Business Analytics for Management Decision
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Lecture - 05
Introduction to Business Analytics (Contd.)

Hello everybody. This is Rudra Pradhan; and welcome you all to this particular lecture. And in the last lectures we have discussed about the decision models. And I have given you the background how you to actually come to the decision models, and then you have to take a management decisions.

So, the observation is like that you know you have data, and then you know problem background then using data problem backgrounds you create a kind of decision models. On the basis you know decision models, then you will find out you know some kind of inside or you know inference on the basis of that inference, then you will take some kind of management decisions.

This is how the particular you know moment is all about. Let me give you some kind of snapshot this is what actually our background.

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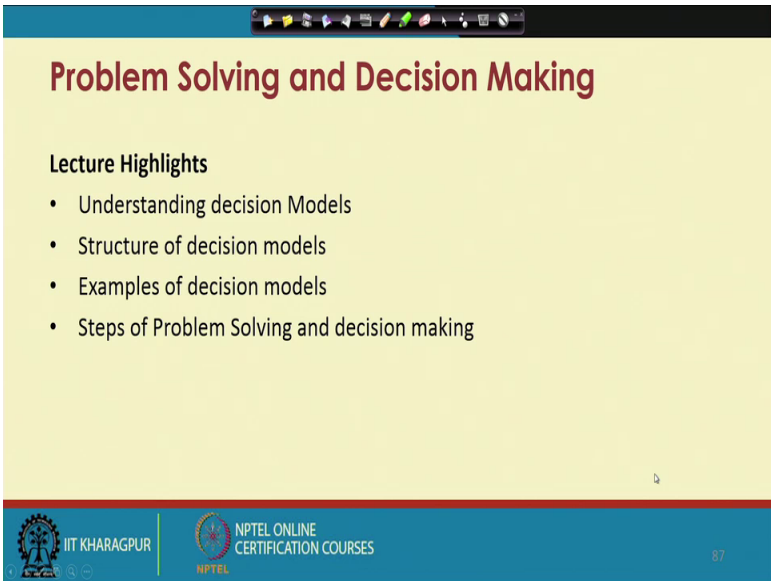

And today's lecture highlights are like this. So, little bit more understanding on decision models. And structure of the decision models, examples of decision models and a various steps to various steps for problem solving and decision making.

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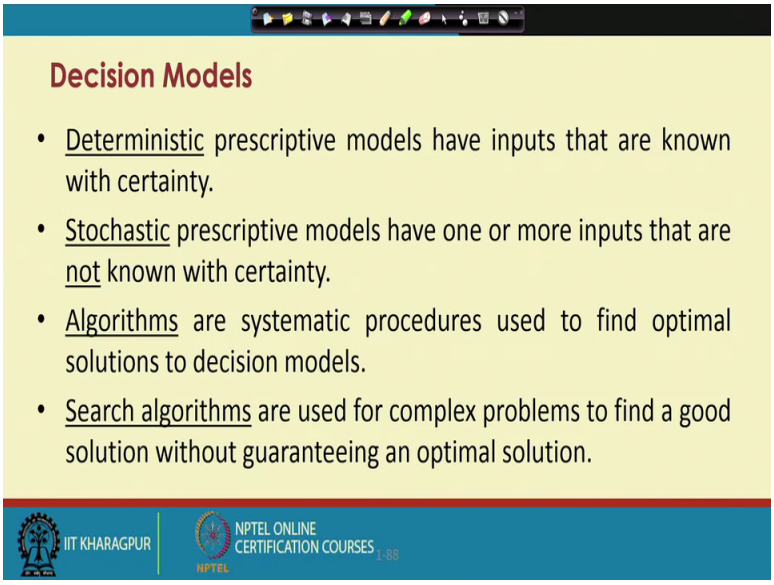

Decision modeling's what do we have already discussed is like this. So, we have a 2 different types of you know models. So, first models is nothing but called as deterministic, and the second one is called as stochastics which we have already highlighted in the previous lecture. So, in the deterministic the structure is very simple and you know easy to handles and you can easily predict the kind of business requirement. But stochastic model is not so easy, a it is a little bit complex compare to deterministic models. And here is in the stochastic kind of modeling and mermen, we are connecting with decision and certainty that is why the difference between the 2 typically depends upon the presence and you know absence of you know probability.

But anyway, once you design the models then; obviously the idea is that you know you prepare a kind of structure you know the kind of path through which you can actually predict the business you know requirement. And sometimes since the process is very complex sometimes you know as per the kind of involvement of variables or the kind of constants, and the kind of risk and uncertainty.

So, easily you cannot actually or you know manually you cannot actually a do the things. So, we have to develop algorithms and the algorithms are you know usually called as a

systematic procedures used to find out optimal solutions and the basis of you know decision models. So, searching algorithms are used for complex problems, and means you know search algorithms which we are used for complex problems to find a good solution without guaranteeing any kind of optimal solutions.

So that means, actually what I told you earlier, we are actually in a search process. And the search process is not actually static, it is completely actually continuous in nature, which actually I have discussed in the long back you know. It is a kind of continuous process all together start, starting with problem identification the review of past literature, then you know developing model's data, then data analysis, then you know the kind of results inference then the kind of sensitivity connectivity a robustness connectivity.

And then finally, to get the kind of best output and that to for you know as per the management requirement. And the simple summation is like this that it is not at all actually static process. It is actually continuous process till you get the best kind of situation. And a the fact is that you know there is nothing that is called as you know best, but you know at a particular point of time you will say that this is the best compare to you know several alternatives.

So now usually we call as you know best in the search process when we have a couple of alternatives, and within the couple of alternatives we will see which one is the best compare to you know others. But that best cannot be actually constant for veers. So, it can change with respect to change of the situation. So, that is why whatever maybe these kind of an environment, we are always in the search process. And the search process is actually continuous. And like you know learning is not at all actually infinite it is a infinite.

So, the root of you know business analytics in the search process is also kind of infinite, but with respect to time kind of requirement or the kind of need. So, we have to actually fix everything then you will be; find out some kind of based as per the requirement. If you say everything is infinite then you are not in a position to take some kind of decision.

