Project Management for Managers
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Lecture – 09
Methods of Project Selection- II

Hello friends, I welcome you all in this session in this session we will discuss about couple of project selection techniques in previous session we discussed about b c g matrix and mechanise matrix.

So, in this session let us discuss something called space diagram space diagram is also one of the project selection or project yeah project evaluation methods wherein we will evaluate different projects and products and we will take appropriate strategy whether we should continue with those products or not. So, it is a management tool to analyse and a company and decide its future its strategy isn't it, as I said whether you want to continue with that project or you want discontinue it right. So, you need to look at 4 points in this space diagram financial strength and competitive advantage. So, financial strength of your organization and how good you are at competitive advantages and compared to other competitors

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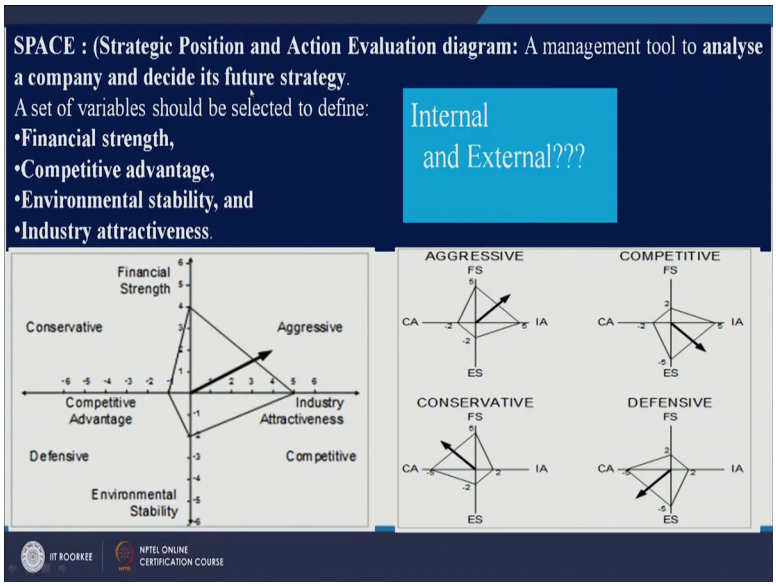

So, these 2 are internal to your organization, but if you look at environmental stability and industrial attractiveness these are external to the organization. So, we will see these

factors and according to particular situation we will take an appropriate decision for example, if you are your financial strength is good let us say on a; let us say 10 point scale if it is 4 and industry attractiveness is also fine right. So, government has given several incentives and government has given several facilities. So, industry attractiveness is very good. So, this is the situation you are you should be very aggressive. So, adopt aggressive strategy, but if let us say industry attractiveness is let us say this let us say the competitive advantage is this for example, and financial strength is this then it is always suggested to go for conservative strategy you need not be aggressive, but you need to be conservative if industry attractiveness is high, but financial strength let us say the environment stabilities low then you need to go for competitive strategy not the conservative one.

Now, if this is the situation for example, environment stability low competitive advantage low then go for defensive. So, you can have let us say these 2 are opposite 2 each other right aggressive strategy and defensive strategy you have you have got competitive strategy in this case and you have got conservative strategy. So, depending upon your situation in a particular coordinate you should adopt an appropriate strategy now what is the meaning of financial strength financial strength means.

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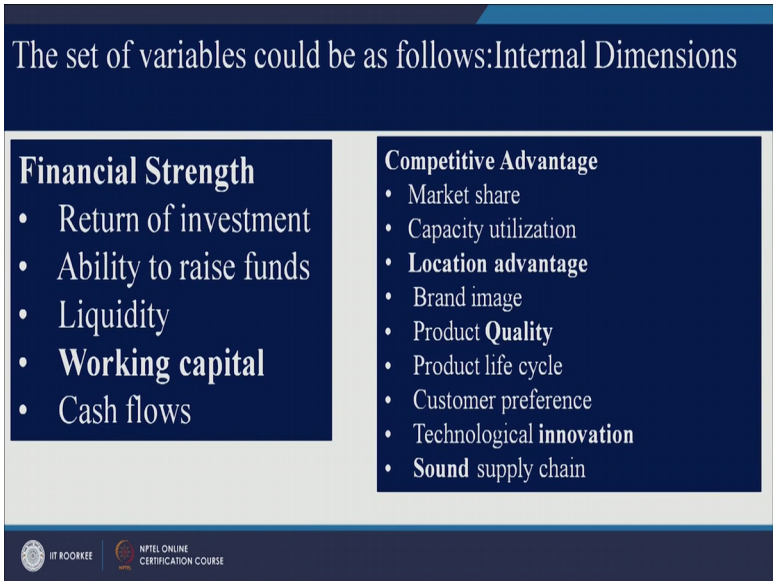

How good returns you are getting on investments how quickly you are able to raise funds whenever there is a need for example, if there is there is a need of financial you know if

you need some money then you may not you should not start negotiating with the banks at that particular point of time if you are having good relationship with the banks then you can get funds easily and that would be plus point for your organization.

