Industrial Engineering
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Module - 04
Lecture - 04
Sales Forecasting – I

A very warm welcome to all of you, in the series of lectures on Industrial Engineering that we are discussing, so the topic of today is Sales Forecasting. We know that sales forecasting is one of the most important aspects of industrial engineering, on the basis of the forecast that are made by the sales forecasting team, the company takes a lot of other decisions. Like how to manage the inventory, what will be the amount of inventory that will be managed, then, when to place the orders for the inventory all these decisions are based on the forecast that how many products will be sold in the market.

For example, if a company forecast that it will able to sell 1000 product in 1 week, then on the basis of 1000 products, which the number is fixed that is 1000. The company will have to take decision that what will be the raw material at what stages the raw material will be required and the how the product manufacturing will be scheduled within the organization or on the shop floor. So, sales forecasting is one of the most important aspect, which helps us to plan our activities within the organization.

So, there are, so many different tools and techniques, different methods for forecasting, we will be discussing regarding the forecasting system, what are the different methods of forecasting, with the help of certain examples we will try to understand the various methods of sales forecasting. Then, we will see that how to judge the accuracy of the forecast that we have made or in nutshell I can say what are the performance measures of sales forecasting methods. So, all that we are going to cover in 2 lectures, that is sales forecasting one and sales forecasting two.

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So, right now to start with I will just put one a question across to you, that is, is forecasting a black art, many of the researchers have found out and they have proposed that it is very, very difficult to arrive at a particular figure. Figure means the amount of product or the quantity of product or the volume of product that will be sold in the market.

So, it is very, very difficult we can say it is like a crystal ball that we are rubbing our hand on that and then we are seen that how many products are what is going to be the future, it is like foretelling future that what is going to be the future activity of that particular product or that particular organization. So, I can say that yes forecasting is a black art, but with the present day scenario when we have, so much of historical data available with us.

We have the trends that how similar products have fared in the last 2 years or last 5 years on the basis of that historical data, that economic data, that market scenario that is available with us. We can try to forecast or foretell the future for a similar product in near future, that what is going to happen to a particular product, if it is launched today. On the basis of the data and the information, that is available with us for the past products or for the information related to the past of the products, which are similar in nature to our product.

So, we can say that although it is very, very difficult to foretell the future, but with the help of a very concise information, we can reach to a estimate which will be able to tell us, that this is going to be the sales or this is going be the demand for this product. Although, with certain degree of accuracy may be plus minus 5 percent plus minus 10 percent, but nobody can say that he can be 100 percent accurate related to the future of a particular product, that how much quantity or volume of that particular product will be sold in the market.

Similarly, M. J. Moroney he has once said that economic forecasting, like whether forecasting in England, is only valid for the next 6 hours or so. Beyond that it is sheer guess work, so what we can say or what we can understand from this particular saying of such famous statistician M. J. Moroney is that we cannot have a long term forecasting, that what is going to happen may be after 3 years or after 5 years although the forecasting methods, that we have those can be used for short term.

Similarly, like economic forecasting here it is shown, that it is similar to the sales forecasting, but the forecasting is valid only for a very small period of time. So, like whether forecasting in England, so we can predict that what is going to happen in the next 6 hours, but we cannot tell that what is going to happen after 3 years or after 2 year. So, long term forecasting is difficult, short term forecasting can although be made with the certain degree of accuracy.

So, from this slide we can conclude that it though it is difficult to forecast the events, but still with the help certain tools and techniques we may be able achieve to a particular estimate, which may be very close to the actual sales or actual demand.

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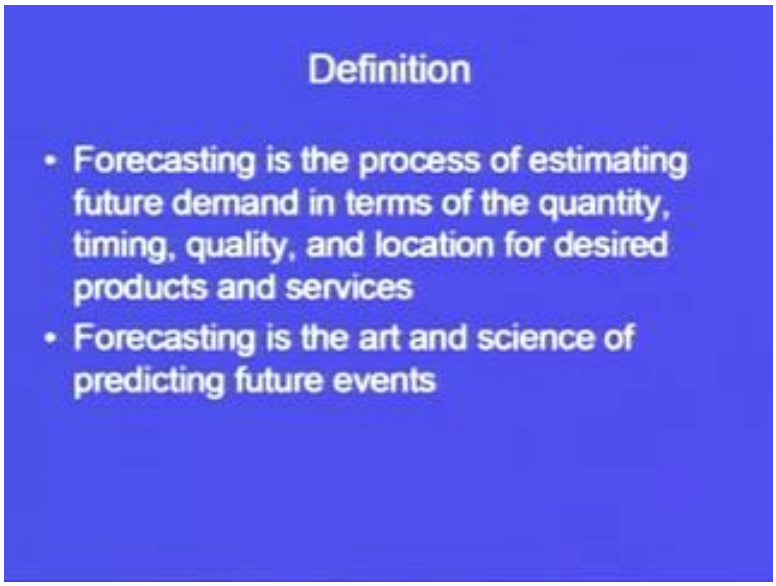

Now, let us come to the definition of sales forecasting, forecasting is the process of estimating future demand in terms of the quantity, quantity I have been using quite often now, timing, quality and location for desired products and services. So, we will be able to forecast that what will be the amount of product sold in particular region or in particular area and we can also see that what will be the quality that will be the desired by the customer.

So, in a way what we are doing is we are foretelling the future, that what is going to happen in future. Similarly, there is another definition which is very, very simply forecasting is the art and science of predicting future event, so events can be in terms of location, in terms of quantity, in terms of quality or in terms of services. So, forecasting is the art and science of predicting future event, so it can be termed as art also, it can be termed as science also somewhere we will be very subjective in our judgment and in some cases we will be very, very objective in our judgment.

So, it can be both art as well as the science, so basically from the definitions we can understand, that forecasting is and technique or a tool foretelling the future. So, forecasting is the process of estimating future demand in terms of quantity, timing, quality and location for desired products and services. So, this definition why I am repeating again and again, so that you can understand that it is something which is related to predicting the future events.

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Now, let us come to the importance of the forecast, on your screen you can see that we are making a forecast. Now, suppose this forecast is related to the amount or the volume, a company forecasts that it will be able to launch 1000 products or 1000 different category of products in the market. And for each product they have a certain guess that they will be able to say sell this particular product in this much quantity, you can for yourself imagine how difficult is the problems, so many different types of product.

And for each product they are guessing that, they are forecasting that, they will be able to acquire this much percentage of the market share or in very plain language I can say that for each product they estimate that, they will be able to sell may be x 1 quantity for product one, x 2 quantity for product three x 3 quantity for product three. Similarly, for each and every product, they were going to make a forecast, so if the forecast turns out to be inaccurate, then it will be very, very dangerous for the organization.

