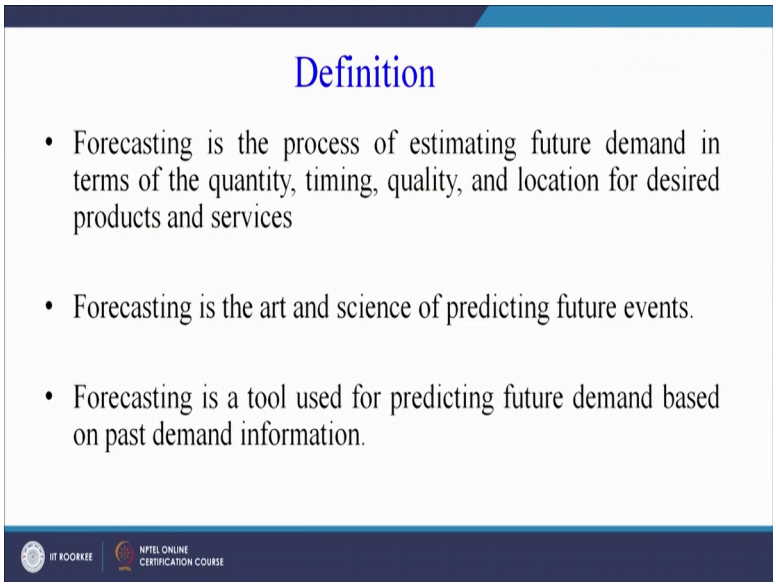

So, forecasting is the process currently this is the definition of forecasting. Forecasting is the process of estimating future demand in terms of quantity, timing, quality and location for desired products and services. Now here there are 3 things I will say first is

estimation the word estimation is there what we can estimate we can estimate the demand or the future demand. Second is in what terms many times people correlate forecasting with the numbers only number means that, this many number of cars will be sold, this many number of motorcycles will be sold, this much kilogram of soap will be sold or this much number of pizzas will be sold.

So, mostly people try to related with numbers, but it is forecasting is not only related to numbers only numbers will come in quantity. So, what we are forecasting we are forecasting the quantity we can also forecast the timing we can forecast that maybe a particular country will be able to reach to the mars in. So, many years or win by such and such year or we can become superpower by the end of this year or by the end of may be 10 years.

So, that is basically the timing. So, forecast not only has the quantity dimension only forecast also has the timing dimension we can forecast in terms of time also we can forecast in term of quality also. We can forecast in terms of location also sometimes we say that a highway is now going to be, we can say laid out in this particular area of the city. So, it is forecasted that in that location number of companies are going to come up. So, that is we can forecast in terms of location also what we are locate trying to forecast we are forecasting for products and services.

So, we are forecasting that how the products will change over a period of time how the services will change over a period of time. So, we are forecasting the nature of products and services. So, forecasting is the process of estimate the future we can say demand especially in case of demand forecasting in terms of quantity timing quality location for different products and services.

So, forecasting is a art and science of predicting the future events forecasting is a tool used for predicting future demand based on past demand information. So, we have some data that is already available with us and we make use of that data for making our future predictions. So, these are simple definitions of forecasting now a very important diagram on your screen.

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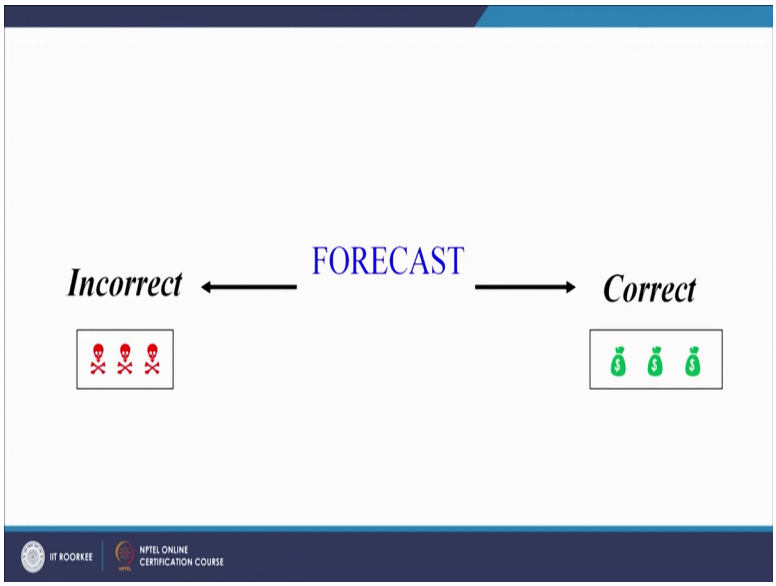