But at a particular point of time you have to fix everything then accordingly you have to build the models, and you will get some kind of management decisions. Ultimately these

a process through which actually you have to go for you know some kind of management decisions.

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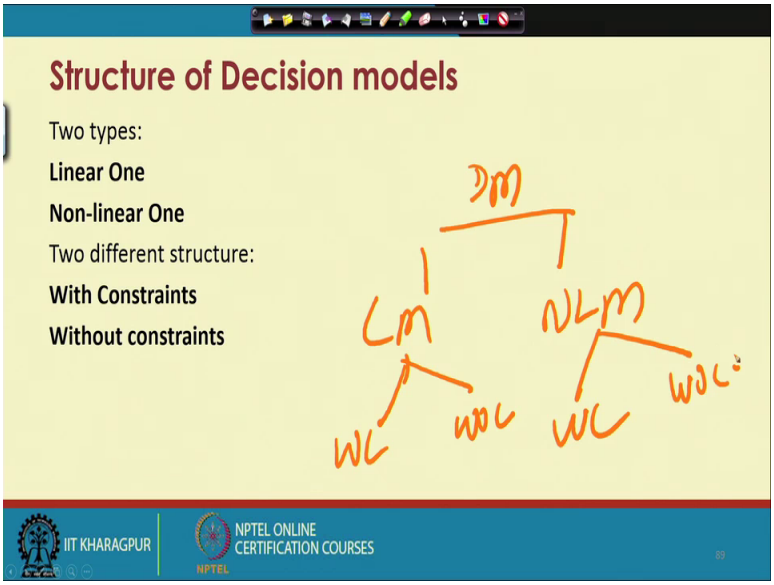

So, the structures of decision models are actually like this. So, it can be linear one or it can be non-linear one which I have already mentions. And agains so, there are 2 different structures it will be like this. So, the decision models technically can be 2 types, the linear models and non-linear models. And linear models can be with 2 types with constants, and without constants. And this is also with constants and without constants without constants.

So now technically a technically a depending upon the problem or depending upon the kind of business environment, your model can be fitted in any of such kind of environment. So, whatever maybe the environment, it is our actually requirement. So, we have to fix as per the as per the kind of problem structure, and then we are looking for actually the best fit or best kind of, a requirement and once you find out the best fit or you know best structures, then that can be a utilize or that can be used for you know better management decisions and that to as per our business requirement. So, this is how we have to proceed.

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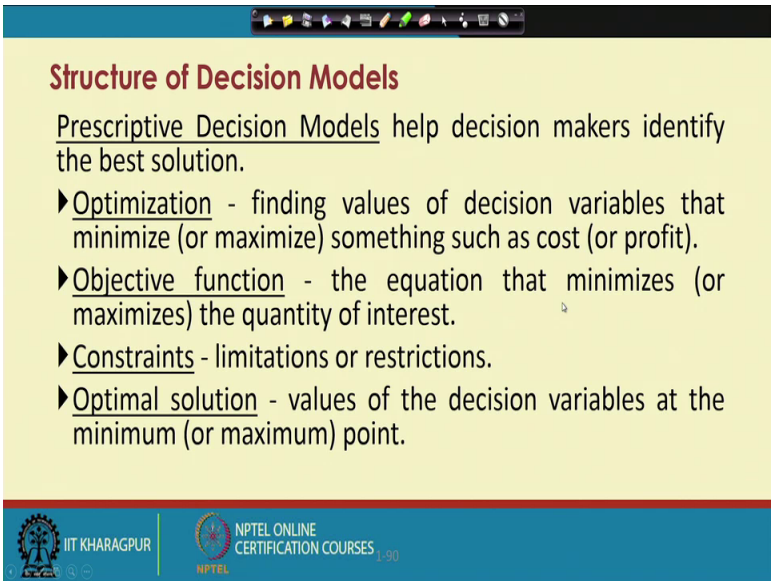

The structure of decision model is like this. So, we have already highlighted this particular you know, structure then a any kind of in the you know business decision models that to mostly for you know prescriptive kind of analytics. So, we are you know having such we are having actually such kind of structure. So, obviously, it is the it is the nothing but you know optimization structure where we are we are mostly keen on you know values of the decision variable.

For example, what should be the a quantity of production, what should be this a kind of profit structure, what is the kind of core structure. So, that means, we like to actually a target a particular you know a variable, and the amount of that particular variable so that you know we can a reach our target or you know we can a reach as per your you know management requirement. So, that means, technically we need to take a management decision. For instance what should be the level of production for a particular time, what should be level of profit for a particular. So, without to having the particular model or you know structures you cannot actually just fix accordingly.

So, this is how we are actually in the process to find out some kind of strategy, or some kind of structure through which you have to take a decision. So, in the decision model the standard structure is the most have a kind of objective structures, and that to starting with tool wise we are actually applying here optimization tools, and when we have optima using when we are actually using optimization tools. So, then obviously, this will

be this will be the structure of you know or the game between fixing objective function and constants.

So now, accordingly the optimization will give you the idea that you know whether the particular function you like to optimize with respect to maximization, or minimization subject to constants or without constants and if it is the constants, how many constant how many variables all these things will be there always. And then you to take a kind of you know or optimum solutions. So, ultimately you are looking for a optimum optimal solution or optimum structure through which you can actually a gets some kind of management decisions.

Without knowing the particular structure, without you know determining the particular structures, you are not in a position to optimize a optimize a something like. So, it is actually all together long journey. So, starting from the data structures the kind of data ability, then the kind of a problem background problem environment then you know with the help of analytic stools then you prepare a models that model itself will give you some kind of signal or route through which you can take some management decisions.

