Principles of Industrial Engineering
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Lecture 47
Forecasting Introduction

Hello, I welcome you all in this presentation related to the subject Principles of Industrial Engineering. And in this presentation I will be starting a new topic that is the Forecasting. This is a very important tool we can say which is used extensively in the industries, enterprises, also at the national and state level to see the way by which the demand for the different items will be changing so that the organizations and government can plan the activities and events accordingly.

So that the demand for the items, goods and services can be fulfilled. Especially in operation management and in the manufacturing industries or the service industry also it is very important that those operation managers are able to have the information about the kind of demand which will be there for their goods and services in near future. So, they have to see, the managers will have to see a look into the future demands using the various tools.

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So basically, in forecasting the focus is on the demand, determining the demand of items or services which will be there in future. So, it is just like looking into future, possible events in the future with respect to the demand, so that suitable plans can be made to satisfy the demands.

If this is not done then there will be lack of so many things, the organizations will be losing their profit, their competitors will be going ahead. So, it is important that what will be the demand for a particular item for a good or for a service that is determined.

So now, when we try to determine the demand for future, it is important to see how far in future, means the time horizon. So, this time horizon is very important because that will be important to see really what things we should look into as far as demand is concerned.

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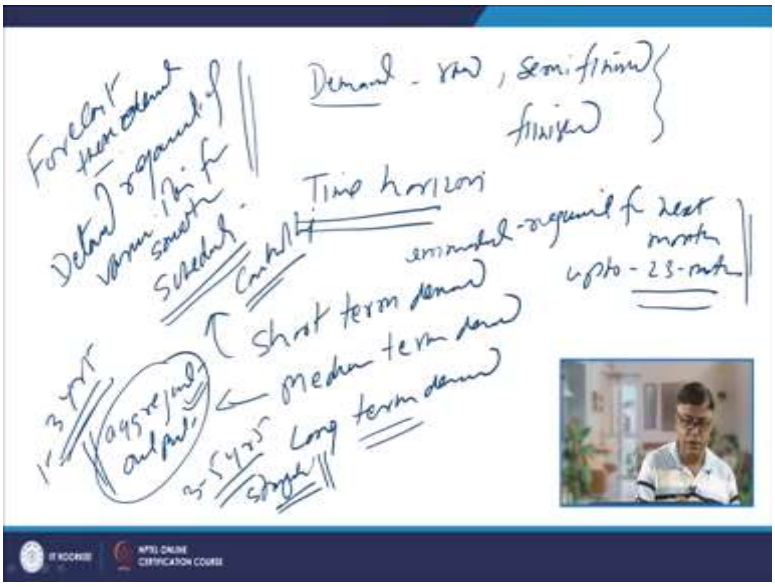

So, like say that demand can be there for raw material for a smooth running of the organization, semi-finished products being procured from other organizations or finished products to be supplied to the customers to satisfy their demand. So, that demand as per the time horizon can be of for the different types like immediate requirements for say next week, next month.

So normally say up to 2 to 3 months, demand will be made for like say the raw material, the kind of units will be required, semi-finished product will be required for the smooth flow of the production. So accordingly we have like say short term demands, we can say accordingly the medium term demand and long term demand.

So, short term demand is about the kind of the raw material, semi-finished products, number of units to be produced so that affects the like say scheduling. When the production of particular kind of thing is to be started so that the items can be produced to satisfy that demand. Medium term is about the aggregate output which is needed like say in short term,

we try to determine the detailed requirement of various items, maybe raw material, semi-finished products for a smooth production.

So, in very detail the demand for the various items is determined for near future on short term basis for a smooth flow of the work, then aggregate output like say a company is manufacturing number of units so a number of types of the products what will be the general trend of the demand in medium term basis like say 1 to 3 years, what will be the general kind of projected demand in the near future?

So for the somewhat medium term range the aggregate requirement, what is the aggregate requirement for various products in medium term basis, and then there is a long term basis. So as I said, the scheduling and control controlling kind of thing is realized through the short term demand, medium term demand regarding the aggregate planning for 1 to 3 years and long term demand, like say 3 to 5 years.

