Decision Support System for Managers
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Module – 02
Models in Decision Support System
Lecture – 06
Structured, Semi– Structured and Unstructured Problems; Models

Hello and welcome to "Decision Support Systems for Managers"! This is a course that is primarily focusing on 'structured, semi-structured and unstructured problems' that businesses face and that managers have to solve in the real world.

Decision Support Systems for managers will help you to build a platform that will enable you to take decisions in the right manner, beneficial for the company and will instill confidence in you that you are taking the right decision. So, it will give you a support system.

So, as we mentioned the decision support system for managers will take you through structured, unstructured and semi-structured business problems. In module 1, you have been exposed to the basics of decision support system, the introductory portions. In module 2, we will take you through the models that are available in the decision support system. And in module 2 today's lecture we will focus on structured, semi-structured and unstructured problems and then we will take you to what is called a model means what do you understand by a model; ok.

So, today we will start off with what do we mean basically a structured, semi-structured and unstructured problem. Remember what did we say in the beginning the decision support system in today's business world managers have to face such a wide variety of problems that we normally cannot just put it in a structured fashion.

We have every problem is different, every problem is new and so we are facing situations which are semi-structured and situations which are unstructured. So, this subject will take you through that.

So, let us first consider what is this is the. These are the concepts that are covered in this particular module or this particular week that is; what is a structured problem? What is a semi-structured problem?

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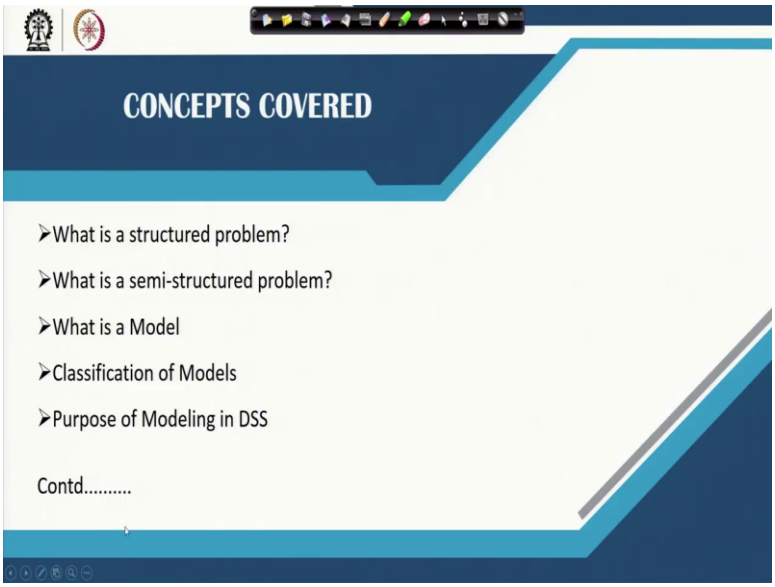

What is a model? How do we classify the models? What is the purpose of modeling in decision support systems?

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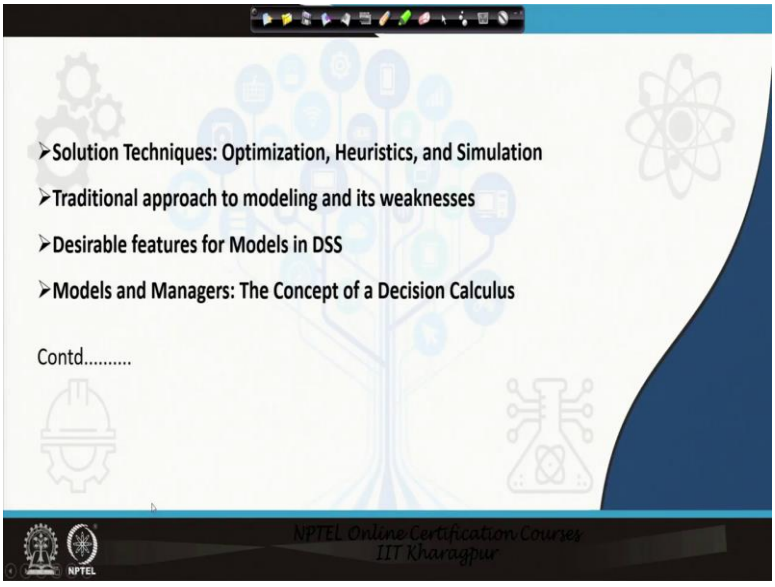

What are the solution techniques? What are the traditional approaches to modeling? What are the weaknesses means why are we going towards the decision support system?

What are the features for models in decision support system? And models and managers the concept of a decision calculus.