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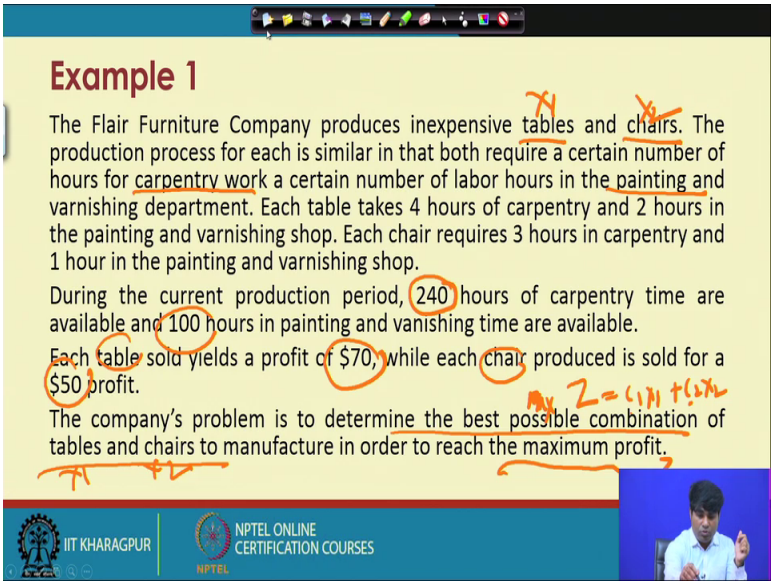

I will give you some examples. Actually, when we are talking about the kind of a models altogether; so we are giving some kind of effect-based kind of situations; that means, technically a the decision models can be linear one can be non-linear ones. And a sometimes you know you know a depending upon the situations, you have to you have to

design the models. And accordingly, this model will give you some kind of better inference.

So, this is actually, I will give you 2 examples; this example one this is actually linear programming problem examples.

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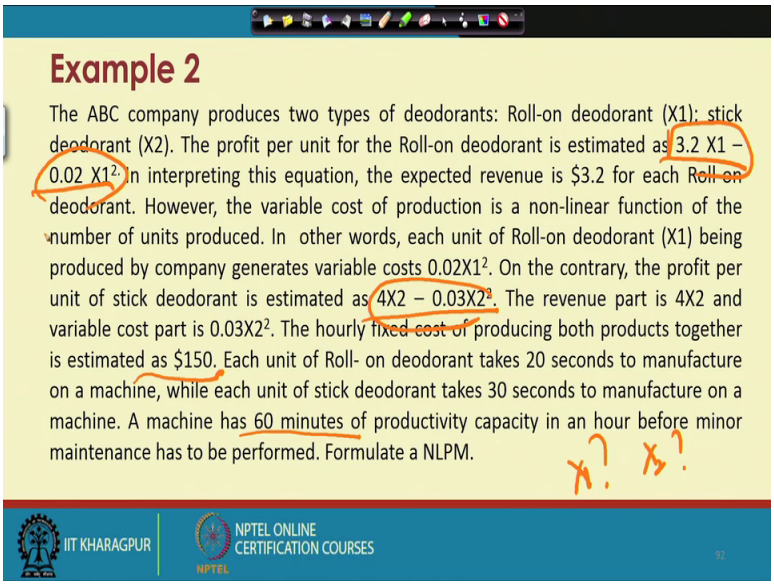

And the second example is nothing but called as you know non-linear programming you know problems. So, the with the pre-first one is the case of in a linear programming, where we have actually 2 variables it is a production problem all together and there are 2 products and 2 constants, and the constants has a some kind of limits; that means, it is a since we are in the optimizations then; obviously, we have to we have to fix the kind of availability. Or the kind of limit, once you fix the limit and the kind of restrictions, then you are going to optimize. Otherwise there is no point to or you are not in a position to optimize a this particular structure.

So, it is nothing but actually 2 into 2 games, 2 products with 2 constants. And then we are looking for some kind of; that means, a if you analyze I am not going to discuss this problem in details. So, you all can you know transfer this theoretical information into particular models. This is actually the idea is that you know, how a theoretical information can be quantify into a decision model. Like which we have already highlighted that you know lock demand or lock some supplier quantity demand depends

upon price or quantity supply depends upon price, that is actually single a single equation models.

And here is we have a single equation model with certain constants, and that to with respect to 2 variables. So, 2 variables are here a table sensors. So, if you put tables equal to x 1 and chairs equal to x 2 then by default. So, that means, technically this is how we are. So, this is you this is actually all right. So, like this this is a tables and this is a chairs, put this is x 1 and this is x 2. Then you know you have a constants this will be actually process through 2 departments, and then carpentry and then this is actually painting. And you have actually current production period 2 hours, this is actually a kind of level requirement constants. And this is how this is how are level requirement constants for you know painting department; then as a result how you can actually streamline the process. And here is so, the last message giving that you know determine the best possible combinations, now tables and chairs; that means, how much x 1 and how much x 2 we can you know produce so that you can you know maximize you know your profit.

This is have the standard kind of structure. So, that means so, you have to fix a you know model how much actually profit you are assigning initially. So, he you check it here 70 percent, 70 dollar is for actually tables and then for chair it is actually 50. So, that means, technically the standard message or standard transformation is like that you know maximizing objective function, let us say a the structure will be I can write like this Maximizing z equal to c 1 x 1 plus c 2 x 2 subject to 2 constraints. Then c 1 is nothing but actually here 70, and x 1 is nothing but tables.

Then similarly a chair is nothing but c a x 2 then 50 will be coming under here c 2. Then as a result so, the conversion will be z maximize z that is objective function equal to 70 x 1 plus 50 x 2 subject to 2 constant, then you like to optimize and then you get to know with the available constants or you know limitations or you know conditions, what should be your number of table productions in a number of chairs production. So, that you can actually have a more profit for the business. So, this is a task for you can actually you, can transfer and you can check the model accordingly. And corresponding to example ones, we have here second problem. And this is actually non-linear model, again it is with respect to actually 2 different production together. But here the structure again it is a profit business. So, it is again between revenue and cost.

So now here actually we have a 2 different equations, one particular structure is this ones, and another particular structure is here this ones. And this is actually say it is game between profit and that is the difference between total revenue minus total cost, since there are 2 2 different products and you have a 2 different revenue functions. So, you have to just add it and this is actually a fixed cost. This is actually fixed cost, and then finally, you have some kind of constants. So, 20 for a first one and 30 for second one and total availability is this much. So, that means, like the previous 1 this this particular problem can be also converted into standard format, you have again objective function subject to a constants. Then once you design this model, then this model can be again you know optimize to know the values of x 1 and values of x 2.