It is more about the strategic in nature like so, what will be the general trend of the technology, what kind of the products will be sold and what will be their demand after like say 3 to 5 years, so setting of those possible demands for the newer technologies newer products will be falling under the long term demands. So, we need to forecast these demands.

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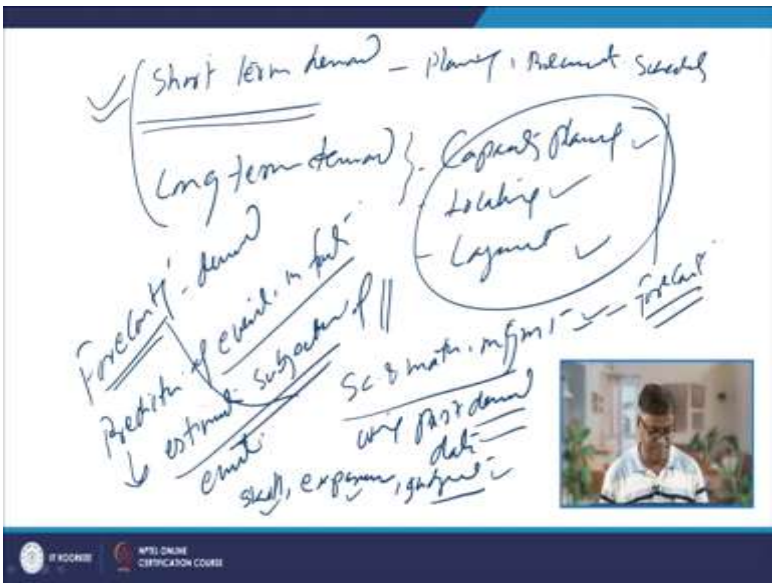

So depending upon the time horizon like short term demands are helpful in planning, procurement, scheduling, etc. While long term demands like say use long term demands using say aggregate demand of the different items that will be governing the kind of the

capacity planning, locating the new plant is identifying the location of the plant and changing the layout in light of the changing requirement of the items to be produced.

So, the plant layout, plant location, capacity planning will be falling in the long term demands so both of these will be crucial, however, it is easier to forecast the short term demands as compared to that of the long term demands because of the various uncertainties. So, for short term demands like say as I have said, the forecasting can be used for both short term and long term demands.

There is another word which is also very commonly used that is called prediction, prediction of the events in future. There is a very minor difference between the two, the forecasting is about the scientific, mathematical and management tools using the past demand data. So, it uses the demand data, it uses the scientific mathematical and management tool to arrive at the demand forecast.

On the other hand, the prediction is based on the estimates or you can say subjective estimates of the events. So it is not scientific, but it is based on the skill of the manager, his experience and judgment.

So, considering the judgment, all these are the subjective things based on the judgment of the manager, his experience and skill, he can estimate the kind of demand which will be theirs but this is very subjective, this is not like say data based approach, it is the subjective based on the skill, experience and judgment of the manager.

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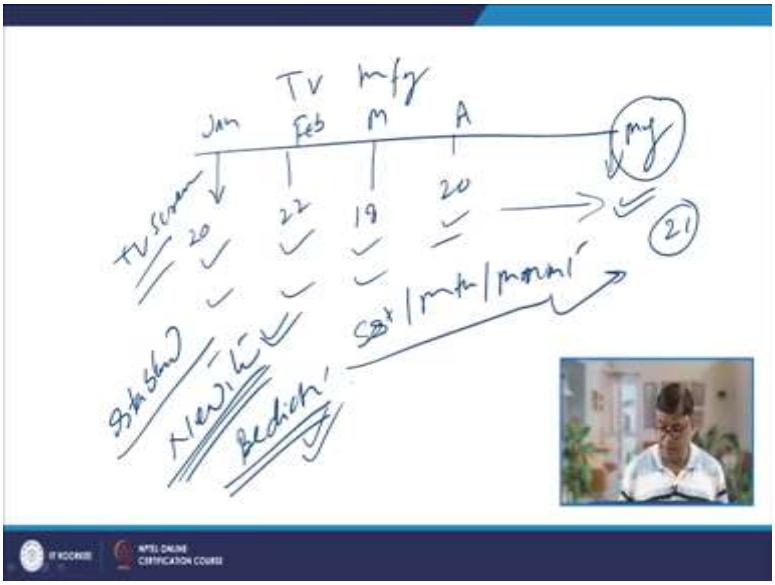

For example, say a TV manufacturing company has got the demand of the TV screens for producing the TV. So, say in January the demand is of that 20 units, for February it was of the 22 units, in the march it was of 18 units, likewise if for April it is say again 20 units. So, if it wants to determine the kind of the demand which will be there in May, so the company will be using that the past demands.