How good your at liquidity do you have lots of case if it is then that would be a financial strength working capital expenditure if you are able to meet these expenditure smoothly then you are good at financial strength. If you look at competitive advantage then there are points like market share capacity utilization location advantage this is this is very good point as far as competitive advantage is concerned you can make lots of money if your business is at a particular location right. So, brand image product qualities all these things come under competitive advantage.

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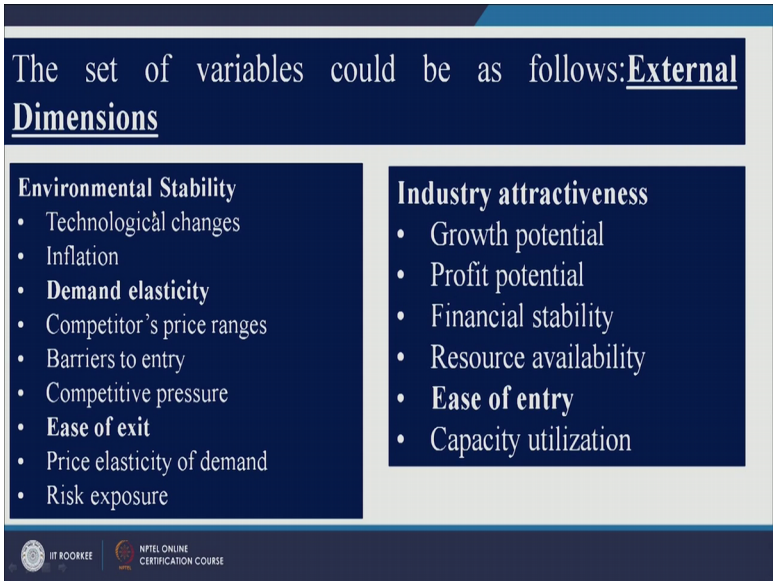

So, financial strength and competitive advantage and these 2 are what these 2 are internal to your organization, but if you look at environmental stability and industrial attractiveness they are external to your organization right. So, we will call it external dimensions right.

So, environmental stability what is the demand elasticity. I hope all of you would be knowing demand elasticity there are certain products for which elastic demand would be very much in elastic when I say in elastic demand means you cannot postpone the purchasing of those products for example, medicines for example, salt and so on right. So, these are couple of things you should look at under this particular dimension

environmental stability how easy to exit from that particular business sometimes you get into business, but it is very difficult to come out of business because of several norms several regulations several rules industry attractiveness, it is very similar the points which we discussed in mechanise matrix. So, how easy to enter what are the incentives government providing what are growth potentials what are profit potentials and so on. So, these are external dimensions industry attractiveness and environmental stability.

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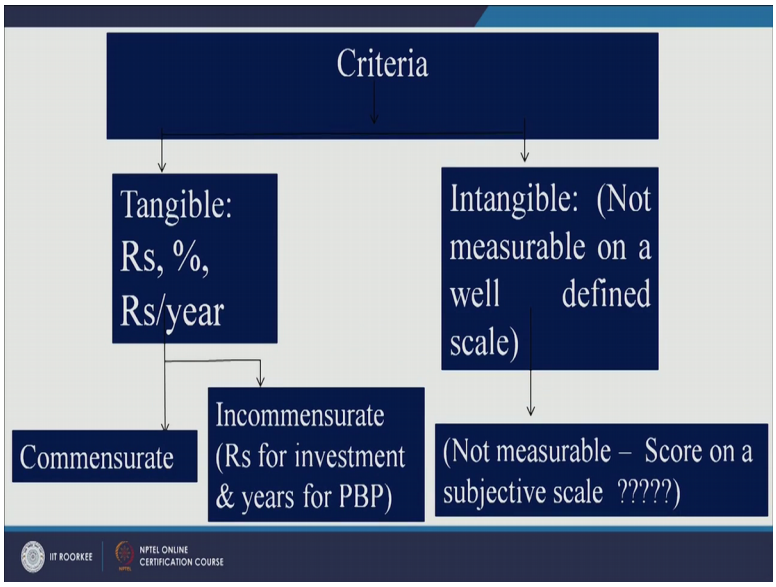