So; that means, technically a here the standard a observation is the how much x 1 and how much x 2. That means, what should be the quantity of x 1, and what is the quantity of x 2, subject to these are the restriction and these are the conditions. So, you convert into a particular methodical model then think about the kind of solution. The fact is that you know actually now the question is you worries the business analytics. So now, this is actually the kind of the last part is the prescriptive analytics, where you are looking for actually the values of the decision variable. But ultimately this equation and this equations we need actually some kind of predictive analytics. So, that means, before that we have a some kind of data, and that is what information related to x 1 and x 2 with different kind of situations.

Then using this data you have to fit the model like this, transfer this data into model, then after that we will apply the kind of prescriptive analytics to take a some kind of management decision what should be the size of the x 1 and what should be the size of x 2. So, that the business can go to at the highest level as per the requirement of you know, or expected level of you know profit or something like that.

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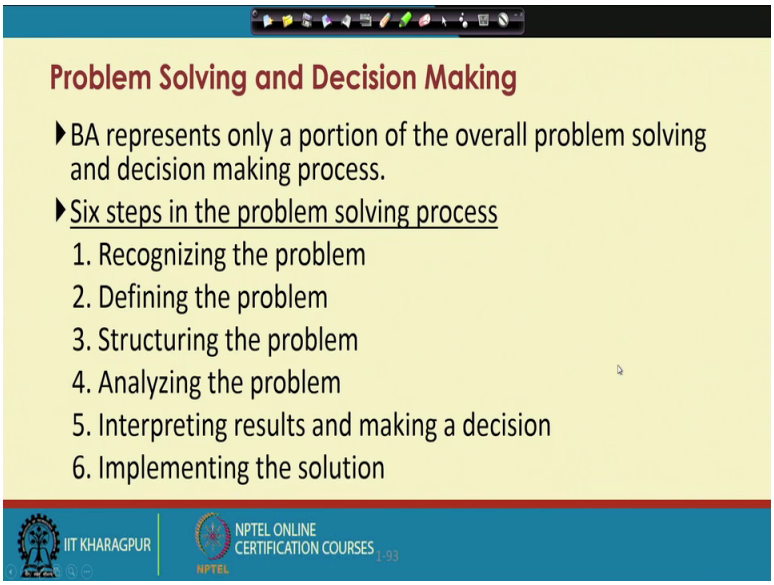

So now so, for as a you know decision models or concerns. So, it is actually we are here discussing how you have to actually operate in this prescriptive analytics. So, it is all together 6 step process. So, first step is the understanding of the problem. So, you have to recognize the problem, whether actually see a you starting with you know let us say you know data. So, data itself will give you the message that you know you understand fast then connect with a problem. Once you understand the data connect with the problems then you are in a position to build the models. So, once you get the model, and that will give you some kind of path for you know decision making process. So now so, fast particular structure is you have to understand the problems. So, recognizing the problem is the first step type of this decision making process.

So, then again defining the problem properly; so once you middle the problem it should be clearly the message should be very clear what should be the kind of focus of or what should be the kind of target, and a the model is you with respect to what kind of limitations or you know conditions all these things. There should be model cannot be actually developed or can be prepared without any constants or you know conditions.

So, there will be definitely this model is it a is a restricted models with different situation or you know different condition, but in any situation. So, once you have a models and you have are looking for a kind of solution to the business problem. So, you have to be very careful and you have to come with a solution with all these condition and constants.

Then after that you are searching for a kind of best decision. Then third part of this particular process is you know structuring the problems, you need actually proper structure to go for some kind of solution, then analyzing the problem. And fifth step is a on the basis of analysis you have to interpret the results and then take a decisions. And finally, a once you get some kind of results how best you can actually implement, it because you know sometimes what happen you know we are developing something else, and you are not in a position to implement.

If you are not implementing then you know the entire process is actually you know useless. So, you do in such a way that you know it should be applied for instance. Any innovation or any kind of technological development may not have any value if you do not have apply it. So, that means, any product or any kind of you know results or output you know deriving from any different situation or any different structure it should be applied actually; so any kind of output to whether it is a product or process or something like that. So, if you do not find any application or you know implementation, then it is no valuators the entire process, you have to tell useless. And that to it is very costlier you know all together.

So, you must be very careful how you have to actually update, that is why. So, the process is not actually again a very simple one it is a very complex. Because with the with the objective that you know it is should be applied finally. And you are coming with a some kind of decision, but the decision is not actually implemented. Why it is not implemented? Because your decision may not be may not be very effective and why not effective because the process is not.

So, your process maybe something wrong actually. Or your problem identification or you know orientation or structuring or some are you know there is a something wrong actually. That is how you know it is again contagious process, when it is not implemented means there is something wrong again you have to you have to actually revisit and again rework then finally, come to a solution; obviously, since you have a data you have a kind of problem understanding then you have a techniques, and I do not think that you will not get a proper model through which you can take a decisions definitely. Since everything is there it is actually a the requirement is you how best you know you have to connect the things properly.

It requires actually proper ordering or you know kind of processing. So, once you do all these things in a systematic way, then definitely you will get of a exact result or proper result through which it can be used; it can be implemented and it can be actually a as per your you know requirement this is how the a process all together.