Whereas, if the forecast turns out to be correct, then there will be huge amount of profit for the organization, we can also understand it with the example of a single product. Suppose, an organization that is an automobile company, they forecast that, they are launching a new vehicle in the market and they will be able to sell 5000 vehicles in one particular year, now 5000 is the forecast based on certain techniques and tools.

So, if they are able to sell 5000 vehicles in the market or close to 5000 vehicles in the market, their estimate is correct and they are going to make lot of profit. But, if instead

of 5000 they are only able to sell 1000 vehicles, then they are going to incur huge losses. So, what does a correct forecast helps the company to achieve is a huge amount of profit and a wrong forecast or incorrect forecast will result into huge amount of losses.

So, each and every company, each and every enterprise, each and every organization has this tendency to make huge amount of profit. So, from here we can understand that forecasting is very, very important for each and every company, we will now in the further slide try to understand that what is the need of forecasting.

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Sales forecasting and why is it important, it is a key elements of business decision making, on your screen you can see, this is key element. Now, what type of decisions we make as I started the lecture with the very simple example, like a company decides on a particular volume, that this is the forecast for the next year. They can do the back tracking that what type of activities have to be done, if we have to achieve this target of 1000 components in the next financial year or next calendar year.

So, 1000 is the figure and on the basis of that figure all the other calculations will be done. In case of materials requirement planning, the master production schedule will be helping us to draw a clear line that in this week of this particular month, this will be the demand or this will be the requirement of the final product. And for that product, then we take a decision that this will be the subassemblies or parts or components or the material that will be required to meet this demand.

So, sales forecast act as input to the master production schedule, which further acts as a input to the materials requirement planning system. So, sales forecast is very, very important and it helps the organization to take key business decisions, these decisions can be related to scheduling of the operations, this can be related to the procurement of the material, this can be related to the management of the inventory and so many other decisions related to financial and service sector.

Similarly, forecasting strongly influences an organization strategy regarding it is future direction priorities and activities. For example, if forecast is very, very poor on the basis of certain tools, we identify or on the basis of certain information, we identify that this particular product is not going to sell in the market, may be in the next financial year. Then, we have to take a decision as a company that should we continue with the same product or should we change this product and launch a new product or slightly enhanced version of the same product.

So, that we are able to acquire the market share, so that is very, very important from the companies perspective point of view. Otherwise, the company may lose the market share and it will become very difficult for the company to again establish the maker share. So, the key decisions or the future direction of the company is also gauged by the sales forecasting, that once we identify the number and if the number is less than the company can plan the direction, which it is going to adopt in near future.

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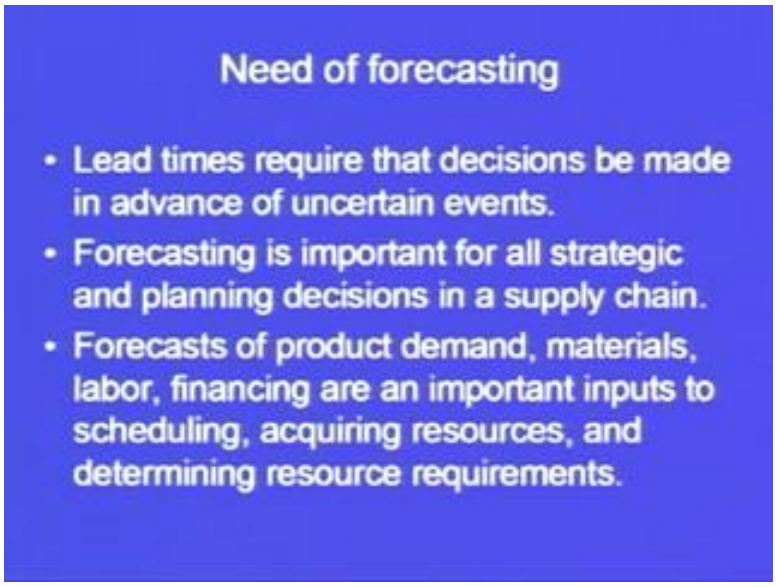

Need for forecasting continuing on to the importance of forecasting, lead times require that decisions be made in advance of uncertain events. So, what happens sometime the demand changes, so there is we cannot directly adopt to that change in the demand, there is always either there will be the continuous demand or there will be a lumpy demand. Lumpy demand means, that sometime there is hung amount of demand, the other time the demand is considerably less.

So, what happens basically is that whenever there is a change in the demand, the whole system has to adopt properly. So, the adoptability is not instantaneous the adoptability will take some time, so there are lead time suppose there is a very huge demand for a particular product in the market. What will be the company do, the company will say yes we are ready to meet the demand of the market.

Now, in their organization or their in their enterprise they will manufacture that product and they will sell it in the market. For manufacturing they require the raw materials and if the adequate amount of raw materials are not available with the organization, they will have to start the procurement process. So, from the ordering to the receiving of the raw materials, there will be a lead time, so these lead times often result in delays in the material that where are the product that we are supplying to the market.

So, this lead times require that decisions be made in advance of uncertain event, so we should be prepared for all these uncertain events or changes in demand in the market. So, whenever there is a change in demand in the market, we showed be able to adopt to it, so if they have the sales forecast already available with us, that we are going to sell x amount of products in the market, in the coming year we will always be ready with the kind of inventory, the kind of subassemblies, the kind of components, that are require to make 1000 products or x amount of product.

So, lead times although require that decisions be made in advance of uncertain events, so uncertain events in my example are the changes in the demand in the market. Forecasting is also important for all strategic and planning decisions in a supply chain, so all the strategic and planning decisions already I have told now, strategic decisions basically is changing the engineering design or the changing the design of the product, which is not doing very well in the market.

So, that is strategic decision how we will be able to take a decision such like this that I am discussing, we will be able to take such a decision, when we know that this product is not going to sell in the next year or the demand for this product is going to decrease in the coming year. So, we take decision that yes the demand is going to decrease let us take a strategic decision, that change this product by a new product or modify this product. So, that we are able to sustain the demand, which was there for this product in this particular year.

So, next year also we want to keep the same demand or we want to increase the demand in the market. So, that kind of strategic decisions only we will be able to take, if we have a very accurate sales forecasting system in practice, then forecasts of product demand, material, labor, financing are an important inputs to scheduling, acquiring resources, and determining resource requirement. So, this point already I have explain through a number of examples that if we have a particular volume or if we have particular number on the basis of which we are doing the planning, then our planning will be much, much, much, much better.