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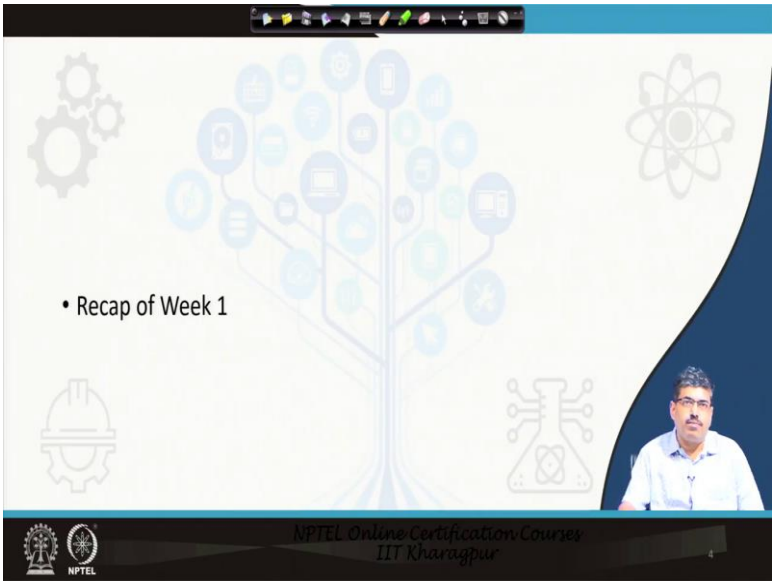

This is the entire gamut of things that we will do in this module or this particular week and to let us so let us start. Let us have a brief recap of what we had in week 1. In week 1, we gave you the basics of what is a decision support system, how does it work, etc; ok.

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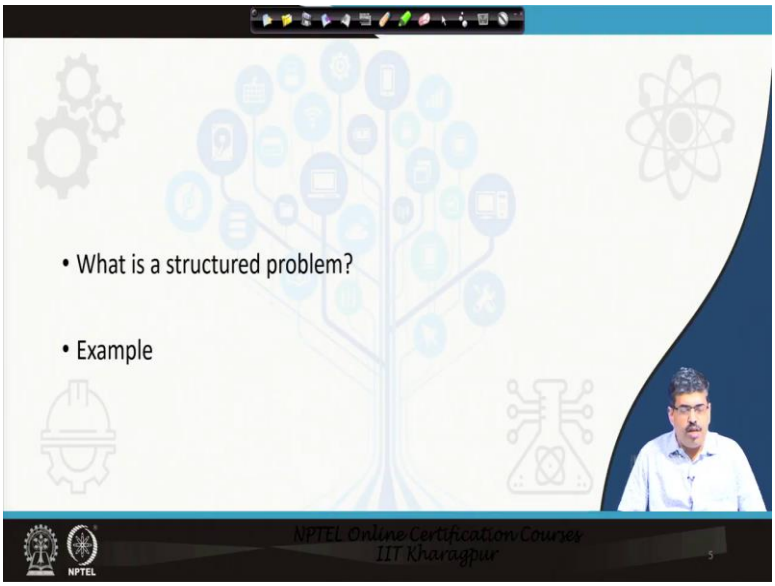

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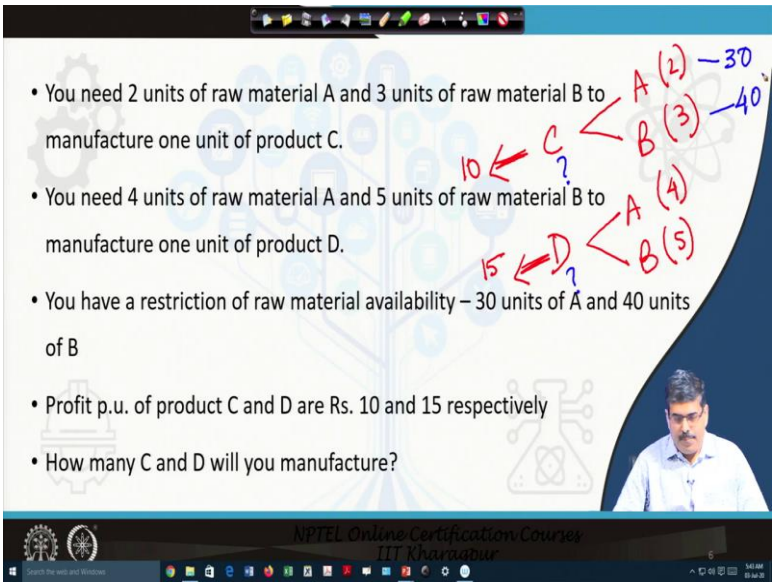

Now, let us take an example of what is a structured problem ok. Remember we started with structured problem, semi-structured problem and unstructured problem. So, let us take what is a structured problem ok. Let us take an example. Now, let us very carefully look through what is there in the screen.

You need 2 units of raw material A and 3 units of raw material B to manufacture 1 unit of product C ok. This is very simple just like you know we clean our floor in our house what do we do. We put some disinfectant in the water. So, what are we doing? What is the ratio?

In 1 bucket of water, we are putting in maybe 1 cap of Dettol or some other disinfectant. So, the ratio is 1 cap of Dettol in 1 bucket of water ok. So, something like that. So, you need 2 units of raw material A and 3 units of raw material B to manufacture 1 unit of a product C.

Similarly, you need 4 units of raw material A and 5 units of raw material B to manufacture a product D same thing. So, a company. So, basically a company is manufacturing 2 products C and D ok. Companies manufacturing 2 products C and D and you need 2 units of raw material A and 3 units of B to manufacture C and 4 of A and 5 of B to manufacture D clear.

Now, just take a situation when this can be possible. Let us say your company is manufacturing similar products one is the daily use version and the other is the luxury version ok. So, basically maybe you are manufacturing a hand wash in these testing times you manufacturing a hand wash.

Some is for daily use and some is for may be sophisticated medical use. So, both are a bit different. So, product C is for daily use and product D is for medical use. So, you need 2 and 3 units to manufacture the daily hand wash and 4 and 5 units of the same chemical to manufacture the medical purpose hand wash. Now, what is the restriction?