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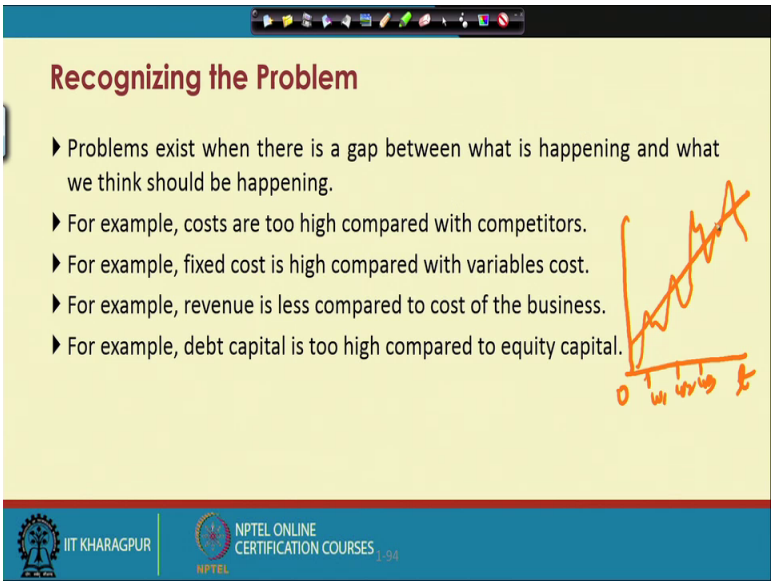

So, let me give you some kind of these are all 6 steps, but you know I will be highlight what are these 6 steps. So, first structure is the understanding of the problem. So, here so, for understanding is concerned the simple the simple structure is you know, problems exist when there is a gap between what is happening and what we think should be happening. So, that means, the actual kind of you know environment and what should be the reality. So, that means, a the difference between actual happenings, and what should be a happening. So, that is how see kind of target.

Once you fix the target then; obviously, you to reorient accordingly. So, without knowing a actual or without fixing the target you cannot actually reorient yourself. So, when you are when I am saying you know it is a kind of continuous search process something like that. And obviously, there should be a target otherwise if you do not fix the target and goals, then you know how you have to actually you know reinvestigate revisit all these things you know, you have to you know, look into this matter right. So, there should be actually see there should be actually kind of target.

So; that means, the data itself will give you some kind of actual kind of effect or actual observation, then we use actually analytics, then you know we like to the transport the particular you know path to the towards you know target only; so once you that is you actually kind of training kind of things; so training them to implement. So, like you know the situation is like this you cannot give the best until unless you trained properly. So, over the time loan practice that is what actually con continuously revisit relook like this then you know once you trained you know smart to develop the model properly. Then then you can actually you know you know do the best, or you know to you know contribute towards the best that is how the process of you know optimization or you know decision modeling.

So, that is why is so; the thing is that like this. So, you should know what is actual effect and what should be the actual these are requirement. So, with the whole idea of business analytics is like that that you know, we like to breeze the gap between the actual effect and you know trend a trended effect.

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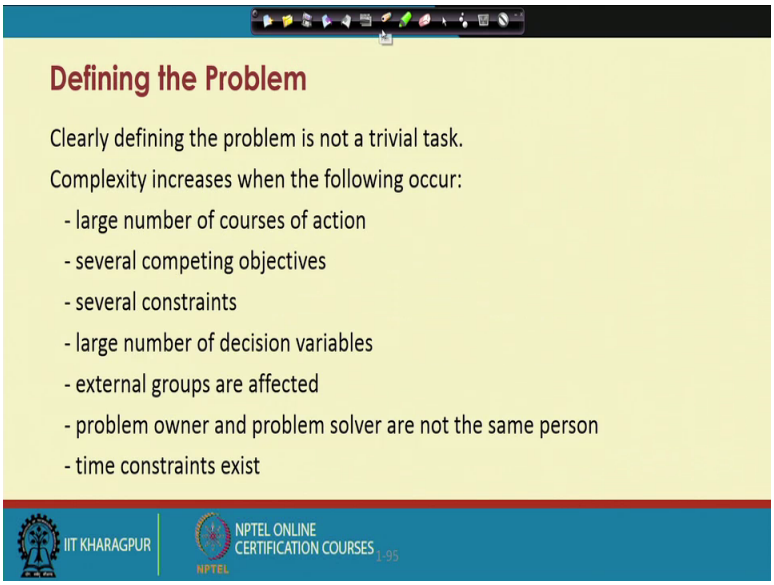

So, it is like this so, let me put let me put like this see here is. So, the thing is that you know let us say I will put like this, I will I will I will I will put environment like this. So, this is this is the let us say sales kind of environment, you know sales environment sales with respect to time. And if I am this is let us say time is weekly, week 1 week 2 week 3 and so on, and I am plotting the actual phenomenon may be like this.

And the desired phenomenon will be like this. Or a it is something like that. So, let me clean once I will put in a more attractive way. This is 0 to week 1 week 2 week 3 and so on like this. So, this is the actual kind of a flow. And this could be the desired flow. So now so, we should have a flow like this, right the straight-line will give you the kind of the expected flow and this is the actual flow. And initially at the actual outputs are not actually trained outputs. Assuming that you know these are all not and without trained these are all happening. So now, with the kind of training or you know trained. So, then the particular moment can be actually streamlined. And then finally, it like to converge towards you know the expected path. It may not be exactly converging towards the expected path, but it should be close to expected path.

This is what we actually need. And that can be that can be possible only if we can you can actually understand the problem and dev develop the problem the second task of this particular requirement is you know defining the problem. So, here the idea is that you clearly defining the problem it is not it this particular process is not a trivial task. It is actually a be careful and address properly. A if you do not address properly or not defining properly then again there is something wrong, and that will give you some kind of bad impact to the decision model. So, that means, what is the standard message is like that you know every stage you must be very careful actually. So, any kind of mistake or little bit a kind of problem.

So, the entire structure may be in a different way. Because everything is well connected in a it is a kind of continuous process, but everything is well connected any mistakes may affect the other one.

So here so, we have com lots of complexities, when we when we like to you know defining problems. Like you know, you may have a large number of gots actions several competitive edge of a competing objectives, several constraint, large number of decision variables, external effects and a this time constraints all these things will be there in the particular you know process value where defining the problems. So, you have to take care all these kind of complexity while you are you know defining the problems.