We know that we are going to sell this much in the market or this is the demand in the market for the next year, we can plan all our resources whatever is mentioned on your screen. So, that there is no breakup or there is no hindrance or there is no breakdown, in the smooth flow of the manufacturing process, so why these things will happen, if we are not ready to adopt to that kind of scenario where we have not forecasted, that this is going to be the exact amount of product, that is going to be the sold in the market.

So, if we know this is the amount we can plan our things accordingly, if we do not know what is going to be the sales, then all the things all the decisions will be taken in a very haphazard manner our planning will not be correct. And sometimes it may, so happen that we are not going to meet the demand of the customers and what is going to be the consequence of such a scenario is that a customer will switch over to our competitors.

So, the competitors will be able to perform better than our company, if we do not have accurate forecast. But, if we have accurate forecast the manufacturing will be very, very smooth, there will be no breakdowns or there will be no shut ups, why because we are always ready, we have always identified, we have already seen that, this is going to be

the product, number of products or this is going to be the volume that we are going to sell in the market.

And on the basis of that figure we are going to do all our planning, so all these things is the identify and all these things estimate that it is very, very important to have a very good sales forecasting system. Now, it is a decision making process, although we have discussed all these things in detail, but just I will read out what is there on your screen.

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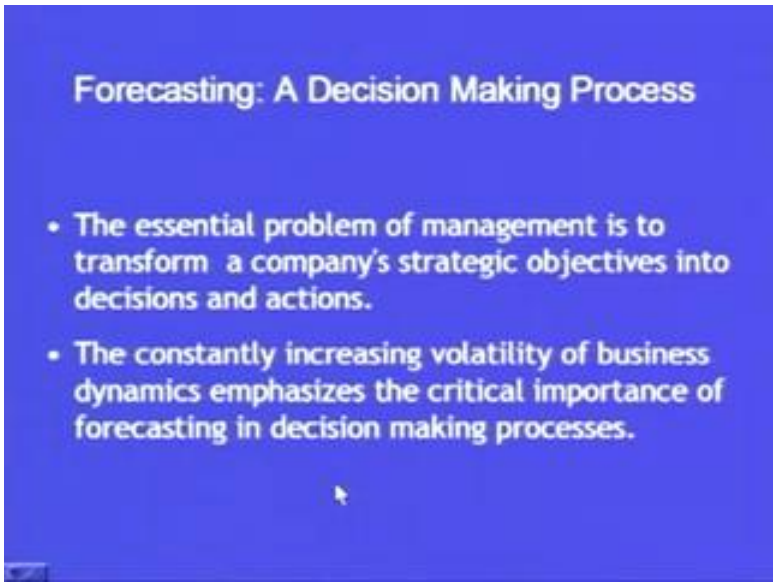

The essential problem of management is to transform a company's strategic objectives into decisions and action. So, sales forecasting is going to help us in this type of strategic formulation and taking decisions and actions accordingly, the constantly increase volatility of business dynamics emphasizes the critically importance of forecasting in decision making process. So, in today scenario we can see that the demand is always changing, every now and then new and new products are coming to the market, enhance products are coming to the market and the business environment is very, very competitive.

So, the forecasting plays a very important role for a company to identify it is strategic future direction. So, forecasting till now we have seen we have identified that it is very, very important, why it is important we have seen with the help, so many different examples that I have given in the course of this lecture. Now, forecasting horizons we can have three types of forecasting horizons, which have been identified in the text.

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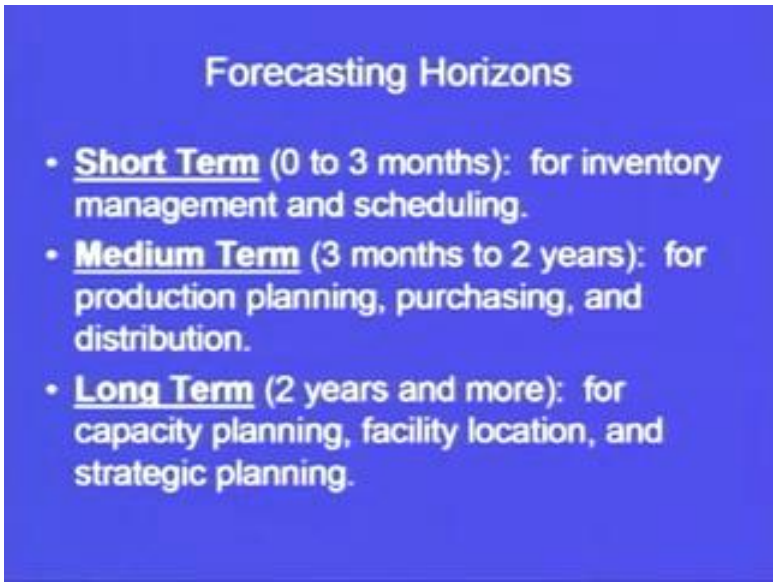

Short term that is 0 to 3 months and this type forecasting is usually done for inventory management and scheduling. So, we will see that how to manage the inventory, what will be the materials requirement and how to schedule the operations or how to schedule procurement process. So, short term forecasting is usually done for inventory management and scheduling, then there is a medium term forecasting, that is 3 months to 2 years.

This is for production planning, purchasing and distribution, similarly we can have a long term planning, that is 2 years and above and that is for capacity planning, facility location and strategic planning. So, from this slide we can see that for day today planning, day today action in the shop floor, short term forecasting is used and for the long term or for the future direction of the organization or the enterprise. Long term planning is there, that is the strategic planning in place the capacity building or the facility location.

Now, suppose organization is having one manufacturing plant, it foresees, it forecast that the product is doing is very well in the market and it is further going to increase it is market share in the market. So, the company sees that, we are having one manufacturing plant, we should increase our manufacturing capability, so they think of putting up another plant. So, where to place this plant, in which area of the country or in which

country of the world this plant should be located, that kind of long term decisions or strategic decisions will fall under the category of long term forecasting.