The demands of the recent past for the TV screen to determine the kind of demand which will be there in the next future in the next immediate if you just say May or June so like that. So for next immediate future if we use this past data using the statistical, mathematical and management techniques, using this past data if we determine the forecast, say 21 for the May, so that will be the kind of the demand forecast.

But if say a new kind of the TV is being produced, a very new item is being produced then we do not know really how many units will be consumed of that TV. So, this is the case when we have the stable system. And there is a continuous demand for that kind of system in the market.

The moment a new item, which it does not have the record of the demand for which the record of the demand is not available, in those cases certainly we have to rely or depend on the predictions. Like for this kind of the item, how much demand will be there in, similarly, like say so in this kind of a situation when a new product is being launched for which demand record is not available so in those cases that prediction kind of thing will be useful.

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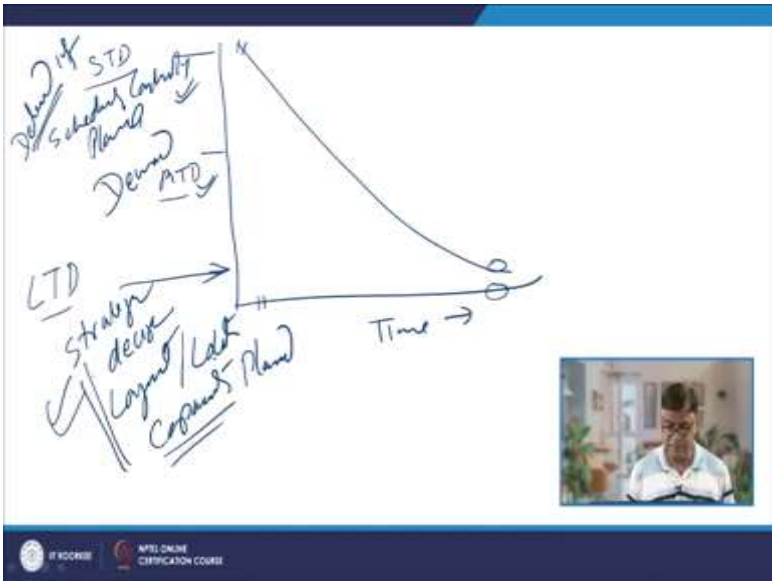

So, now, we will see that, how with the change of the time origin like say in X axis we have the time, and in Y axis we have the demand. So, the demand pattern with the change of the time horizon, the demand and its use is modified like say, there are three levels, long term demand, medium term demand and short term demand.

So, short term demand for a very short period say that demand is identified, say for long term the demand is identified, so here the long term demand is primarily used for the strategic decisions like say, how to develop the layout based on the kind of the product life cycle, then what will be the location based on the changing market scenario or what will be the kind of the capacity for which a plant should be there considering the demand which will be there after 3 to 5 years so, considering that how the capacity is to be planned.

On the other hand, for short term basis, it helps in scheduling and controlling, planning like say the manpower, material requirement, so that that demand on short term for the raw materials, semi-finished goods or sub-components. So, here we may get the detailed information about the demand of the various items. In medium term basis we get the aggregate requirement for intermediate time period like say, 1 to 3 years.

And for short term basis, we get the detailed demand and very long term basis that the demand which will be forecast for a very long period in future for the strategic decisions.