However, only 30 units of A and 40 units of B are available and when you are manufacturing you are selling them. So, profit per unit of product C and D are rupees 10 and 15 respectively. So, the question is how many Cs and Ds will you manufacture right? Now, if you see very carefully this problem now I will pause for a second to make you look at the problem; ok.

You look at the problem very-very carefully. So, what is it? You are manufacturing let me just tell you are manufacturing 2 products. You are manufacturing 2 products; you are manufacturing A, sorry; I am so sorry; you are manufacturing; you are manufacturing product C and you are manufacturing product D; ok.

You are manufacturing C and you are manufacturing D 2 products. This is ordinary hand wash this is a medical use hand wash. Both these products need raw materials A and raw materials B right. But for product C which is a ordinary hand wash you need 2 units of raw material A and 3 units of raw material B. And for product D you need 4 units of raw material A and 5 units of raw material B right.

And the profit if you sell product C is 10 and the profit if you sell product D is 15 right. So, this is basically the models. So the question is how many units of C. So, the question is how many units; how many units of C will you produce?

So, the question is how many units of C will you produce and how many units of D will you produce; ok? How many units of C will you produce and how many units of D will you produce? What is the restriction? Now, this raw material A has a restriction of 30 units and this raw material B has a restriction of 40 units right. So, question is how many

Cs and Ds will you manufacture. This is the problem if you look at it very carefully right now.

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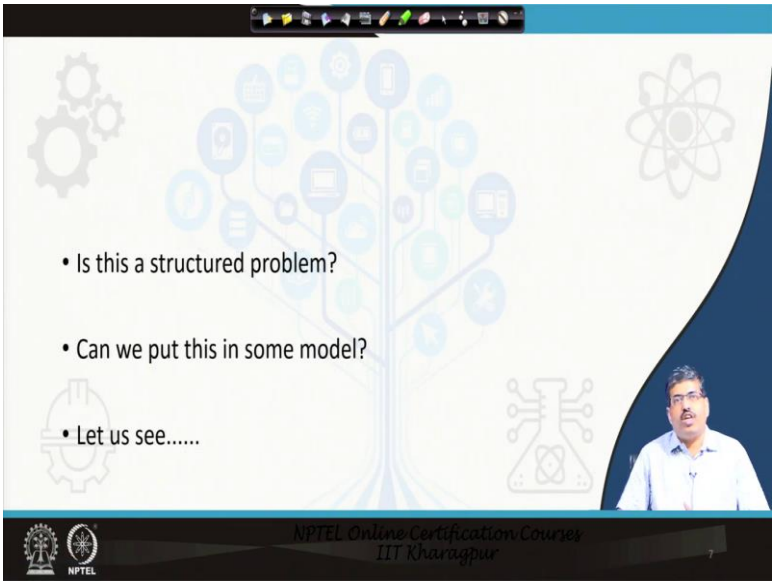

So, let us move. Is this a structured problem? Yes, no, maybe. You see from the description and from what I wrote already you can put it in some structure ok. So, it we can structure it. We can put it in some pattern some form we can structure it. Is this is a structured problem?

Answer is yes. We can put it in some pattern or some form that form is explainable, that form is understandable ok, that form makes sense. Can we put this in some model? Yes, we can put it first in a structure as we wrote it down and can we put it in some model? Let us see ok.

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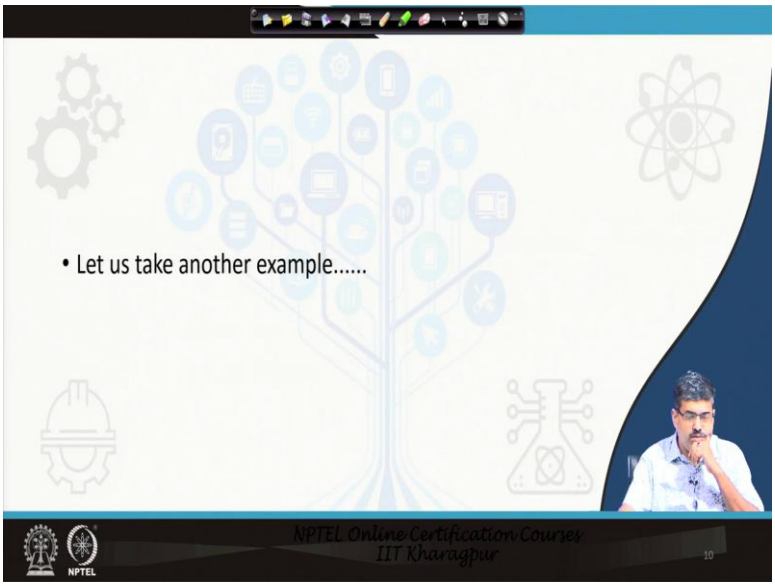