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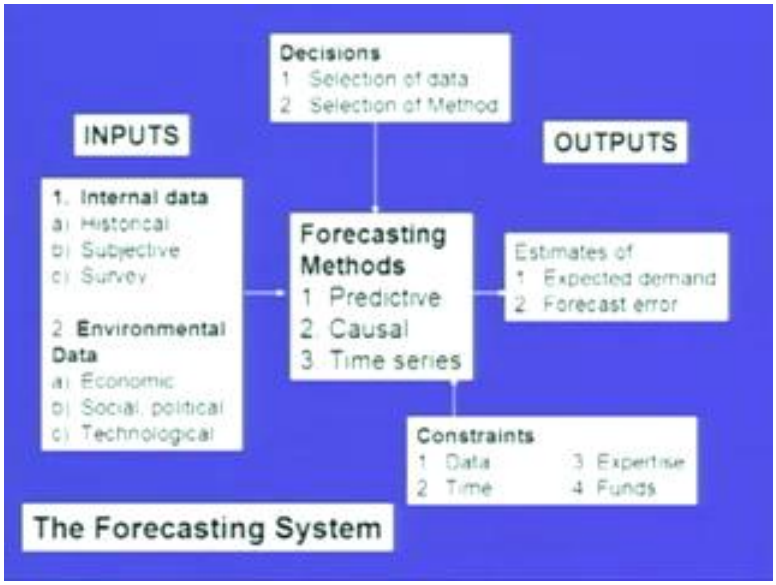

Now, on your screen there is a very, very important diagram that is depicting the forecasting system. Now, forecasting system basically will work in the way it is shown on your screen, there will be certain inputs and there will be certain outputs. So, you can see the inputs, the input basically to a forecasting system is the information, already I have told in the course of this lecture, that it is the past data it is the information, it is the history of the products or the similar products, that we are going to launch in the market or the type of forecasting, that we are going to do it depends on the information, available for similar type of products or services or materials.

So, the inputs basically to a forecasting system are the internal data, that is the historical data I have already told, that can be for this product for which we want to forecast or for similar type of product or for the competitors products. So, we need to have information related to the historical data, then we need to have certain subjectivity, now subjectivity means that some intuition, some sixth sense that guess according to the economic condition of the country or economic condition of the world, this is going to happen in the next year, whether it is going to be a recession or it is going to be boom time.

So, depending upon the subjectivity or the sixth sense of the forecaster or of the organization or the people who are dominating the forecasting process, we will have a

certain degree of forecast. So, inputs are historical subjectivity or the subjective data, then we can have survey, a survey basically is we will see each one of these in a little bit of more detail, but just to outline the forecasting system how it works, I am explaining all these points in a little bit more detail as they are mentioned on the screen.

Now, survey basically means that you have a market survey, you have a market research, that what the customer wants and that can be used to transform into a sales forecast. Similarly, the environmental data already I have mentioned this thing, that what is going to be the economic condition in the next year, whether the all the products are going to see of increasing the demand or there will be a decrease in the demand, what is going to be the economic condition in the next year or the next 5 years, that is the environmental data which is needed to make a very accurate forecast.

Then, the social and political scenario that is also very, very important and last one is what is the technological data available with us… Now, suppose we are working on one particular product, but our competitors have already launched the product, which is better in technology as compare to the product that we are developing. So, we cannot say that this is going to be having niche market or this is going to be our product is going to be a product, which is the only product that is available in the market at that technology level or we cannot expect a monopolistic type of market for our product.

If our competitor has already come up with the product, which is better in technology as compared to our product. So, that type of data is also required, that what it the technology that is prevalent in the market, so this type of information if we have, that is internal data and environmental data. So, is this information will act as a input to the forecasting system, now forecasting methods this can be divided into three different broad categories.

So, these three different categories we will see in much more detail, we will see each one of these and then we will try to identify, that how these work. But, for now we can see that there are three broad categories or three basic categories, which are predictive methods, causal methods and time series method. So, these three methods have their own advantages and limitations, and depending upon the kind of data that is or the kind of information that is available with the us, in terms of internal data and environmental data any of these will be chosen.

So, what type of decisions a forecasting team have to take, three type of methods are usually available, now these three are the broad categories. Now, within these three also there are, so many other types of methods, so many other types of tools and techniques that are usually available. So, the decisions that need to be taken is the selection of the data, this is the selection of the data on your screen you can see and the selection of the method.

Now, out of these methods we have to select a particular category, suppose we say we are going to have predictive or subjective methods only. We do not have very good historical data available with us or the kind of product that we are going to launch in the market is completely new, there is no similar product available in the market. So, that we can use the data of that particular product in forecasting, the sales for this particular product, that we are going to launch in the market.

So, depending upon the kind of data available and depending upon the type of resources and the type of expertise, that is available with us, we have to take a decision that which type of the method we are going to use for sales forecasting. So, we have certain inputs and we have to take certain decisions, now these decisions will help us to identify a particular method, which we are going to use in order to predict the sales or in order to do the sales forecasting.

Similarly, for a forecasting system to work properly, we have certain constrains also what are these constrains, the constrains basically are as I have already told that is the data. Sometimes, no data may be available with us, then there is the expertise sometimes there are certain tools and techniques available, even there are certain software's available in which we can directly input the data. Whatever is available with us and on the basis of method or the technique that we choose the software will be able to provide us the figure, that can be used as a sales forecast or it is going to provide us an estimate that we can use.

But, in order to use that type of a software or in order to use that type of tool and technique, we need to have certain degree of expertise. So, if that expertise is not available, then the forecasting system cannot be thought of working properly or we are not doing the exact forecast for that particular product.

So, the constrains basically two already I have discussed, that is data and the expertise, the third one is the time that sometimes a company wants that now the product is ready, we want to do it as quickly as possible, we want to launch the product in the market as quickly as possible and we do not have time to carry out of full flashed forecasting, system out of carry out of full flashed forecasting program.

So, what do they do, they want the time is less what type of method should be used, so that is also a constrain there are also certain methods in the forecasting methods like predictive, which are used whenever the time is less. Whenever, we have ample amount of time available with us, we may choose a different method, which may be more accurate. And in certain case where the time is a constraint, we may select the particular method, which requires less amount of time.

Moreover the last constrained to in forecasting system or to a forecasting system or the funds. The funds are also an constrained, sometimes the company takes a decision that yes we want to forecast sales, but the funds are not available, so funds sometime are the constrained. But, if we have seen that if we have very accurate forecast in place, we make a lot for profit, so even if we spend small amount of money in forecasting, the results that we get at a later stage are very, very encouraging and we are if the even yes the important point to mention here is, that if the forecasts are accurate.

If we are spending some money or forecasting and the forecasts are accurate we make a lot of money or we save a lot of money for the company. So, there are certain constrains, there are certain inputs and there are certain decisions that we have to take, so these three things, like the decisions, the inputs as well as the constrains that will be used a forecasting method and then we get certain outputs. So, the outputs basically are the estimates of the expected demand or the sales, what is going to be the sales of a particular or what are going to be the sales of a particular component or a product in the market.