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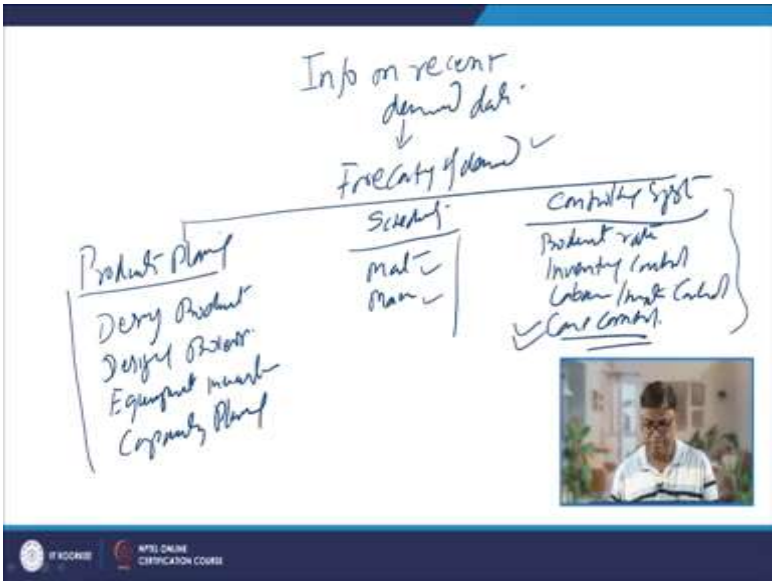

So, let us say we need to get to the latest information on the recent demand data. Based on this, we go for forecast of demand in near future which can be used in various ways. Like I said short term demand, long term demand and intermediate term demand. So, say the demand forecast can be used in the production, planning like coming out designing products, designing processes.

Then the decisions related with the equipment investment, capacity planning, this is one type of use based, use of the forecasting the demand. Another is scheduling to satisfy certain demand, what kind of the material that will be needed, how much manpower will be needed. So, the operation scheduling material and the manpower requirement all that is based on the demand forecasts so that the items can be produced in the required quantity as per the kind of the demand which will be there in the future.

Then it is also used in controlling the system like production control, as per the demand we can adjust the rate of production whether it is to be accelerated or moderated. So, the production rate considering the kind of the demand which will be there, considering the demand also inventory control, then the labour material control and then we have the cost control.

So, if we know how much how many goods and services are to be produced in the next near future, we can plan the activities in very effective way so that the required volume of the goods and services can be produced at the minimum possible cost through the proper production planning and control.

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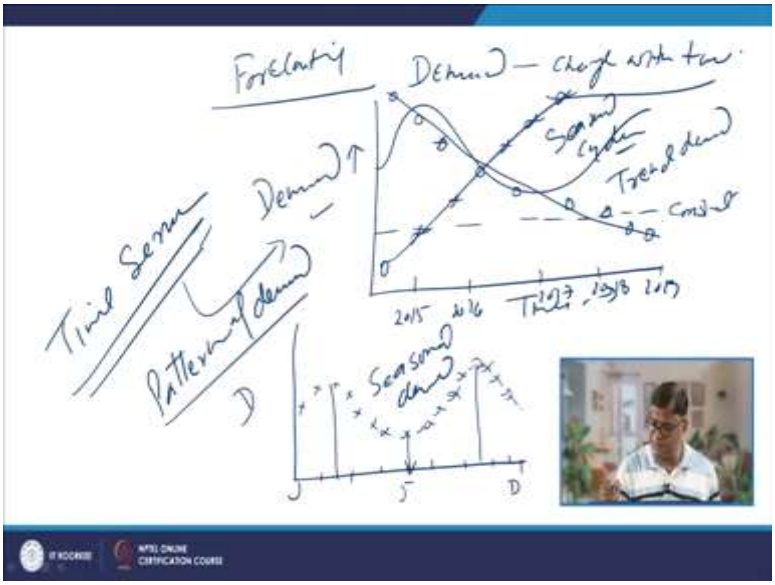

So, determination of the demand through forecasting is extremely useful. Since the demand obviously can change with the time. So, based on the past data, a plot between the demand versus time is developed. So using the data of the past regarding the demand, it may be weeks, it may be months, it may be years, it may be quarter variation with respect to the change in demand say 2015, 16, 17, 18, 19 like say the demand for a particular item is plotted.

And this the kind of trend which shows, the kind of the variation in demand as a function of time is called the time series, time series shows the variation in demand as a function of time that is called the pattern of demand.

So, the relationship between the demand as a function of time, relationship between the demand and time can say is shown by the time series and there can be different patterns of demand. One type of the pattern is like where demand is almost constant, it is not fluctuating so, we can say the constant demand.