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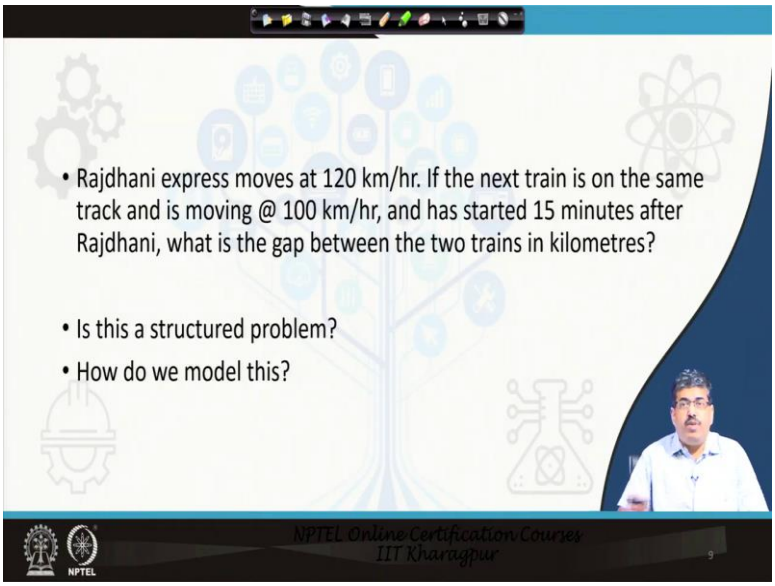

Let us take another example, we will come back to it. So, let us see whether we can let us take another example. Rajdhani express moves at 120 kilometers per hour. If the next train is on the same track and is moving at 100 kilometers per hour and has started after 15 minutes of Rajdhani, what is the gap between 2 trains in kilometers; ok?

So, first problem we learned it was a production problem. Next problem that we have not come to the model as such. We have said that yes it is a structured problem. Rajdhani express moves at 120 kilometers per hour. Next train moves at 100 kilometers per hour

and has started 15 minutes later to Rajdhani, what is the gap between 2 trains in kilometers? Is this a structured problem? Yes-no; may be.

Now, if you look at it, the problem is very simple. First train is moving at a higher speed, next train is moving at a bit slower speed and I have started at 15 kilometers, 15 minutes late. We already know the science formula. Distance is equal to speed into time. We can use those types of formulas here; ok.

This first; the first train Rajdhani is moving at a particular pace; the next train again is moving at a particular pace. So, it is a structured problem and that is the basis on which railway time tables are prepared. But, how do we model this. We will use a formula. We will use a formula as simple as distance is equal to speed into time; ok.

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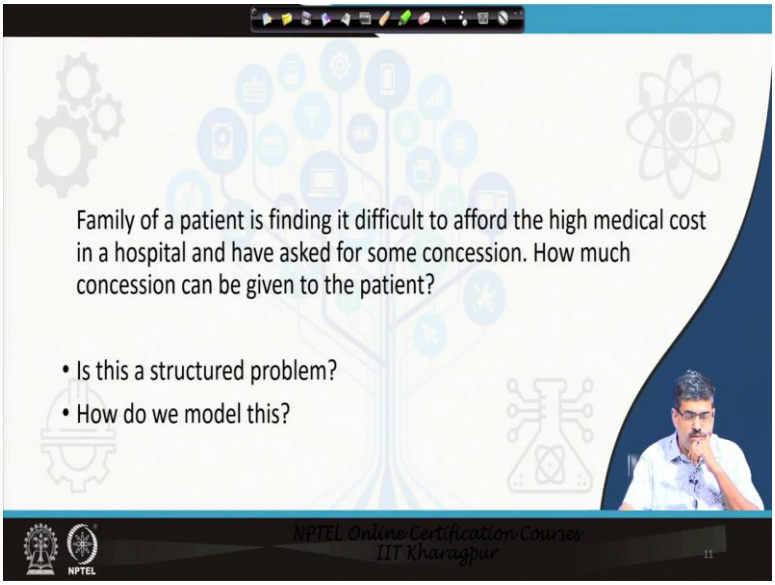

Let us take another example. See family of a patient is finding it difficult to afford the high medical cost in a hospital and have asked for some concession. How much concession can be given to the patient? Very-very important, very-very pertinent in real life.

Cost of medical care has increased and so poor families sometimes are unable to afford the high cost of medical care particularly in the private hospitals. So, now assume that a patient family has come up and I have requested that can you please give us some

concession. Question is how much concession can you give? Is this a structured problem? How do we model this?

So, you see this one is a bit dicey. Is it really a structured problem? Is it a semi-structured problem? If you look at it very carefully it looks like it is a structured problem. Because we know the exact costing of the hospital ok, we know how much is the cost of construction, the depreciation of the equipments, how much is the cost of the equipments, what is the salary of the doctor, nurses, etc., etc. So, this part is structured, but what is unstructured is as more and more patients come in the cost per patient comes down.

So, when a patient family is asking for a discount we are looking at the cost that the hospital is incurring divided by the number of patients. But, since the patient flow is dynamic the patient flow keeps on increasing or reduces. So, what discount can we give to the patient family that part is semi-structured?

Are you getting my point? When the costing is done costing is very easy because costing assumes a fixed quantity of input and output. But, when your inputs are changing and your outputs are also changing, then that particular structure is no more a fixed one. That particular structured becomes a bit semi-structured or dynamic one. So, this is a semi-structured problem. How do we model this? Again we have to ask these questions.