And also we calculate the forecast error, error basically is that what has been predicted and what actually has taken place. So, the difference between the two is going to tell us that what was the forecasting error or what was the forecast error, so we have seen in brief, if we summarize this forecasting system, that on the basis of the certain information, certain data, the forecasting methods use this particular type of data and

they take certain decision, that which type of method has to be used, working under a certain degree of constraints, the system is able to predict or give an estimate of the expected demand or sales.

Although with the certain degree of accuracy, now the accuracy may be 90 percent, 95 percent or sometimes 100 percent also. But, it is very, very difficult to be 100 percent accurate as already in the start of the lectures I have in this particular lecture, I have told forecasting is a black art. So, nobody can be confident that I will be able to predict the future events correctly, although we can predict, but with the certain degree of accuracy.

So, this is a brief summary of this forecasting system, that there is on your screen, now in subsequent slides we will see, that what type of forecasting methods are used. So, input everyone might have understood that on the basis of historical subjective or survey or environmental political economic, all this information whenever this is available with us, we take a decision that this type of method we are going to use and then we generate the estimate of the demand.

So, now the important thing as an engineer or as a manager is to know the forecasting methods, that although the information is available with us which method we should use and how the different methods work and what are the relative advantages and disadvantages of these methods. So, if the data is available, we know the tools and techniques, we will be very easily able to estimate the demand and very accurately also. So, we need to minimize the error and increase the accuracy of our forecasting system, now coming on to the methods, there are basically two categories of forecasting method.

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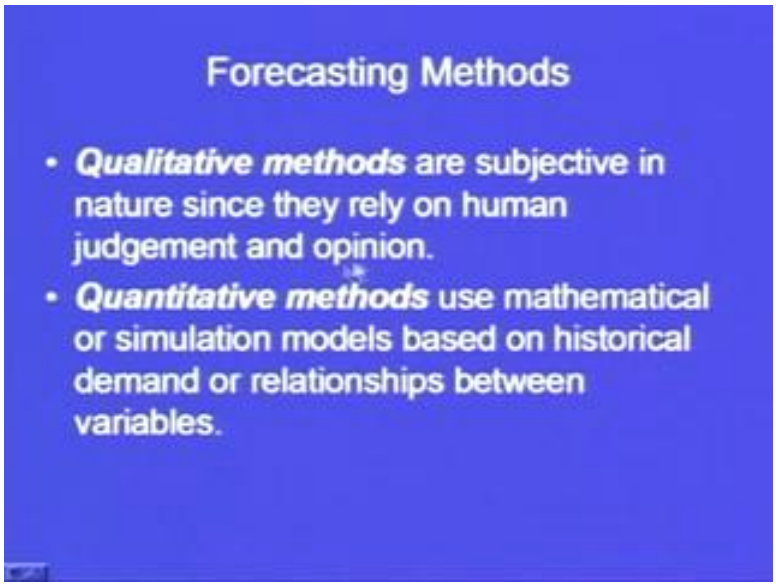

Now, what are these two categories, these are the qualitative methods, now qualitative methods are subjective in nature since they rely on human judgment and opinion. Now, the basis of human judgment or opinion sometimes we see that on my according to my sixth sense, I believe that next year is going to be a very big year for this particular product or we say for example, that the sixty pay commission is coming for the in the automobile sector or in the construction industry or in the infrastructure industry, there is going to be the boom in the next year.

So, according to some subjective judgment of the forecaster, we are able to predict that yes, this is going to be the scenario in next year. So, certain degree of subjectivity is attached to the qualitative method, on the contrary there are quantitative methods which are more objective in nature. So, quantitative methods they use mathematical or simulation models, based on historical demand or relationships between variables, so there are different methods that fall under the category of quantitative methods, that we are going to see in the subsequent slides.

But, here we need to understand, that in a forecasting system on the basis of certain input, these methods are going to operate on the basis of that information and are going to give us the output in terms of the sales forecast. So, these methods we need to understand and learn that how these methods are going to help us and how these method have to be used in order to generate a particular volume or a particular figure or a

particular amount, that we are saying as the sales forecaster, this is the amount that is going to be the forecast for the next year or for the next 5 years or for the next 6 months. So, there are these two methods and these as methods we are going to see in the subsequent slide the further categorization of these methods.

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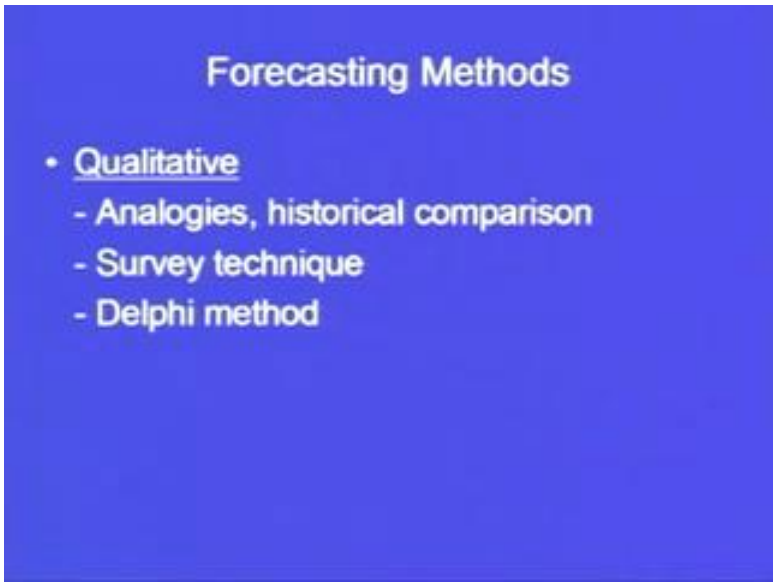

Now, qualitative methods let first come to the qualitative method, now qualitative methods are analogies on the basis of analogy with the similar type of product we are able to make judgment, that this is going to be the sales for this particular product or the historical comparisons. So, historical comparison basically are that what happened in the past, may be same things is going to happen or same things are going to happen in the near future or in the next year or may be in the 5 years.

So, on the basis of analogies or on the basis of historical comparisons, we forecast that this is going to happen or we foretell the future. Similarly, the second method is the survey technique, in survey technique we are going to estimate the sales or the demand for the next year on the basis of certain data, that we will collect from the market or from the salesman or from the regional office, that we are going to see in the subsequent slide, that what are the various steps that are followed in the survey technique.

Then, there is a third type of method that falls under the qualitative method of sales forecasting. And that is Delphi method, in Delphi method also we are using the subjective judgment of certain experts, who are going to guide us in order to arrive at a

particular forecast. So, these are the qualitative methods of forecasting, similarly there are quantitative methods of forecasting.