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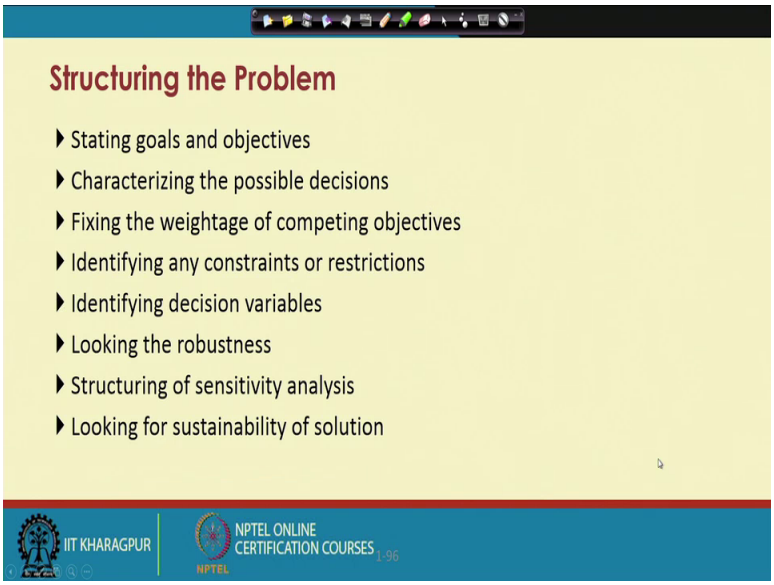

Then the next step is the structure structuring the problem. Starting with the goals and objectives; that means, you must be very careful about fixing how best you can fix the better objective, and featuring the possible decisions, fixing the weightage of you know competing object objectives, identifying any constraints or restrictions identifying the decision variables, looking the robustness structuring of the sensitivity analysis, then finally, looking for you know sustainability of solutions.

These are all some what I what you can as it is the kind of boundary or you know kind of conditions or restriction you are you know imposing with respect to your decision models. Once you fix all these things then; obviously, within the kind of boundary we will get some kind of management decisions, and that is the most actually, when you are going to take a decisions for a particular problem. So, you can you can develop a models with respect to different you know availability of data techniques tools etcetera.

But ultimately so, these are all under a particular you know conditions boundary. So, this cannot be actually you know kind of unlimited you know environment or you know unlimited situations. It is a always actually with a limited boundary. So, the idea is that until unless all these boundary. So, then you may not in a position to you know find out the optimum solution and that optimum solution may not be best. So, you may get, but you it may not be the best. So, that is why identifying all these things a at a time is always you know good to predict the best environment.

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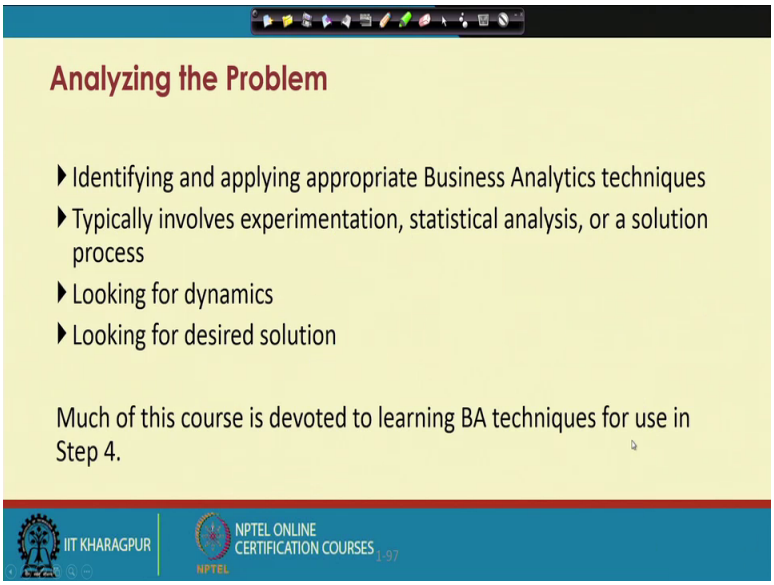

Then analyzing the problems; so here is we are identifying and applying the appropriate business analytic techniques, and typically involves a experimentation, statistical analysis and solution process. Then finally, looking for dynamics and looking for you know desired solution, which I have already told you it is all together you know continuous process. So, starting from you know data availability problem understanding a you know you picking up you know a appropriate statistical techniques develop a models, fixing all these you know condition constraints.

Then finally, a gets some kind of decisions values of the decision variables, and that itself will give you some kind of better insights or inferm inference for management decisions a as per your particular organization or industrial requirements.

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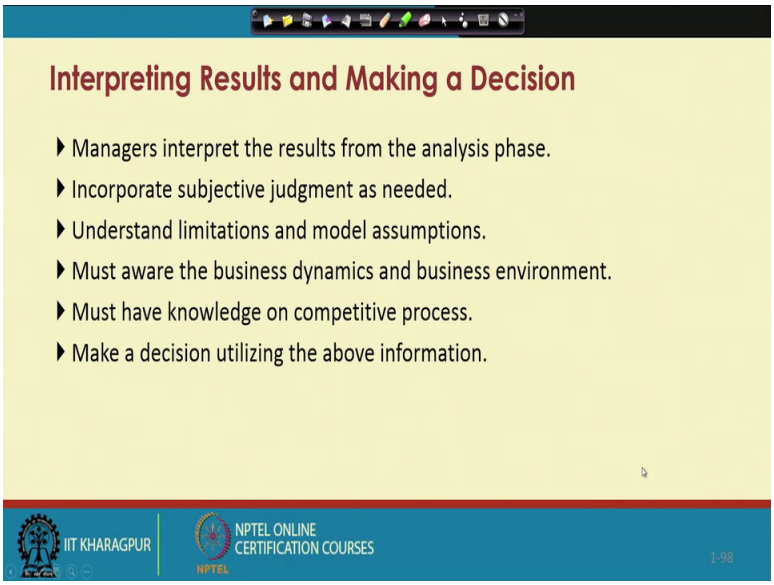

Then the next step is you know interpreting the results to make a decisions, sometimes you know managers interpret the results from the analysis page. A incorporate subjective judgment as per the requirement. Sometimes you know, managers may not be in a position to take a decision without knowing the actual happenings the actual effect. And sometimes as per the business requirement, analytics will give you some kind of path it cannot actually a just you know implemented.