Now, after discussing this particular selection technique space diagram let us look at some more techniques, but before going for some more techniques let us decide what are different criteria on which you should select a project. So, selection criteria can be tangible can be intangible when I say tangible it means you can measure it either in terms of rupees or in terms of percentage growth or in terms of the rupees per year and let us say loss per year and so on. So, you can measure them, but on the other hand you have got some intangible criteria you cannot measure directly, but you need to have some subjective scale right for example, have to measure let us say image of the company. So, can have some let us say 10 points scale and then you can ask questions to the customers and then you say this is the image of the company right. So, you have get intangibles and you have got tangible criteria right. So, in tangible again many times you have got you can have incommensurate and you can have commensurate sub criteria under tangible criteria.

So, in commensurate let us say rupees for investment and years for payback period. So, so you can have different units, but you may also have same units. So, we would be calling them as commensurate sub criteria right.

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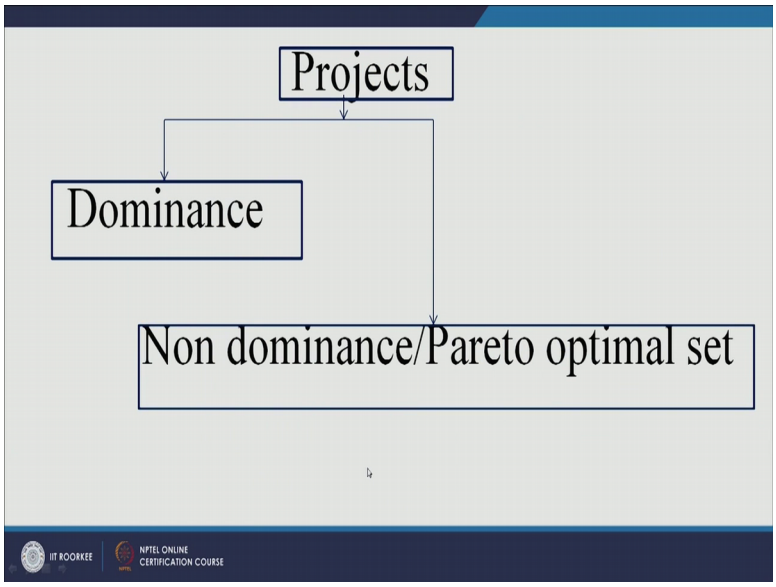

When you have project let us say there are several projects then you can have 2 types of sets first is dominance dominances projects and the other one is non dominances or Pareto optimal set when I say dominance means out of 10 project there is one clear winner which you would be taking up for your organization, but when you say non dominance or Pareto optical set you have got several projects which would be giving similar profit or similar IRR or similar payback period right.

So, let us look at what is the next slide. So, this is the slide where in you have got non dominance and Pareto optimal set.

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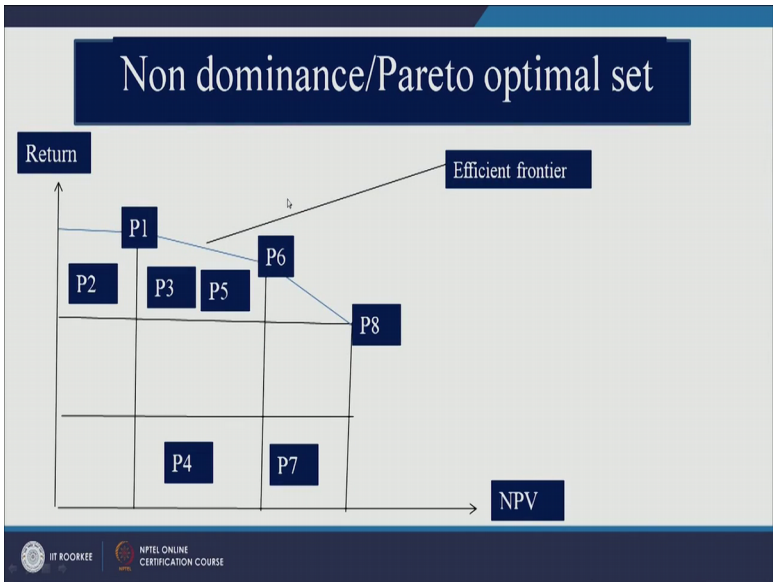