You can see if we go inaccurate if your forecast is not proper what will happen we will buy the raw material we will convert it into the final product and product will not be sold into the market what will happen the company will be at loss. On the other hand we have brought the materials we have converted the material into the final product and the product is successful in the market we will get lot of money.

Similar is the case in the entertainment industry also if we see none of the producers, will make a movie expecting that it will flop at the box office all the producers, will invest their money in order to make successful film which will on them profits, but many a times they are not able to gage the mood of the audiences and therefore, the movies generally flop and the flop movies what do the lead to they lead to loss is for the producers and the promoters.

So, that is also a case of forecasting only they are trying to forecast that this movie will definitely do good in the we can say entertainment industry, but many times the forecast are not correct. So, why sales forecasting is important by now I think all learners might have quite clearly understood that what is sales forecasting and what is the importance of sales forecasting, but again we will just read these points to reiterate the fact that I have already explained it is a key element of business decision making as I was already told.

That once you know that magic number or the volume or quantity of product to be produced based on that your other secondary decisions will be taken that as I have taken

the example of manufacturing of a car or assembly of a car we have seen that the number of car will be directly proportional to the number of tyres, that we need to order and that will help us in the materials planning it will help us in the planning of our schedule it will help us in the planning of our quality.

So, we can say that if we have the number we can do all the calculations and do our planning activity in a well-informed manner the planning active will not be based on assumptions it will based on the number and therefore, the planning activity will be more successful and effective as well as efficient.

So, once we have done the sales forecasting it will strongly influence the organisation strategy regarding it is future direction priorities and activities.

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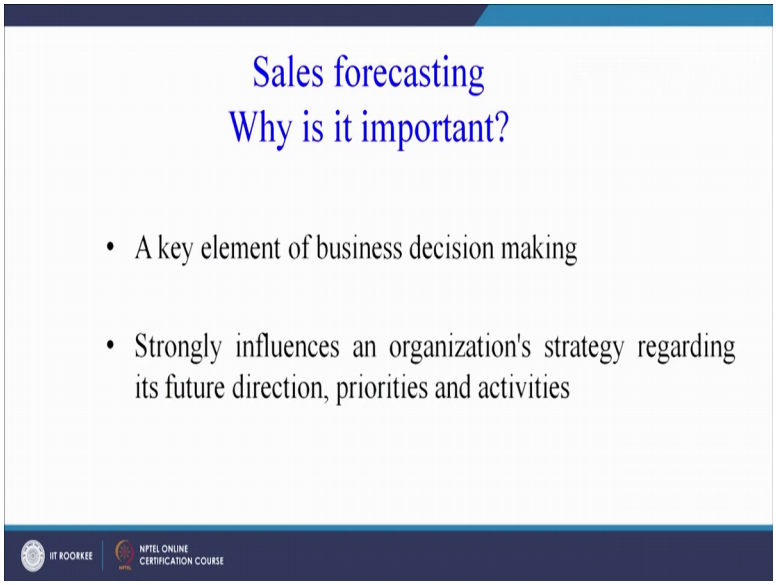

There is a famous saying that if you do not obsolete your product you will be obsoleted from the market. So, we have to always keep a tab on the performance of our product in the market and if it is not performing well we have to forecast that what is going to be our strategy or what is going to be the technology in the next 3 years or technological development in the next 3 years. So, that we are able to match up with our products we are also able to revamp our product that we are able to match the technological advances in the next 2 or 3 years.

So, the forecast will help us to see that how and where our priorities lie and how we can change our product in order to be competitive in the market. So, it will overall helps our help our operations strategy regarding the future direction priorities and activities. So, that number of the forecasting activities not just numbers, it will help us in the overall decision making regarding that organisation or overall management of the operations and the organisation.