It will give you the part if you do not know the actual scenario then you cannot actually judgment proper judgment as per the particular you know business requirement so that means, the subjective judgment cannot be very effective until and unless you know the actual the kind of requirement. So, that is why business analytics through business analytics will get a particular decision model or, decision the kind of environment. But that may be applied that may not be applied depending upon the kind of business requirement or some kind of subjective judgment, but there is a high chance that you know. So, the final judgment or final implementation will be very closure exactly close to the particular you know inference which we get from the decision making process.

So, finally, understanding the limitation and model assumptions must aware about the business dynamics and business environment, and must have knowledge and competitive process, because if when will we using some kind of subjective judgment to the particular decision-making process. And then finally, you are in a position to implement

you must have all kind of knowledge in and out of the business environment. Until unless all these things you are not in a position to take a decision. That is why it is very important that you must have all round of knowledge a in and out of the particular business environment.

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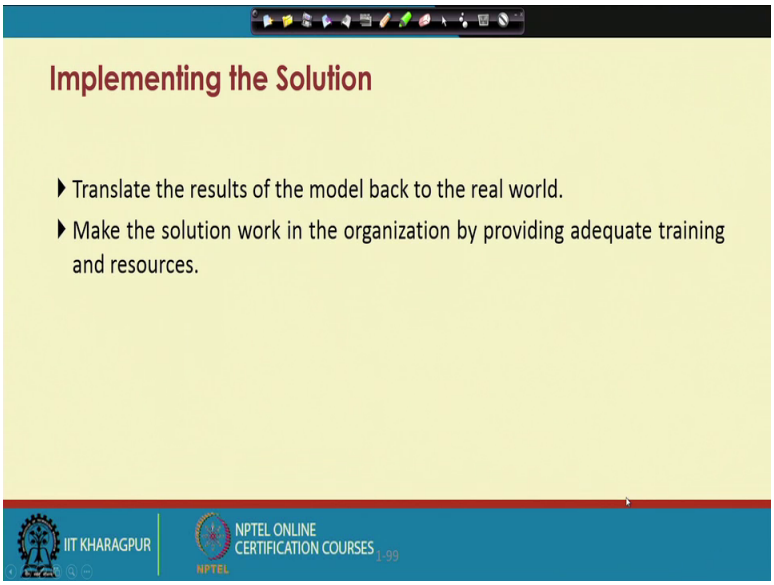

Then finally, implementing the solution translate the results of the models back to the real world, make the solution work in the organization by providing adequate training and resource. That is why I am saying that you know it is all together it is a kind of decision making process. Be careful how you have to apply and you know materialize the process.

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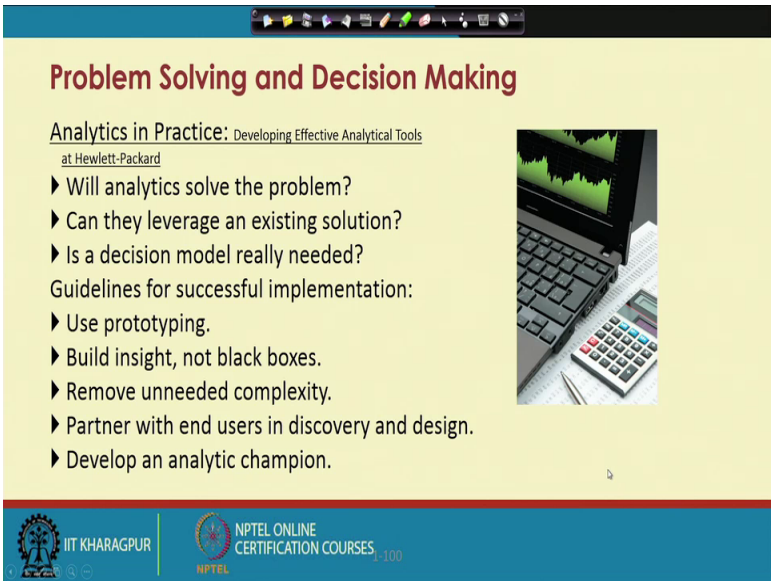

And some of the side examples are here is, and a I am giving you for yours reference, just about threat a read and understand how you can actually start with the problems, analyze the problems, and take a decisions, then kind of subjective judgment. And then finally, how best you can you know implement as per the reality.

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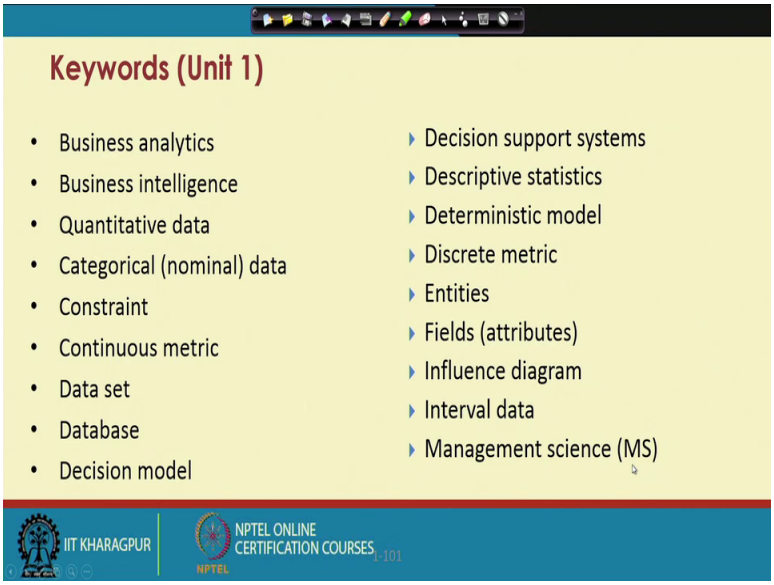

So, these are you know altogether you know keywords starting from first lecture to fifth lec fifth lecture. And this is all about the first week a you know structures, and that to you need to one. So, we have all these keywords, and go through all these keywords and

if you have any doubt we can discuss in the later stage. And these keywords will be frequent use in the rest of the units. But this is all about actually regarding this snapshot of you know introduction to business analytics.