So, let us say you are selecting the projects on the basis of 2 criteria net present value and IRR right and let us say there are 8 projects. So, you have got let us say P 1, P 2, P 3, P 4, 5, 6, 7 and 8. So, if you look at for example, P 2 project now in P 2 project if you look at this is your return this is your NPV had there will only one criterion that that is return you would have definitely chosen this. So, out of these 2 criteria P 2 is good on this particular criterion this one, but not. So, good at NPV if you look at P 7 project it is very good at NPV and NPV is this much, but return is only this much. So, either you select P 2 or you select P 7 on P 2 you will get good returns, but NPV I slow here NPV is good, but not so good returns.

On the other hand, if you look at P 1 P 6 and P 8. So, P 1 this much return this much NPV P 6 this much return this much NPV and for P 8 this much return and this much NPV now this is known as efficient frontier. So, either you select P 1, P 6 and P 8 they all are equally good projects right. So, you would be getting let us say if you select P 1 this much return and this much NPV and this would be as good as selecting P 8 this with this much returns and this much NPV right. So, this is in this case this is a clear winner if you take returns as criterion right these are efficient frontier Pareto optimal set you can select any one of these right.

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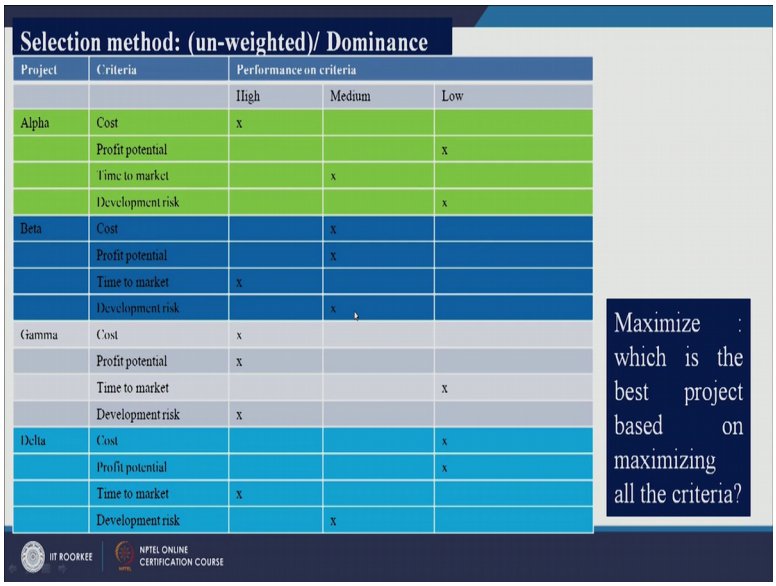

So, let us look at couple of other election methods this is the first selection method where in you have got the dominance project out of several projects there would be one clear winner one clear project which is which would be dominating other projects and it is un weighted will not give different weightages to different criteria. So, let us look at there are 4 projects and you could have alpha project beta project gamma project and delta project alpha beta gamma and delta and what are the selection criteria the selection criteria are cost profit potential time to market and development risk. So, what would be the cost of the project alpha, how profitable that project would be, how much time it will take to launch in the market and what are the risks involved in this project alpha.

So, if you look at cost is very high in this while profit potential is very lower where is alpha project is concerned time to market is medium it does not take much time right its quite medium and development risk is low. Similarly you have got beta gamma and delta let us look at these delta project cost is very low profit potential low time to market very high development risk medium. Now if I ask you a question out of these 4 projects which project you will select if the objective is to maximize all the criteria all these criteria can you think of this particular question and try to answer the question is out of these 4 projects which project you will select. So, that all these criteria are maximized. So, since we want to maximise all these criteria if you look at this, yeah, look at this gamma project this is high this is high this is high though we should not maximize our cost, but since your question is like that. So, you are saying that you should select gamma project

right because you want to maximize all these criteria right. So, this is one of the method it is an un weighted method and clear dominance of this particular project is there.