Now, again I have already highlighted the need of forecasting with number of example quickly I will read these points.

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So, that you are able to understand and always remember that what is forecasting? And why it is required? So first point is lead times require that decisions be made in advance of uncertain events. So, we need to plan in advance that what is going to happen maybe in 2018 our planning activity must start in 2017.

So, that we are able to match up the demand that is going to be there in 2018 and in that planning we have to keep in mind the lead times also. Now what is lead time? Lead time basically we can say that, today if I order something I get it after 1 month. So, may be 1 month will be called as the lead time.

So, if I have decided or the company has decided that we have to come up with this particular software or this particular product by 31st March 2018, today we have to start

planning today we have to start forecasting that what type of inputs? What type of a sub-assemblies? What type of product? Or we can say parts, components will be used for this product and what will be the lead time when should we order. So, that we are able to come up with our final product on 31st March 2018. So, we have to start our planning activity may be 6 to 8 months in advance.

So, lead times will also be taken into account and forecasting will help us to take advantage of the lead times, as well as the planning activity related to the launch of the product forecasting is important for all strategic and planning decisions in a supply chain.

So, supply chain is something a may be a new word that has come in our discussion. So, basically we can say supply chain is right from the procurement of the raw material to the final, we can say delivery of the product to the customer the overall supply chain is or the overall chain is called as the supply chain.

So, here we see that in the overall supply chain starting from the procurement of the raw material, to the final delivery of the material, to the or the product to the customer; sales forecasting will help us in the decision making approach. Forecast of product, demand, materials, labour, financing are an important inputs to scheduling acquiring resources and determining the resource requirements.

Now, the third sentence on your screen is directly we can say the theory, but I have already explained with the help of an automotive example or a car manufacturing example. Now forecast of product demand what is this? This is the number that we have forecasted or the materials labour and finance are an important inputs. Now, once we know that our number is 10000 cars in the first quarter of 2018; that number will help us to schedule it we need to produce those 10000 cars in 3 months. So, we have to schedule our operations properly.

We have to acquire the resources as I have told the number of tires is directly proportional to the number of cars that, we have to produce we have to acquire the tires, we have to acquire the steering systems, we have to acquire the seats. So, that acquiring of resources also depends on that and finally, the resource requirements how many people will be required, who will be responsible for what. So, all these decisions depend upon the forecast. So, if we have done the forecasting properly our decisions will also be

informed decision they will be judicious decisions and the decisions that will lead to the success of an organisation.

So, as I have again and again reiterated that forecasting is a decision making process.

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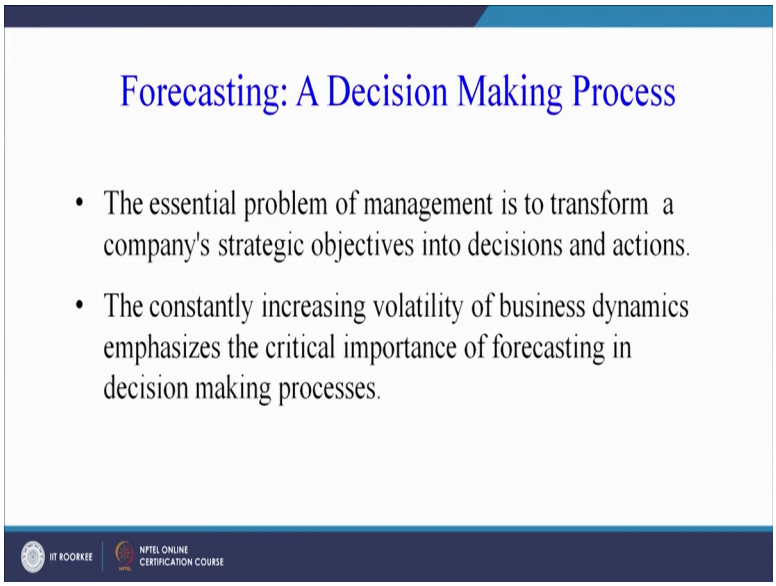

So, the essential problem of management is to transform a company's strategic objectives into decisions and actions the constantly increasing volatility of business emphasizes the critical importance of forecasting in decision making processes. So, whatever is written here is I already explained that the constantly increasing volatility of business dynamics.