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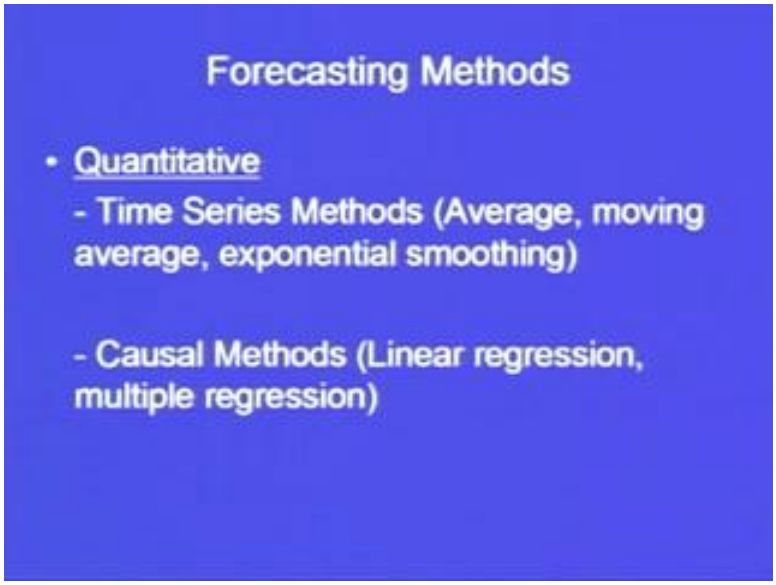

Now, what are these quantitative method, these are time series methods, like average, moving average, exponential smoothing all these methods we are going to cover one by one, in the series of this lectures on sales forecasting. But, here just to give you a brief introduction, what is time series we have the data for the last say an year on the basis of that data we are going to predict or we are going to extrapolate for the next year.

We are going to see that this data is already available with us and how we can use this data in order to predict for the next year or in order to foretell for the next year or in order to arrive at a particular figure for the next year. So, time series methods are there, then there are causal methods, causal methods are like linear regression, multiple regression. Now, this forecast or the figure that we want to arrive or the amount of product that will be sold in the market, that we want to foretell or forecast.

Now, this particular amount of figure is dependent upon a number of variables, now there can be a mathematical formulation, in which all these factors are used as the variables. And all these variables will help us to predict or to arrive at a particular figure or a particular number, that this is going to be the sales for the next year. So, in order to incorporate all these variables into a form of a simple equation, we may use linear regression and we may use multiple regression as well.

So, we have seen that broadly we can categorize the forecasting methods into predictive causal, time series methods out of this we have a qualitative and quantitative methods, in qualitative we have the survey technique, we have the Delphi method. And in quantitative methods we have time series methods and causal methods I would like to once again summarize the forecasting method. So, that we have a very clear knowledge, that how to categorize the method two method, two types of broad categories are there quantitative and quantitative.

In quantitative we have subjective or predictive methods and in qualitative we have objective methods and in quantitative further categorization can be in terms of time series methods and causal methods. So, by now I think all of you might have understood, that what are the forecasting methods available with the forecaster or with the company to arrive at a particular number for doing the sales forecasting. Now, we will see what is qualitative or subjective or what is the basic mechanism of qualitative or subjective method?

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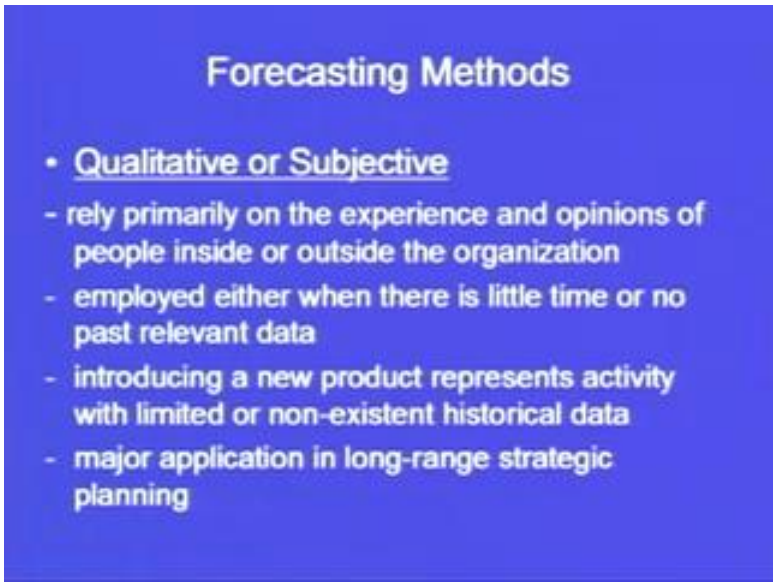

These rely primarily on the experience and opinions of people inside or outside the organization. So, this already I have explained, that what is the qualitative or subjective method, that here this will depend upon the opinion and experience of the people, within the organization or outside the organization. Similarly, they are employed either when there is little time or no past relevant data, so where we are going use these qualitative

methods, we are going to use these qualitative methods, in places where we do not have any historical data available with us.

Moreover, the time constraint is there, if you remember the forecasting system we had four constraints and out of which of time was one of the most important constraints. So, whenever the time is limited we may go for qualitative or subjective methods, similarly whenever we are introducing a new product, it represents an activity when limited or nonexistent historical data. For example, we want to launch a electric car in the market, we may not have a relevant historical data available for similar type of products launched in the market.

So, wherever the relevant historical data is not available, qualitative or subjective methods are used. Similarly, major application is in long ranges strategic planning, now long ranges strategic planning comes from the three horizons or forecasting, may be short term, medium term and long term. So, whenever long term planning or strategic planning has to be done, there these qualitative or subjective methods are used, so here we are basically trying to understand the importance of qualitative or subjective methods.

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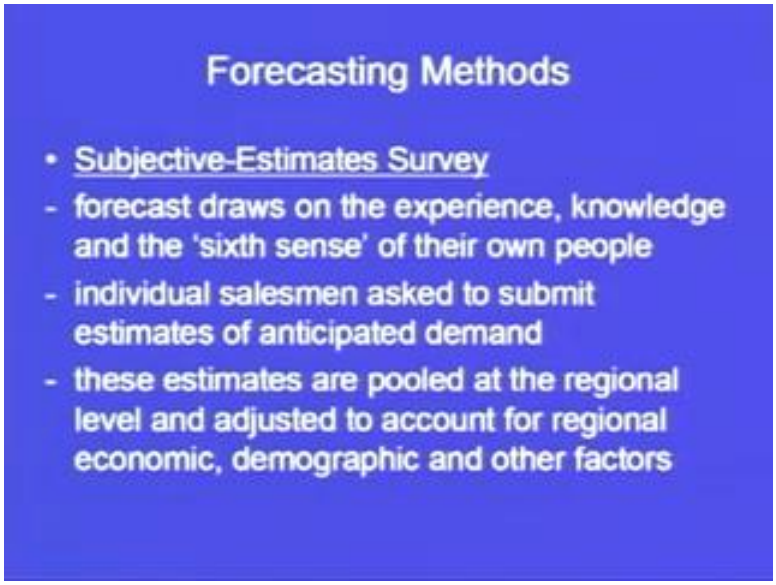

Now, let us come to one of the methods that is the subjective or estimate survey, we are going to discuss today two methods of qualitative forecasting or qualitative methods of forecasting, the first one of them is the subjective estimates or survey. So, this forecasts

based on the experience, knowledge and the sixth sense of their own people of their own people is also important.