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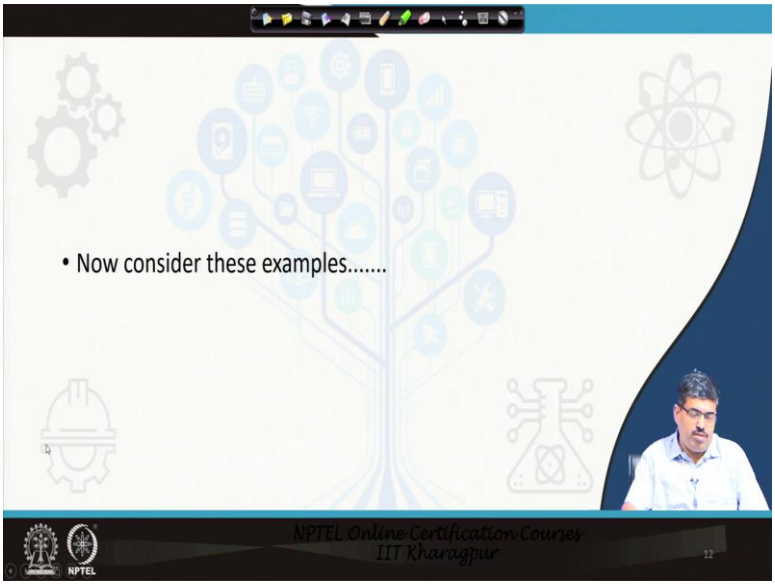

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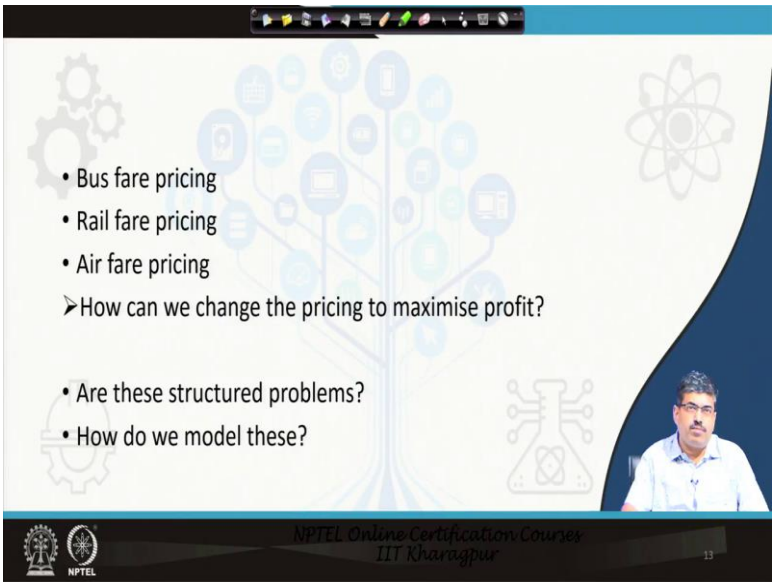

Let us take another example. Consider these examples. Bus fare pricing. We all travel by buses. How do you arrive at the bus fare? Because it is a public good, it involves public money, many poor people are travelling. Now, the poor it is not like that poor people pay less and rich people pay more in a bus.

In trains, yes poor people or rather ordinary people sorry I should not use the word poor ordinary people I may choose a sleeper class. If I can pay a bit more I choose an AC compartment ok. So, in trains, it might be possible to charge different fares from different groups of passengers, categories of passengers. But in buses it is not that, if it is an ordinary bus a poor person pays the same money a rich person pays the same money.

So, how do you do a bus fare pricing? It is public money it is common mans means of transport ok. Real fare pricing, do we have more AC coaches? Do we have more ordinary coaches? How do we recover your costs? Airfare pricing very very dicey. You will see dicey in the sense that we will see that as and when the demand of these air tickets increases the airfares also keep on increasing.

How do you model these? How can we model among them to change the prices offer the prices in such a manner that my profit becomes maximized? If it is a government organization for example, railways my surplus becomes maximized. So, are these structured problems? No, they are not structured problems. They are semi-structured problems. How do we model this?

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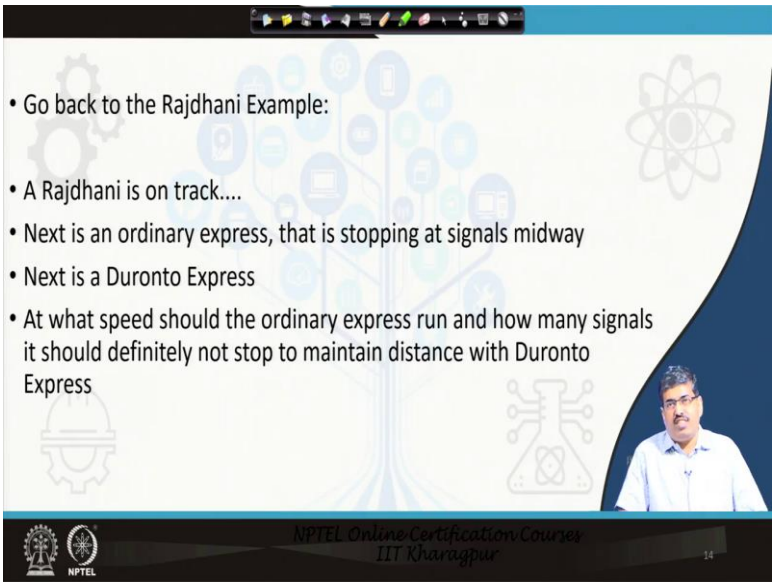

Go back to Rajdhani example. What did we say that Rajdhani is on track; next train and running at 120 kilometres per hour; next train is 15 minutes behind and running at 100 kilometres per hour. So, what is the distance between these 2 trains?