The demand sometimes for some of the items fluctuate as a function of time during the year like say from January to December, like say July so demand for the likewise intermediate months here in between and here we have demand. So, starting from the January to December as a function of with the time the demand for certain items change in a particular fashion like this.

So, this is called like say in particular season demand is very less, in particular season demand is very high and this pattern is repeated every year or in every season. So, this kind

of the demand pattern variation like this, this is called Seasonal demand. And when the demand continuously changes as a function of time like say, earlier demand was too high and then it went on gradually decreasing as a function of time or so, this is like the decreasing trend of the demand.

So, this is termed as Trend demand where either it is increasing or decreasing, this is the Seasonal demand where a particular cycle with respect to the time, the demand varies cyclically as a function of time that is called seasonal or cyclic demand. So, the demand can show that continuous increasing trend also, so both these indicate whether it is continuously increasing or decreasing as a function of time, so this is called a trended demand.

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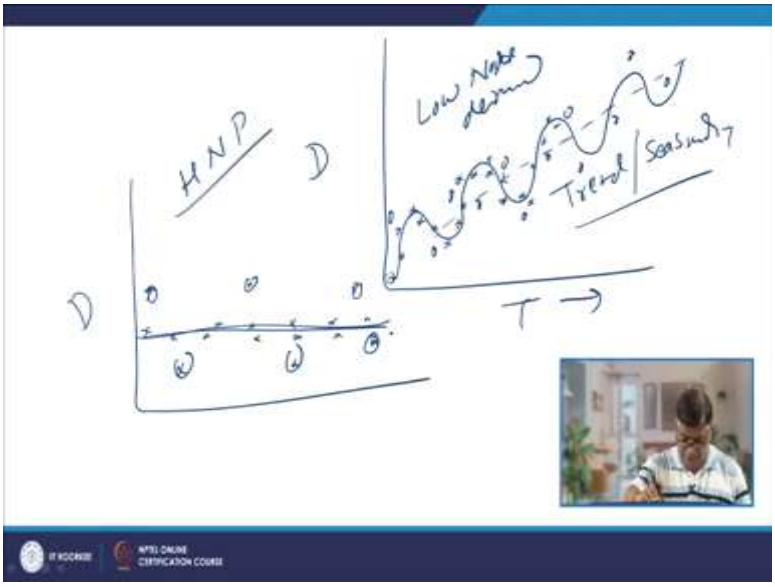

Demand pattern can also be a combination of these, like say the demand and the time, so the demand can vary in this manner also. So, what it is saying that demand is increasing continuously. At the same time there is a cyclic variation in, so it is a combination of the trend as well as seasonality effect is there or seasonal trend as well as the seasonal demand pattern as well as trend demand pattern both are present in this case.

Now, the demand as a function of time since, as I have said this is the constant demand, but the demand actually may not be constant, there may be little variation. So, the demand is like say, showing a very close variation with respect to them. So, when the variation in demand as a function of time is not much but that so and it is almost a constant similarly, the demand points are falling very closely a particular trend or pattern like this.

So, in all those cases where the pattern line is very close to the actual demand data as a function of time, this is the situation corresponding to the low noise demand. And when the actual demand fluctuates significantly corresponding to these demand patterns, then we say high noise demand pattern like say in case of this constant demand pattern, one point is here actual demand point, another actual demand point is here then here and here.

So, the points are the actual demand is fluctuating a lot about a particular type or a particular pattern of the demand. So, this corresponds to the high noise, high noise demand pattern like this going far away from this pattern lines is indicating the presence of the high noise demand.