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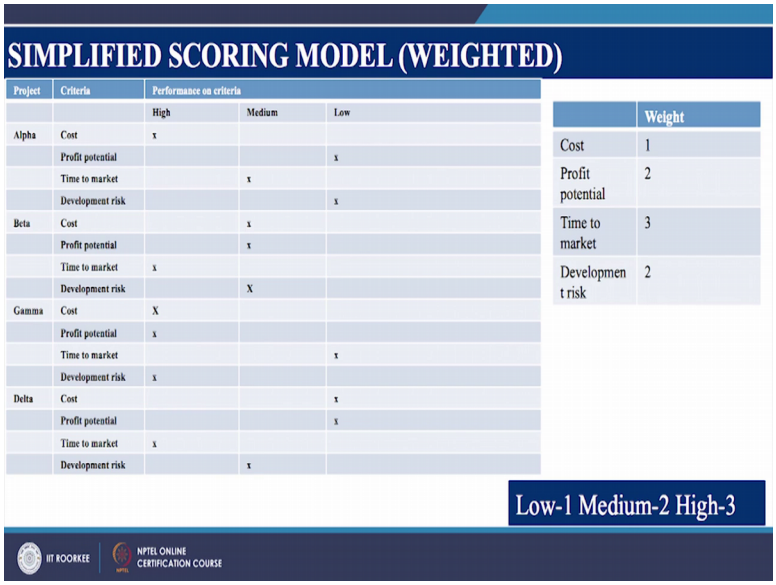

Let us look at second the next model which is simplified scoring model, it is a weighted one. So, we will take the same example of 4 projects alpha beta gamma and delta, but here we are assigning weights also. So, will assigning let us say weight is equal to one to cost 2 to profit potential 3 to time to market and development time development risk is 2. So, these are different weights and again we have we have we have assigned some weightages to high medium and low. So, let us assign this as this is a one this as 2 and this as 3 now you want to maximize all these criteria which product which project would be best one just think over it for couple of second and in fact, you need to write down the values also in this particular question.

So, hope you would have started solving this question let me give you hint. So, cost is one right. So, one into high is 3. So, this is how you should get it. So, this is 3 then profit potential is low it means one profit potential here is weightage is 2. So, 1 into 2 plus time to market this medium right means 2 2 into 3 6 plus development risk low means 1 and weightage is 2. So, just add all these things you will get number for this similarly for bet for gamma and for delta and the answer is beta.

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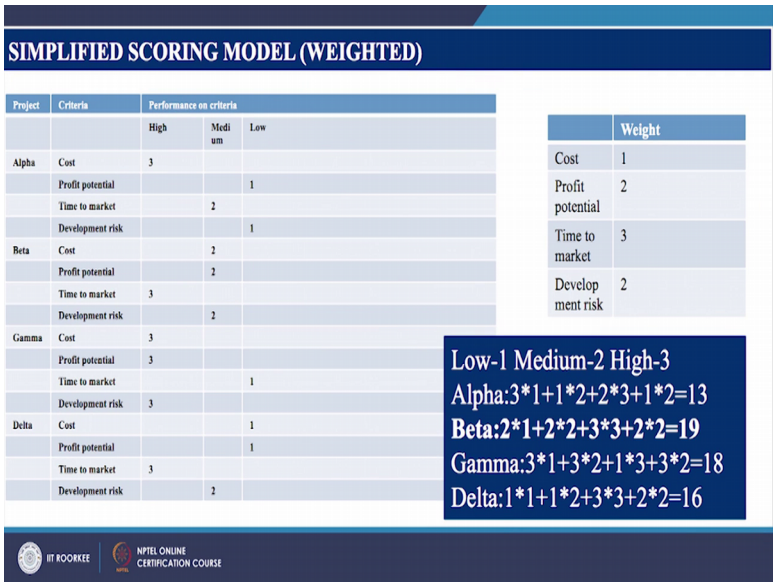

So, for alpha this final number is 13 for beta it is 2 into 1. So, 21 then you have got 2 into 3 sorry 2 into 2 and then 3 into 3 and 2 into 2. So, this is 14 sorry 19. So, the project which you would be selecting is beta right. So, this is a weighted scaling model.

Now, let us look at couple of other project selection techniques and we will see couple of optimisation techniques and one of the techniques is linear programming very wildly used technique.