So, in survey method what is done is that the experience and the knowledge as well as the information available to the people working in the particular organization is used to the draw a particular number, that this is the going to be the sales in the next year. So, how this is operationalized we have seen that what is done, but how it is done, individual salesman are ask to submit estimates of anticipated demand.

Now, individual salesman of the organization who are there in the market, who are in direct contact with the retailers or with the customer draw of certain estimates, that is going to be the sales in this particular area. These estimates, that is the estimates given by the particular salesman are pulled at the regional level, so at the regional level all these estimates are pulled. And these are adjusted on account for regional, economic, demographic and other factors there are, so many factors all these factors are taken into a account and the data which has been generated by the individual salesman is then pulled together.

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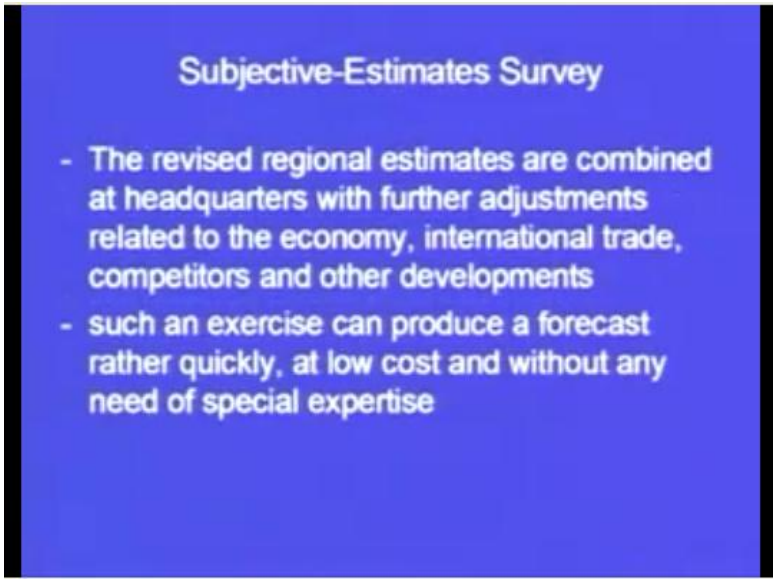

The revised regional estimates are combined at head quarters, now for a particular region we have suppose for north region we have a certain value. Suppose, we call this value as f 1, similarly for the other regions, like western, southern, eastern, central for each and

every region we will have certain amount of forecasting data or the pulled data for that particular region, so let us say that it is f 2, f 3, f 4, f 5.

So, the revised regional estimates are combined at head quarters with further adjustments related to the economy, international trade, competitors and other developments. There are, so many other types of factors that can be incorporated when we pull this data from the different regions. So, it is adjusted further on the basis of all these points that are mentioned on your screen, that is international trading or the competitors, what competitors are doing which product they are going to launch in the market.

So, the data has started the generation of data has started right from the salesman or I can say from the customer or the retailer to the salesman, from the salesman to the regional office, from the regional office to the head quarters. And the adjustment of that data or the fine tuning or tweaking of that data has been done on the basis of a number of other factors. Then, such an exercise can produce a forecast, rather quickly at low cost and without any need of special expertise.

So, we have seen that how it is done, how it is operationalized, what is the survey technique. And then we are now seeing the advantages related to this type of technique, what are the advantages, the advantages basically are it will produce a forecast rather quickly. So, the time is very, very important here, so within a very less amount of time or very quickly we will be able to generate forecast, similarly the cost involved is also very less because, we are not hiring any outside consultants, it is our own people who are helping as to generate a particular number or were to generate a particular sales forecast.

And without any need special expertise, so the time required is less, the cost required is also considerably less and the third important point is there is no need of any special expertise. So, this is a survey technique which is used for generating a forecast very, very quickly, now there can be certain drawbacks also there are other sides of the coin also.

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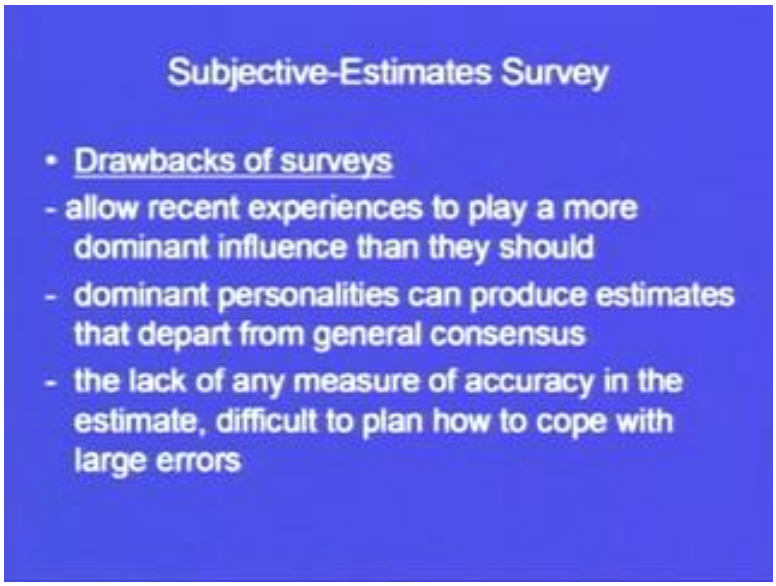

So, what are the drawbacks of the surveys allow recent experiences to play a more dominant role, than they should. Now, it is giving more weight age to the recent demand or to the recent experiences or to the recent activities, now the salesman will only say he may just make a forecast for the last 3 months I have been selling this much amount. So, this is going to be for the next month also he averages out for the last 3 months and he gives the particular forecast.