So, these days the lead times are reducing the product development cycle are reducing time between the conceptualization of an idea to the launch of the product is also reducing. So, the business environment is quite volatile technology is changing every now and then and therefore, the importance of forecasting is very very very very high why, because if you are able to make a forecast accurately we know that may be after 6 month these technologies to change. So, we will plan our operations for the next 6 months only because we have forecasted that after 6 months the technology is going to change.

So, in today's scenario the importance of technology the importance of forecasting has become even more relevant then it was maybe 50 years from now 50 years or may be 80 years back a company has come up with a product they know that this product will be in

market maybe for the next 20 years, but no company maybe todays until unless it is a monopoly type of product can claim that their product will be successful or will be in the market for the next 20 years or 30 years because the things are changing so, quickly so fast. So, therefore, there is further you can say emphasis on accurate forecasting of the future demand or of the future activities.

Now, this is fairly simple it is given you can make a short term forecast, you can make a medium term forecast, you can make a long term forecast. So, short term is 0 to 3 months medium term 3 months to 2 years and long term 2 years and more.

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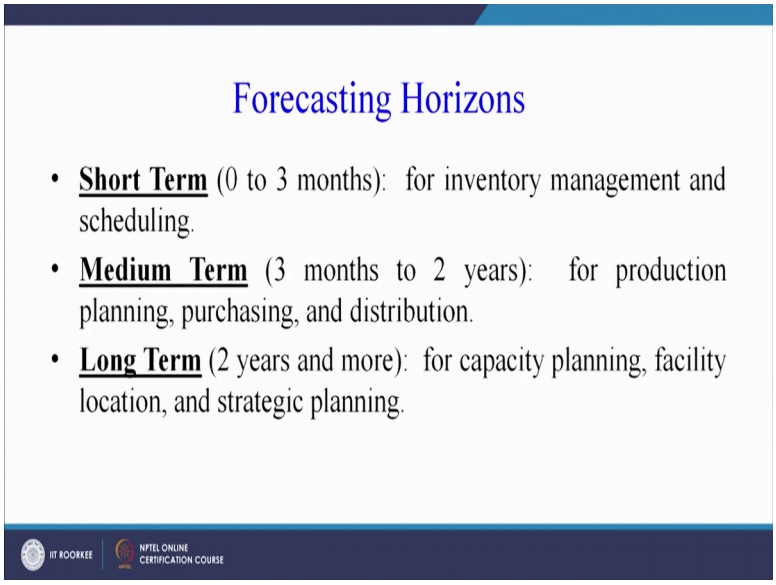

So, short term for inventory management and scheduling 0 to 3 months we know what will be the materials required who is going to work on what particular system. So, all that is under short term medium term for production planning purchasing and distribution may be we will make a completely yearly, plan for the purchase that in the financial year 2016 17 or 2017 18 what is going to be our purchasing procedure and how we are going to purchase. Finally, the distribution can also be covered in the media medium term planning, in long term for capacity planning facility location and strategic planning.

So, when we are talking of long term we will see how the technology is going to change, where all we can add the further facilities the further factories, where they should be located. So, all that what is the capacity how the demand is varying? So, if we have

forecasted a comp a large increase in the demand we also need to map it with our capacity, that if we do not have the capacity to meet that demand we need to build our capacity in order to in increase our manufacturing. So, that you are able to meet the demand.

So, they are these are the forecasting horizons we can make a short term forecast we can make a medium term forecast, we can make a long term forecast long term forecast are majorly strategic type of forecast and mostly they are done at the higher level or higher hierarchy in the organisational; structure may be at the CEO or the Vice President level and short term forecast are usually done on the shop floor by the engineers or the work or the foreman or the shift supervisors.

Now, what are the key issues in forecasting a forecast is only as good as the information included in the past data. We will see this that when we make a forecast what is the information that we take as input and what type of output we produce and how we do a forecast or what are the various methods of doing the forecast. So, there we will try to understand that the previous data is one of the most important source of information which helps us to make accurate forecast.