Now, take another situation Rajdhani is on track, next is an ordinary express that is stopping at signals midway. So, it was supposed to go at 100 miles per hour or 100 kilometres per hour, but it is stopping at different signals. But, the very next train behind this ordinary express train is a Duronto and Duronto moves at the same speed as Rajdhani. So, what is happening?

The gap between Rajdhani and the ordinary express the gap between Rajdhani and the ordinary express is increasing because the ordinary express is stopping at different signals, but the behind is a Duronto. So, now consider this as the ordinary express this as the ordinary express.

So, the gap and here is the Duronto originally here is the Duronto. But now because this train is keeping on stopping at signals the gap between the Duronto and this one is coming closer. So, what speed should the ordinary express run and how many signals it should definitely not stop to maintain the distance with the Duronto express?

This is a semi-structured problem, why? Because you can do mathematical calculations where there is no guarantee that the signal will be green; ok. Signaling depends on so

many other criteria. There may be a road a level crossing. There may be another Rajdhani coming from another direction and there is an intersection point. So, signal becoming red is dependent on so many other contingencies that this problem becomes a very-very semi-structured and in extreme case, it might become unstructured also.

Suppose there is a problem and people have come out from the nearby areas and are sitting on the railway track not allowing trains to move. The entire time table, entire schedule goes into huddle buddle; then which train will go first, what will be the gap; where is the time; how much is the delay? This becomes an unstructured problem; ok.

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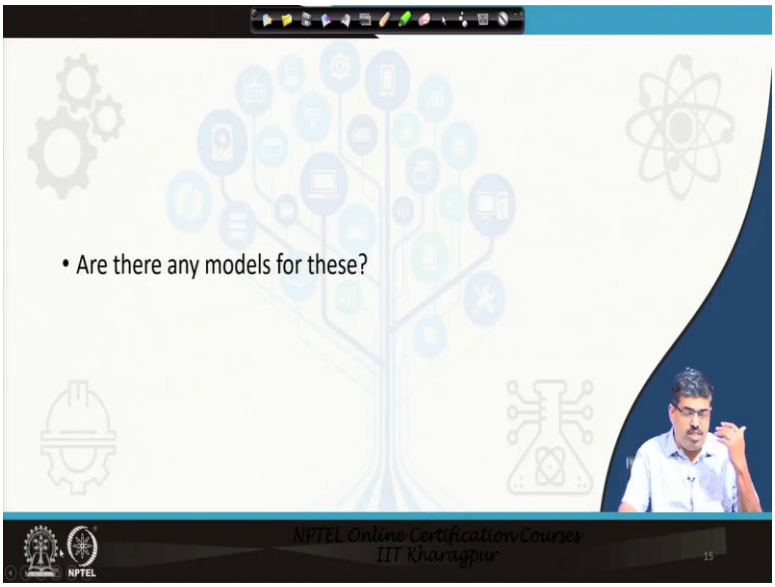

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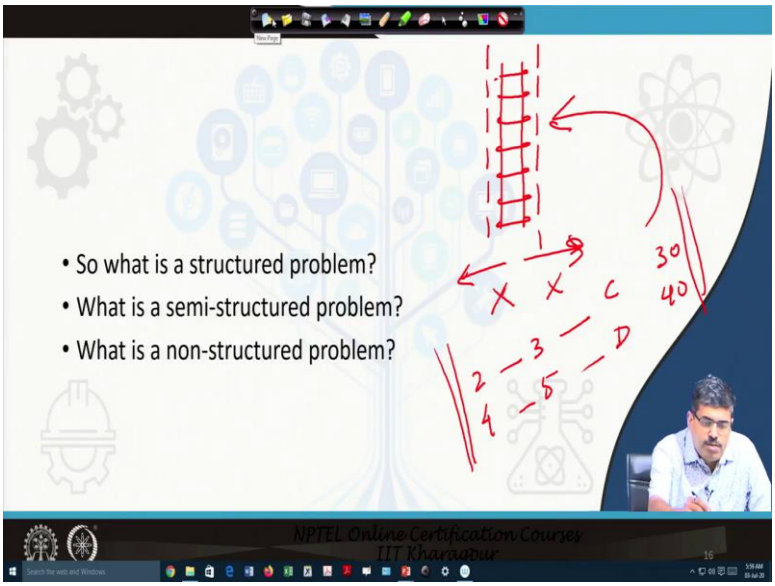

So, structured, semi-structured, unstructured these are you see how we are changing ok. Are there any models for these let us see let us go back. So, what is a structured problem? What is a structured problem? Let us see.

You see the very word structure you remember you look at your house construction ok. Look at your house sorry just give me some time. Look at house construction. What happens with the house construction? In house construction just give me a second; sorry; in house construction, what is happening?

In house construction, first the iron pillars the sorry the iron bars are put in right iron bars are put in and they are tied like this right. They are tied like this. You remember if you have seen the house construction the iron bars are put like this, then what happens.

They put a wooden protection around it or a steel protection around it and then they put the mixture of stone, chips, cement sand and they make a mixture with water and they put in this. So, this casting and then this becomes a pillar. Remember in house construction or a bridge construction then this becomes a pillar. So, what are we doing?

This is a structure this is the structure ok. What is happening? In a structure, this cannot sway this way or that way right this cannot sway this way or that way. This is not allowed. This cannot sway right. So, what is a structured problem? Structured problem is

very-very well defined; very-very well defined structured problem. It cannot be interpreted in any other manner, cannot be interpreted; it is very-very well defined; ok.