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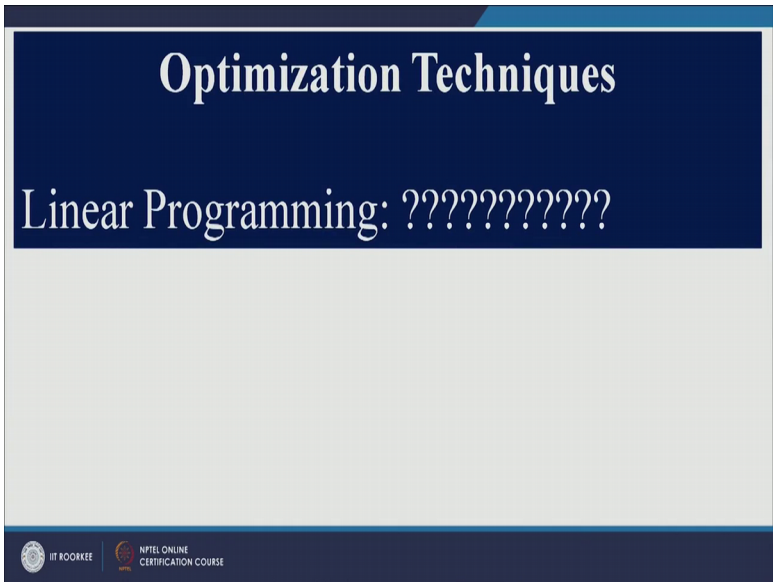

So, let us look at what is there in linear programming. So, linear programming is basically technique wherein we always try to maximize or minimize a function of variable and that function is subjected to set of constraints and we represent those constraints in either equality form or in equality form. So, this is linear programming I will I will take up a very simple example.

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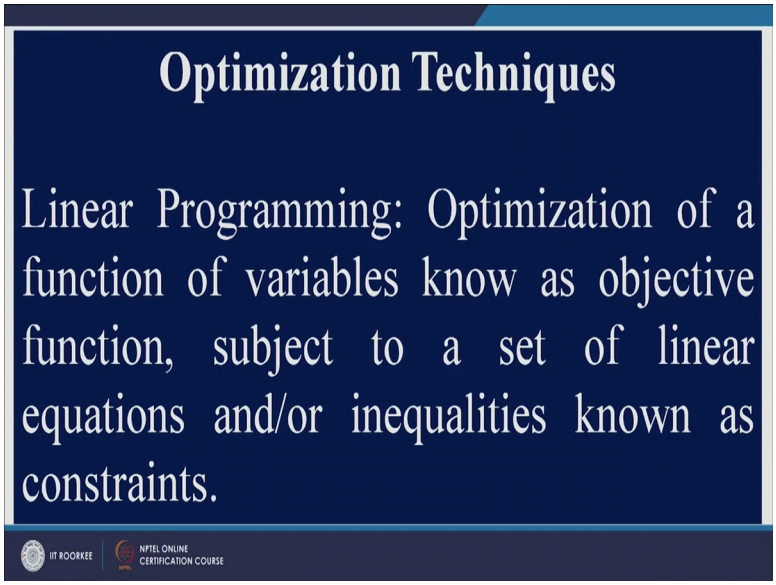

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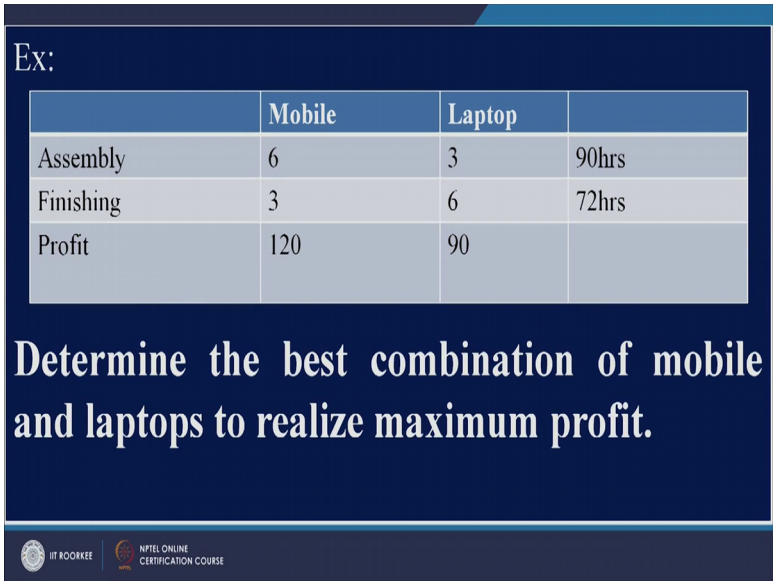

Let us say your organization is making mobile phones and laptops the profit you get by selling 1 mobile is 120 rupees and profit you getting by selling 1 laptop is 90 rupees and

these 2 products mobile phones and laptops they go through these 2 processes the first is assembly and the second one is finishing. So, in assembly in assembly process the total time available with you is 90 hours and in finishing process the total time available to you is 72 hours and this 6 is nothing, but the assembly the time assemble to one particular mobile 3s time to assemble one laptop this 6 is time to finish one laptop and this is time to finish one mobile.