So, the attention we are giving to the data of the recent past is much more, so on your screen you can see what is the first drawback, allow recent experiences to play a more dominant influence than they should. So, we need to give it a very, very judicious think or we should think it judiciously that what is going to be forecast for the next year or for the next quarter or for the next month, we need not give undue weight age to the happenings of the recent past.

So, we should spread our forecast on a may be information of the last 6 months or for 1 year may be for the 2 year. So, just latest development should not have much more influence on the forecast, then dominant personalities can produce estimates that department from general consensus. Now, sometimes may be in a particular organization at the head quarters the fine tuning of the forecast data is being done, so the dominant personalities are the people who are very good or who are very good say in the decision

making of the organization may stamp their authority that know, this is going to be the forecast.

So, general consensus may be little bit less or little bit more, but these dominant people are going to use their influence, in order to change or in order to have a particular number that is suited to their wasted interest. So, that should be avoided and that may happen in the survey technique, so it accounts to one for the drawbacks of the survey techniques. And then coming on to the third disadvantage that is the lack of any measure of accuracy in the estimate, difficult to plan how to cope with large errors.

So, here we are not able to have any measure of accuracy, that how accurate we work and we cannot also identify, that where the forecast went wrong right from the salesman to the regional office to the head quarters. So, there are certain limitations with this survey techniques, so these three are most important that are mentioned on your screen.

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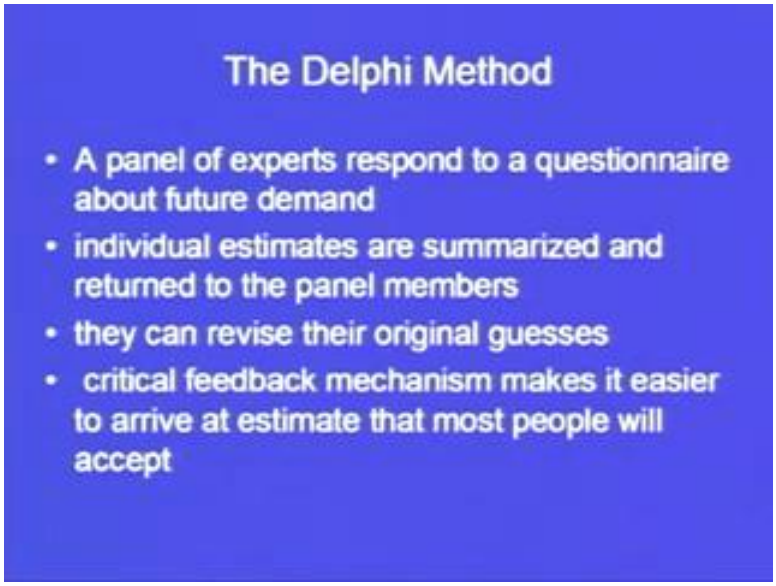

Now, coming onto the second method that falls under the category of qualitative methods of forecasting is the Delphi method, it is also similar to the survey technique only, but there is a little bit of difference. So, we will try to understand what is the difference between the Delphi method and the survey technique, so a panel of experts are used in the Delphi method. Whereas, in the survey technique our own people or the people of the organization right from the salesman to the regional office to the head quarters are used to generate a sales forecast.

In Delphi method we are using the panel of experts, so just to outline the summary of what is done in the Delphi method. A group of people or a group of experts or a panel of experts are given a particular questionnaire, in which there are certain questions, on the basis of that questions we need or we aim to arrive at a particular sales forecast. So, each and every member will feel the questionnaire and they will try to make their own estimates for the sales for the next year or next 5 years. And they will submit that questionnaire to a particular coordinator of the forecasting team.

Now, the coordinator will then summarize the questionnaires submitted by each and every panel member and that questionnaire is then further summarized into one particular output data file. Now, that output is then again given to the people or the panel of experts, so how this is beneficial is that initially suppose one expert member had certain information available with him, on the basis of which he predicted the sales forecast or he predicted the sales or he generated the sales forecast.

Now, the summarized report of all the questionnaires is going to have the information submitted by the different panel of experts. Now, this particular person who was earlier having a limited information is now having the information, which the other people or the panel of experts are also having. Now, he can change his estimate on the basis of the information provided by the other people it may, so happen that one particular member expert or one particular panel member may not be knowing the other panel members or the other expert teams, which is a part for the Delphi method.

So, if there are ten experts, one expert may not be knowing that who are the other nine experts, in this particular forecasting team. So, what we are doing here is that we are going to use the expertise of 10 or 15 or 20 different members, who form a panel to generate a sales forecast. And one members information is also shared with the information or the data which the other people are having and then we can continue this process two times, three times like first questionnaire is given, it is summarized the summarized report is again given to all the panel members.

So, that they have more information on which they are going to base their sales forecast and again the questionnaires are collected, again it is summarized may be again once again, it is given to the panel member and this iteration can be done two or three times. And finally, we can arrive at a particular number that is going to give us the sales

forecast, so whatever I have explained you can see on your screen, the things have been summarized.

Just I will read it for you, a panel of experts respond to a questionnaire about future demand, individual estimates that is the estimates given by a particular panel member are summarized and returned to the panel member. So, again first iteration is done, they can revise their original gausses on the basis of the information, that they get from the information or the expertise of the other members. So, critical feedback mechanisms make it easier to arrive at an estimate that most people will accept. So, a consensus can very easily be reached here, the cost of this method is medium to high, why medium to high because, here we are hiring the services of certain expert panel members.

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Then, originally applied to technological forecasting, used for a variety of long term prediction such as developing new products, acquiring new capacity, penetrating new markets and making other strategic decisions, for which historical data is in insufficient. So, Delphi method can be used in all these different scenarios, that are there on your screen and also to note is that, wherever insufficient data is available to use any of the other forms of forecasting, we are going to use the Delphi method.

So, what we have seen till now in today's lecture is that forecasting is one of the most important engineering activity, which helps us to arrive at a particular number on which we can base a large number of our business decisions. Then, we have seen that what is

the forecasting system of the basis of certain inputs, it generates a particular output, which is the estimate of the demand or the sales. Then, there are certain constraints to the forecasting system and the certain decisions, that we have to take while choosing the forecasting method.

There are two types of forecasting methods, the qualitative and the quantitative method, so both of these have their own areas of application. In today's lecture we have started with the qualitative or the subjective methods, in which we have seen the survey technique, what are the advantages of the survey technique, what are the limitations of the survey technique. And then finally, we have seen a Delphi method where it is used, what is the Delphi method and what are the application areas of the Delphi method. In the second lecture on sales forecasting, we will see some of the quantitative methods of sales forecasting with the help of certain examples. And finally we will see that what are performance measures of these forecasting methods.

Thank you.