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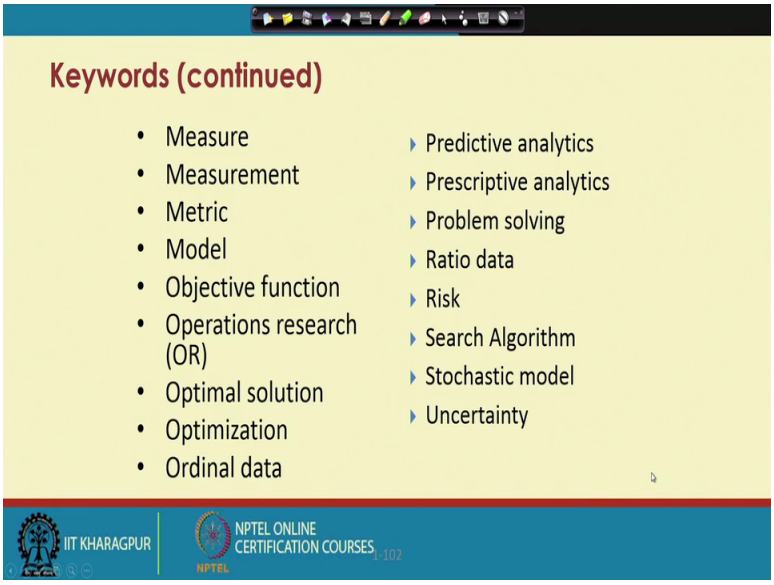

By knowing all these details about you know data, tools, techniques, the requirement the kind of structures all these details it will. I hope a you have that you got a better exposure to understand the now on the effect or the kind of the reality how you start and how to come with a kind of conclusion as per the business requirement and supersize a management decision is concerned.

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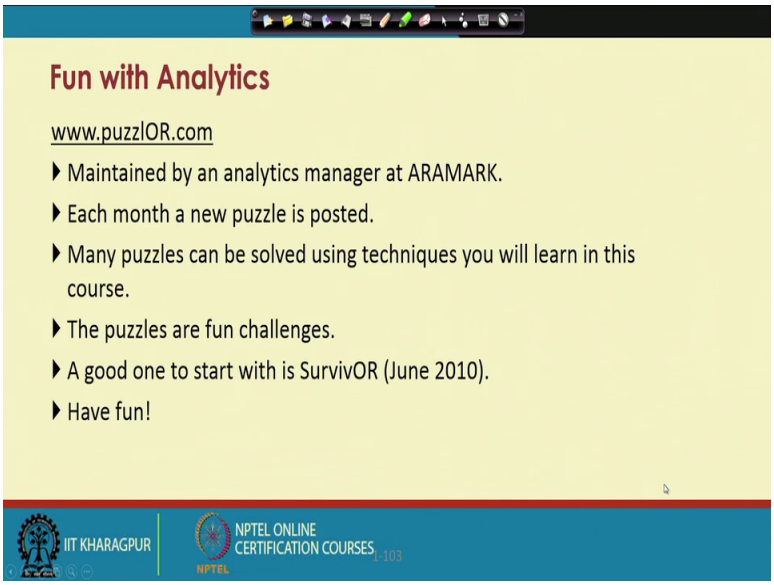

And some of you can visit this website and go through some of the kind of task which is the going through business analytics.

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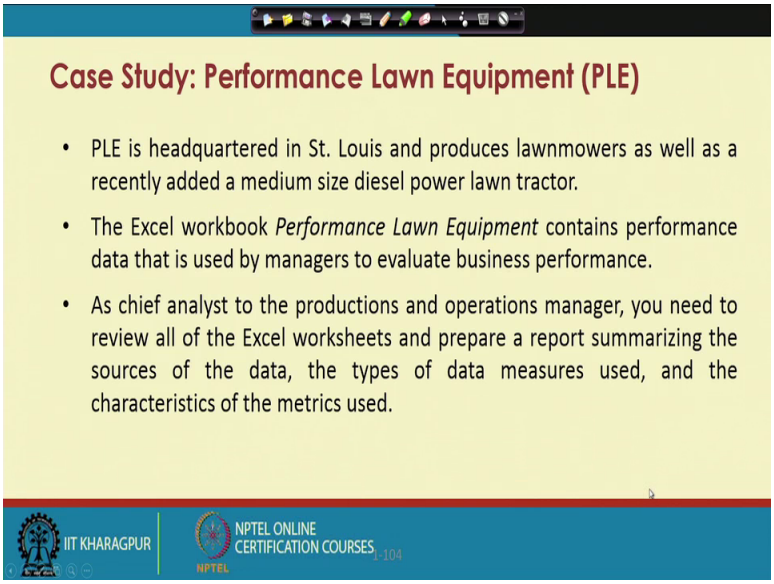

Some of the case study and these are the two references books.

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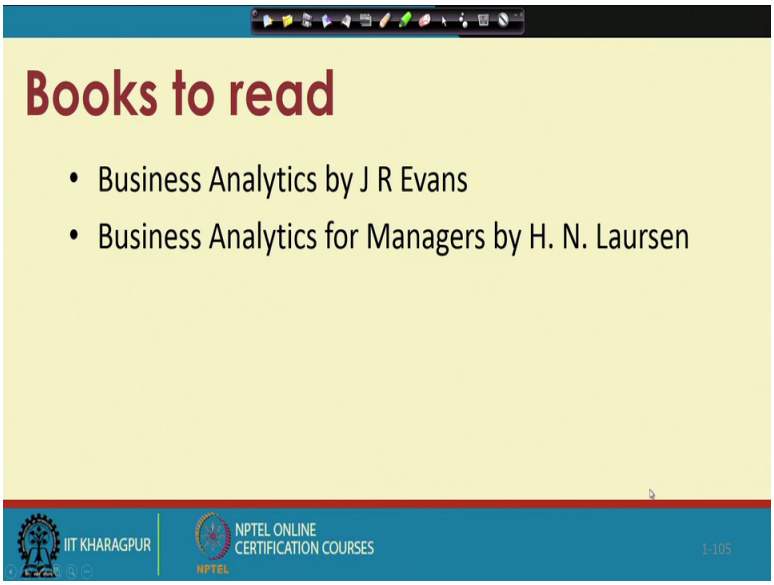

Thank you all. Have a nice day, with best wishes.