So, this question is given to you and what you have to do is you to determine the best combination of mobile and laptops. So, that your profit is maximised I hope you would have understood this particular problem if not you just watch this video one more time. So, let us now formulate a linear program from this model from this problem. So, this is your linear programming model and as I said liner programming is a mathematical technique where we maximise or minimize a set of variables subject to some constraints. So, here X 1 is nothing, but the number of mobile phones you are making and X 2 is number of laptops. So, 120 X 1 plus 90 X 2; this is your objective function right you want to maximise your profit.

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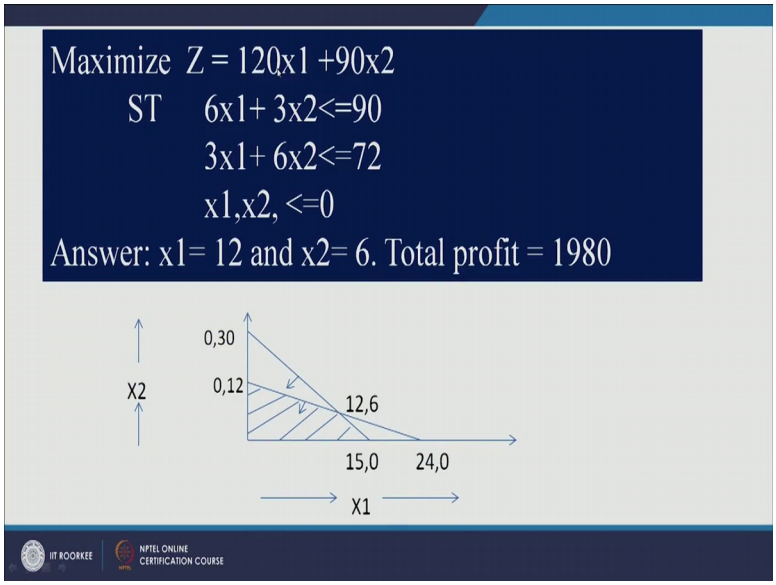

And by selling one mobile you would be getting 120 rupees by selling one laptop you would be getting 90 rupees. So, you would like more and more profit. So, you would like to you know produce more and more laptops and mobiles. So, more of these 2; X 1 and X 2 more is the profit right, but you cannot do so because you have got some constraints

and the constraints or on assembly time and finishing time. So, this is your constraint on assembly time. So, 6 X 1 plus 3 X 2 should be equal to or less than 90.

So, because you have got 90 hours available in assembly process either you consume entire or 90 hours or less than that similarly this your second constraints and this is the third non negativity constraint. So, you cannot prepare mobile and laptops in negative quantity. So, this is either you do not produce mobiles or mobiles and laptops or if you produce it would be some positive number. So, this is mathematical model of the previous problem and this is solution to this particular model by graphical method. So, I will tell you how to solve this question this is a very simple one. So, if you put X 1 is equal to 0 here then X 2 would be 30. So, this is the point. So, at this point you have got X 1 is equal to 0 X 2 is equal to 30, now when you put X 2 is equal to 0 here X X 1 would be 50; this point right.

So, X 1 is equal to 0 here yeah sorry, X 2 is equal to 0 here you have got X 1 is equal to 15. So, this point right if you look at second constraint if you put X 1 is equal to 0 here when X 1 is equal to 0 X 2 is equal to 12 right and when you put X 2 is equal to 0 here X 1 is 24. So, this area is common in these 2 constraints right and this is the direction towards the origin right because this constraint is less than time less than and equal to type right. So, this is the direction for first constraint this is the direction for second constraint and this area is common to both these constraints right. So, at this point you are getting a X 1 equal to 12 and X 2 is equal to 6 which is the answer for this particular question. So, you are making 12 mobiles and 6 laptops and your total profit is this now very simple linear programming problem; so, this how you should select any product or any project right.