For example, your wrist watch. It is moving in a particular motion very well defined. It will move in that particular motion ok. So, it is very structured. Semi-structured as we mentioned that there is a element of structure, but then lot of elements are there that is left to the manager to solve for himself or herself.

What is a non-structured problem? Things become things are so new or things have developed in such a manner that it is no more a structured problem. It is so new to the world that you have to develop new methods; ok.

Go back to that linear programming problem once again. Go back to that production problem once again ok. We had you remember 2 units of product A, 3 units of product B and 4 units of product A and 5 units of product B were required to manufacture product C and product D right. This was the problem. How much was the material availability? Material availability was 30 and 40.

So, you see you cannot move out of these bounds you cannot move out. So, this is an example of a structured problem. You cannot move out of these bounds. This is the structure.

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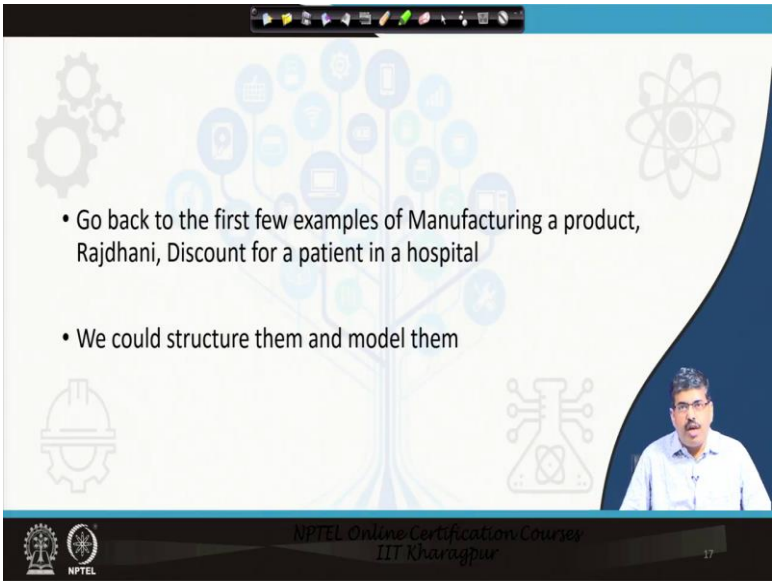

Go back to the first few examples of manufacturing a product Rajdhani discount. We could structure them, we can model them.

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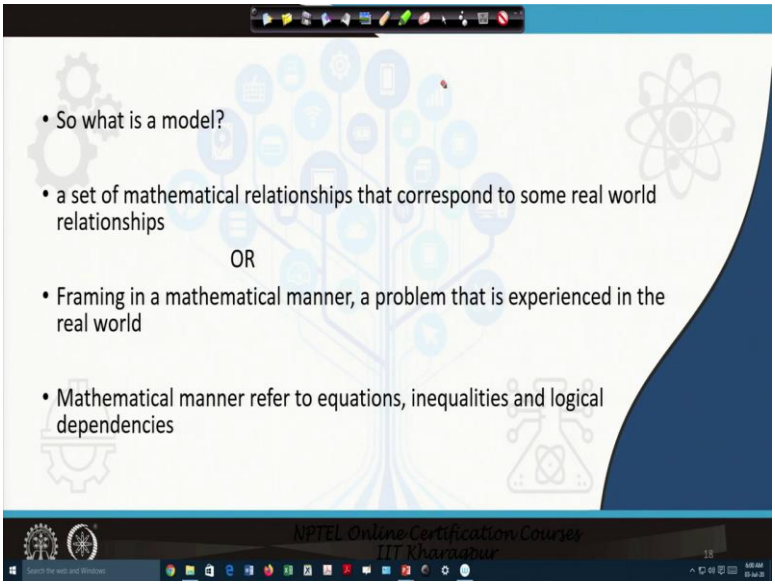

So, what is a model? A set of mathematical relationships that correspond to some real world relationships. Look at the Rajdhani example. It is a real world problem. What are we doing? We are applying the formula of distance is equal to speed into time. So, we are putting a mathematical relationship we are putting a mathematical relationship that corresponds to the real world problem or framing in a mathematical manner a problem that is experienced in the real world. We are framing the problem in a mathematical manner.

Go back to that manufacturing problem; A, B, C, D, the raw materials and the products; we are framing the problem is; that is just a situation that every industry is facing. We are framing the problem in a mathematical manner. We are framing the problem in a mathematical manner that is experienced in the real world just to get to know how things will happen in my industry and mathematical means equations, inequalities, logical dependencies.