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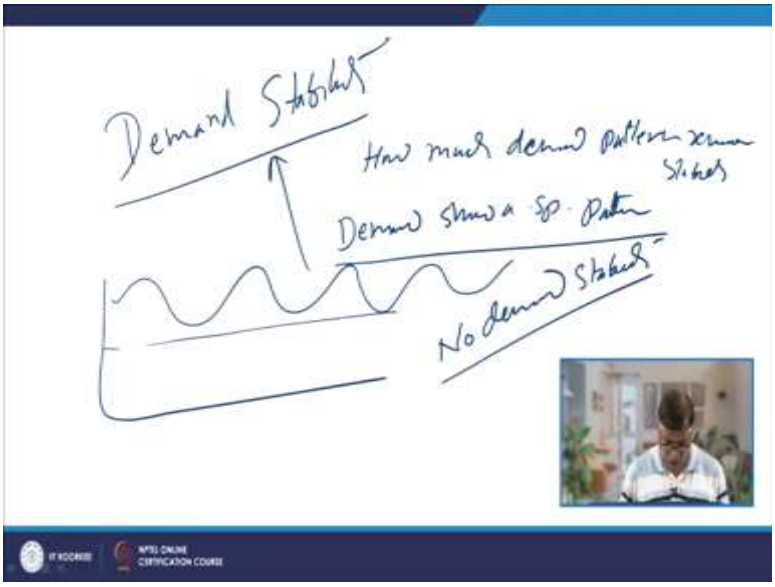

Now, we will see another aspect is about the Demand Stability, demand stability is about that how much demand pattern remains stable, means the demand shows a particular pattern, a specific pattern for how long time? Whether it is just for 6 months or for 4 years, like say the demand is constant for say, just for 6 months or for 4 years.

Similarly, the demand is cyclic in nature just for 2 months, 6 months or for many years. So, if the demand is a stable means or the demand is stability means, if the demand pattern is the same for longer period, then we say that there is a stability in demand. And if the demand pattern changes rapidly, then we will say that that is not a situation of the demand stability. So, when there is a no demand stability, then forecasting becomes difficult.

So, means when there is a demand stability, it is easier to forecast the demand as compared to the case when there is no demand stability, which means the pattern of the demand is

changing continuously as a function of time which makes the forecasting job difficult. So, because we can have certain equations and methodologies to forecast the demand when it is showing the demand pattern is stable.

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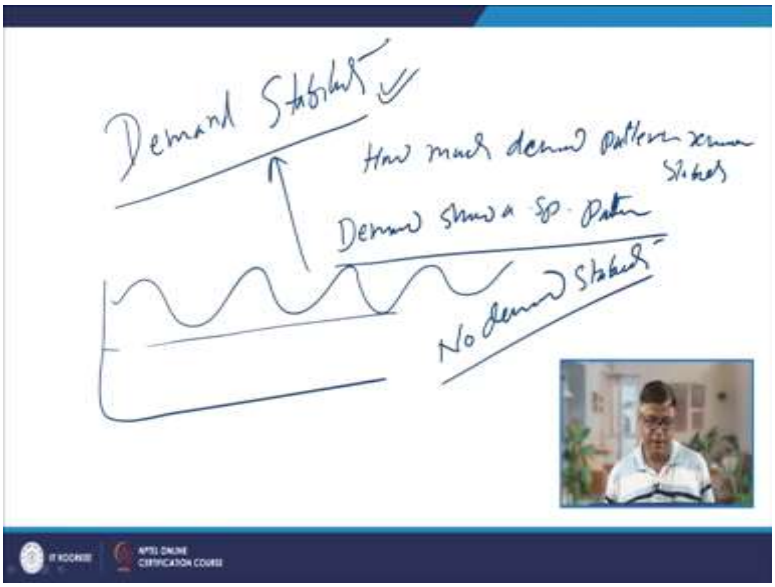

Then, we have already talked about the other two terms which will be used in forecasting is like dependent demand, demand is of the two types. One is dependent, dependent demand is about like demand for an item is directly linked with the production volume of some other item, demand for an item is linked with the demand of any other item.

So, that is that dependent demand case whether it is semi-finished product or finished product or the raw material which is directly linked with the production volume, and independent demand is another one is the independent demand. So, in this case demand of an item is not linked with the volume of any other unit which is being produced.

So, mostly we focus on the dependent demands determining the or forecasting the dependent demands, in which case the demand of an item is linked with the volume of any other item which is being produced. Now I will summarize this presentation, in this presentation basically I talked about what is the purpose of the forecasting and what are the basic terms which are used in forecasting.

What are the different types of the pattern in demand which are observed, in the coming presentations, we will be talking about the different methodologies which are used to forecast the demand. Thank you for your attention.