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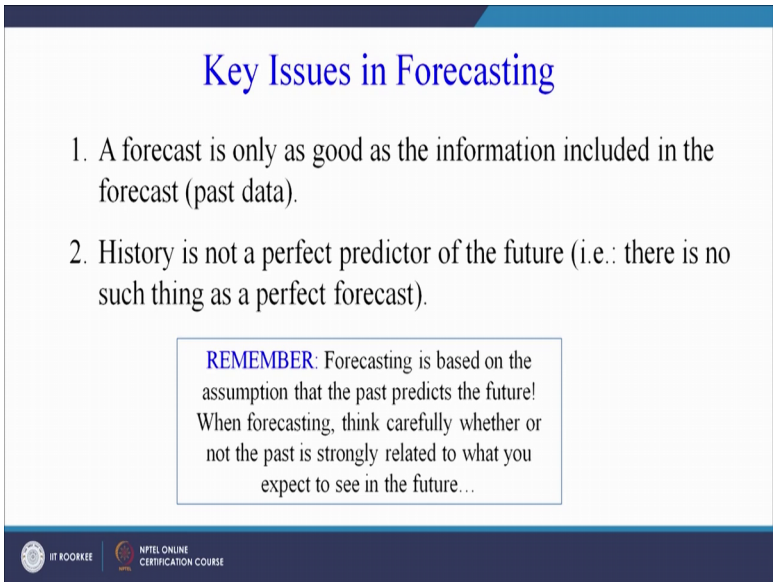

So, here we are relying too much on past data history is not a perfect predictor of the future that is there is no such thing as perfect forecast. So, may be many times we will see that the historical data is ambiguous it is not giving us any trend and therefore, we

cannot believe on that data to make a forecast. So, history is not a perfect predictor of a future. So, we must remember that forecasting is based on the assumption that the past predicts the future.

So, when forecasting think carefully whether or not the past data is strongly related to what you expect to see in future and their your intelligence your skills, your knowledge, your knowledge of the technology, your knowledge of technological advancements will come into picture in nutshell your knowledge of the market scenario will come into picture.

So, we have to see as engineer that what is the previous data, why this data is like this can we use this data to make a forecast for the next year or we need to do some tweaking this data in order to make a forecast for the coming years. So, there your expertise will come into picture it is not simply mathematics we will see that some of the techniques are purely mathematical in nature, add the things and make an average you get a forecast, but are these things really going to help us in today's scenario that we need to understand.

So, we have to see that what is past data whether it is relevant in today's context or we can use it for making a future forecast that is where our knowledge will come into picture as a forecasting expert.

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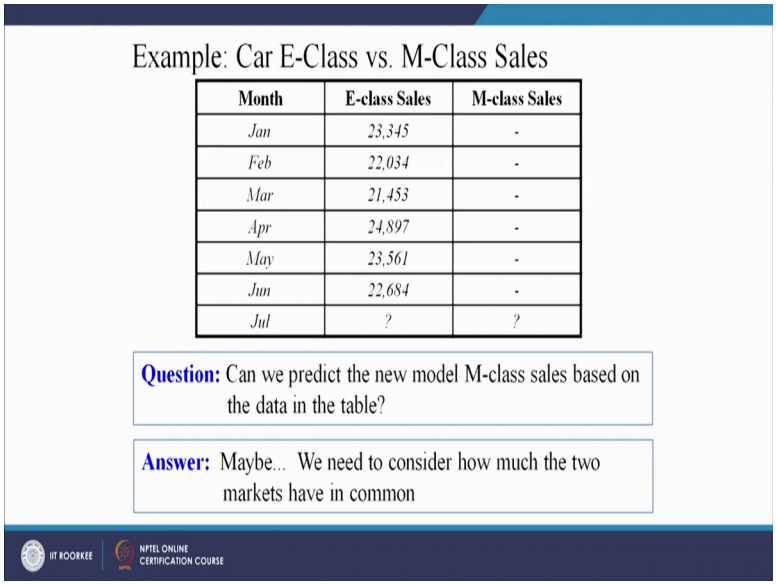

Let us take a very simple example. So, here you have a e class car and M-Class car. So, the monthly forecast is given January it is not the forecast sorry it is that actual demand that is given for January 23, 345 for June 22, 684. So, that complete demand data or the sales data is given we need to forecast for July for E-Class as well as we need to forecast for m class for which there is no previous data available maybe it has been launched by the end of June.