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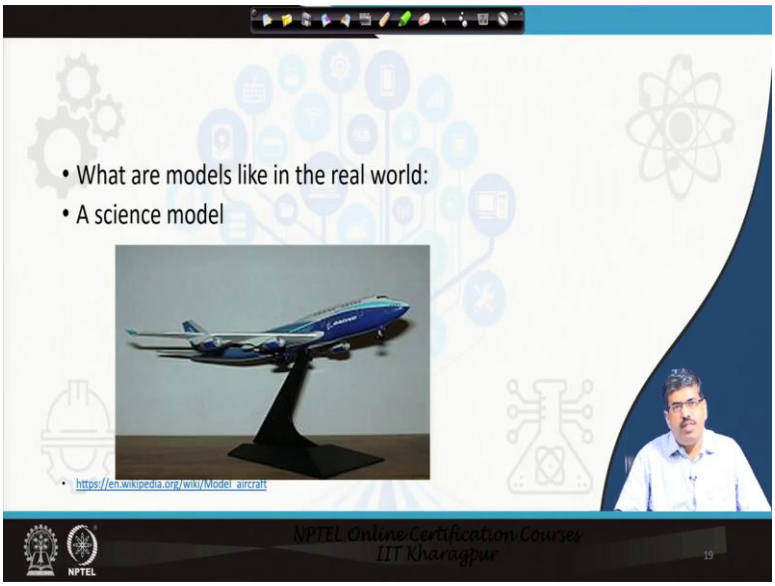

So, what are models like in the real world? This is a science model ok. We are all seeing these types; ok.

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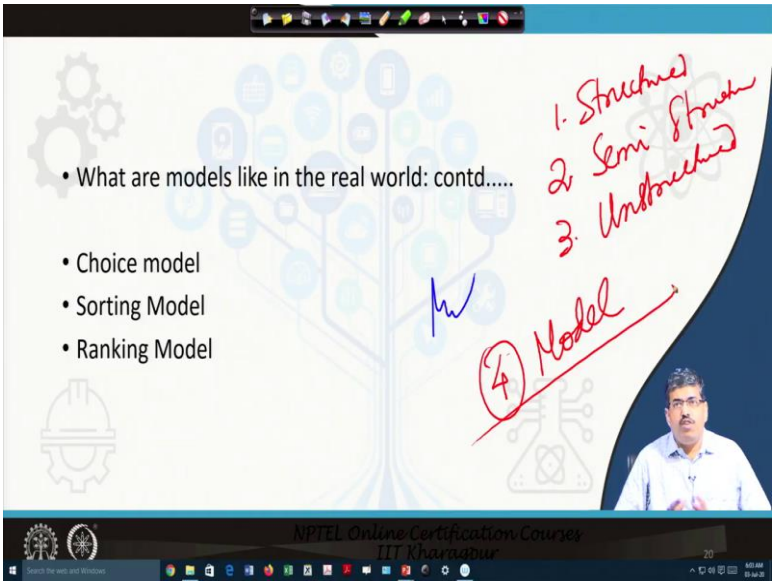

In models; model, as we said, it is a mathematical. These are choice models are there sorting models, ranking models. What are choice models? You have to take a decision which one do I choose. Do I choose product A, product B or a mixture of both? Choice model. Ranking models, how do I rank different attributes ok? For example, I am buying a toothpaste. There are so many brands available. How do I choose?

So, priorities are given. I want fresh breath. I want only ayurvedic ok. So, ranking models, choice models, sometimes some sorting has to be done based on different situations. So, sorting models we will come to these later on. So, models in real world are like this; ok.

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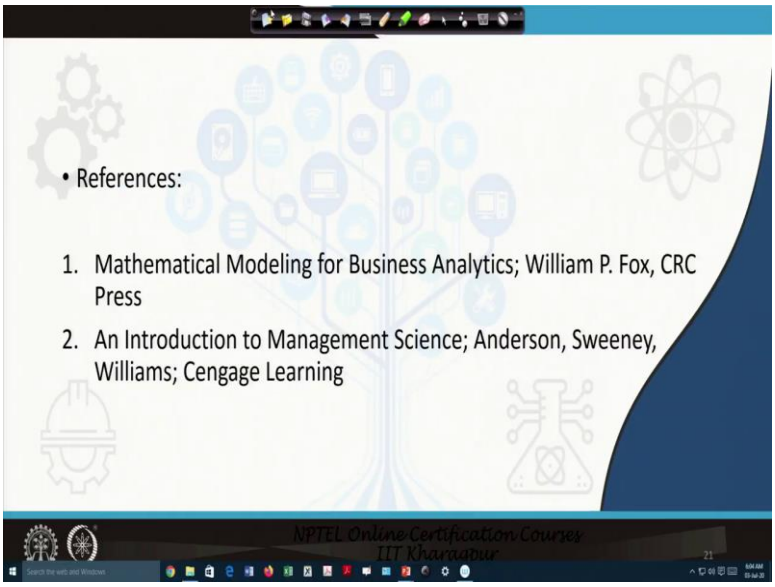

So, this will. So, and these are the references for today's class. What I want to say is that what are we learnt in summary today. In summary, we have learnt. Anyway, there is no problems. In summary, we have learnt; what is a structured problem, what is a semi-structured problem, and what is an unstructured problem and 4th basically, what is a model; ok.

So, structured, semi-structured, unstructured and 4th is, what is a model? Right. So, just to recap; what is a structured problem? It is within; it is within bounds. It has been tested done so many times that we can frame it mathematically. And every time we do it we will get similar results reliable results, dependable results structured problem.

What is the semi-structured? There is a structure hospital costing, but sometimes things become a bit dynamic. There we will have to use our ingenuity and develop some new methods semi-structured. Unstructured a chaos has happened. So, how do you solve it; ok?

So, and what is a model? It is a mathematical representation of what is happening in reality; ok. In the next class, we will do why, how, etc.; these models, how does it work, when does it do not work, etc., etc. and slowly we will move forward with what is model in the decision support system; ok. These are the references, you can go through them.

Thank you!