So, can we predict the new model M-Class sales based on the data in the table may be we need to consider how much the 2 markets have in common? Moreover we have to also understand that what is going to be the customer base for the 2 different class of cars. So, basically we cannot use data one particular product for other particular product or other specific product.

So, we have to may be very judicious in the selection of the data, we cannot directly copy this data and put it in the next column and make a forecast based on that data, because the terms and condition and the requirements are entirely different the market segment may be entirely different the type of customer the each car is focusing can also be different the age wise segment also may be different, area where the cars are to be sold may be different. So, we cannot directly take any data and use it for forecasting maybe in the same segment also.

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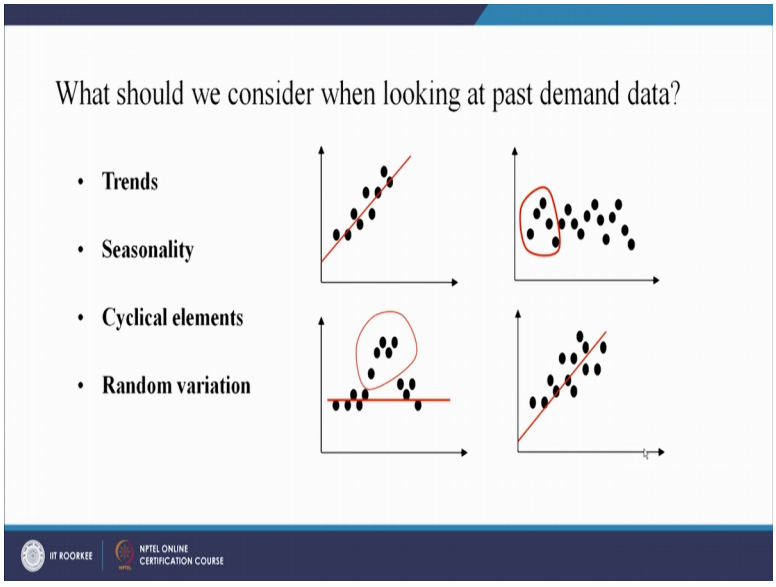

So, what should we consider when looking at the past data? So, we have to consider the trends. So, here we see that there is a trend all the data points sorry we have not mentioned the x and y coordinates here. So, x coordinate here is the time, y coordinate here is the sales. So, basically we are seeing that with time the sales are increasing and there is a increasing trend in the data.

So, this is you can see a seasonal we can see component here; the sales are increasing then decreasing, then increasing decreasing, increasing, decreasing. So, there is a trend component or the seasonal component here. So, may be these four data points; these four data points here represent 1 year. So, the third quarter of the year has the maximum value.

So, here we can see that there is a seasonality component in the data, there is a cyclic variation where we can see a cycle top value and then there can be random variation. So, it is not close to the trend line; so, there is a random variation we cannot classify this variation as a trend. So, it can be further random in nature; so, basically once we are looking at the data we have to be very very judicious. Now we have plotted the data and we have seen that we have to look for the trends; whether there is some trend in the data we have to look for the cyclic patterns in the data.

We have to look for the random variation there is no clear cut we can say distinction that it is increasing or decreasing or there is a cyclic patterns, we have to look for a seasonal pattern that every season or may be every quarter, there is some trend may be seasonality one example can be the sales of umbrellas.

So, you will see maybe in North India the monsoon season will be there from maybe in the month of July and August. So, we can see that in the third quarter of the year the sales of umbrellas are maximum for every year. And in first, second and fourth quarter the sales of umbrellas are less in northern part of the country.

So, here we have a seasonal component every year in the third quarter there is a jump in the sales. So, that we can say that this is seasonal components. So, basically in today's fashion, we have tried to understand that is sales forecasting is an important topic; it influences the operations management in many diverse ways; it helps in the strategic planning of the organisation and as a forecasting expert, we need to be very very

judicious and careful while selecting the data; based on which we are going to make a forecast.

In our next session we will focus on the inputs the outputs as well as the various methods that can be used for making a forecast, with this week come to the end of today session. So, we close today's session with a; we can say thought that in next session, we will cover the sales forecasting system.

Thank you.