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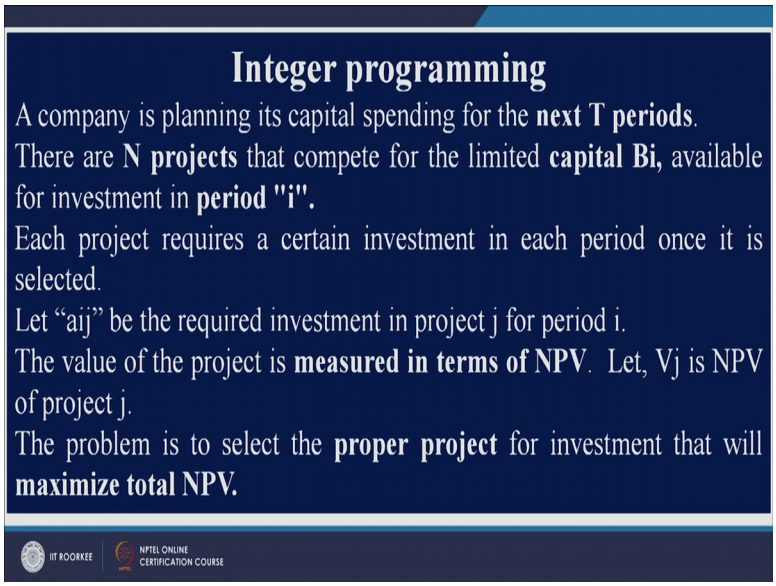

Let us look at another method of project selection this is known as integer programming technique in linear programming it is possible that you may have a value for X 1 as 12 point 5 or X 2 as 6.5, but when we say integer programming we want our variables to take only integer values they cannot take fractional values. So, I will take a simple example and we will try to formulate integer programming model.

Let us say there is a company is planning its capital spending for next t year t periods and there are n projects to be completed with within limited budget. So, Bi is the budget available with the company and there are n projects and in next couple of t periods we have to select couple of projects, right. So, each project requires a certain investment in each period once it is selected. So, if a project is selected in a particular period we would have to assign some budget to it.

Let a i j be the required investment project j for period i a i j is the investment in period in period I for project j the value of project is measured in terms of net present value that is NPV let v j is the NPV of project j right now the problem is to select the proper project for investment that will maximize total NPV right little bit difficult, but you should try to formulate a model. So, if you look at this question you your objective is to maximize NPV right and you can maximize NPV when you select a project if you do not select a project NPV would be 0 right, so, how to how to prepare a model for this question let us do it.

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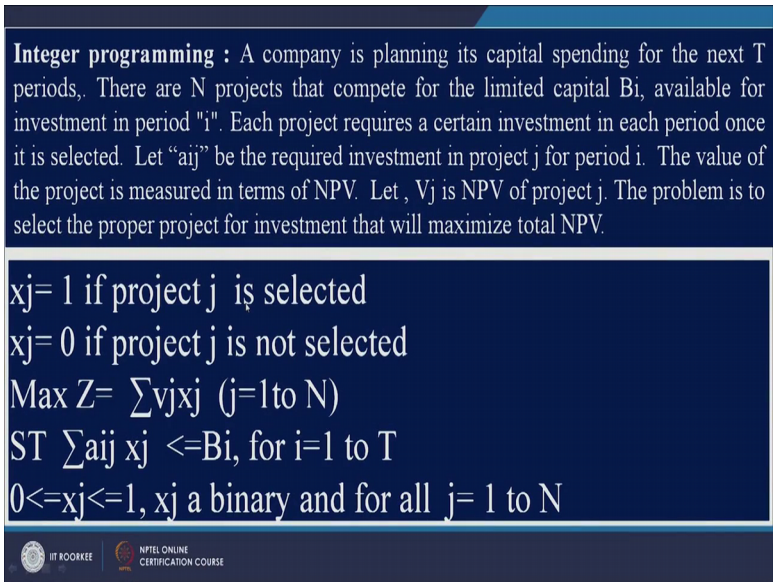

This is your question. So, X j is equal to i project j is selected otherwise 0. So, X j is 0 if project j is not selected otherwise one if t is selected. So, maximise summation of v j X j. So, if X if X j is equal to if X j is some positive number then there would be some NPV if it is 0 then this would be also be 0 right and j is ranging from one to N because there are N possible there are N n projects available. So, if this is your objective function then you have got constraint on your budget right. So, this objective function is subjected to a i j X j if X j is selected if X j is selected it means that project is selected and when a project is selection selected then this is your what the budget requirement right a i j is the required investment right just see this a i j be the required investment in project j for period i right. So, this is this should be less than or equal to your total budget available.

And one more constraint is that X j has to be this of course, we have already ensured that constraint that X j is either 0 or 1 right. So, there is no possibility of having X j is equal to 1.5 or 3.5 or so on right, so this how you should formulate this integer programming model right. Now I will take a very simple example as for as a NPV as for as integer programming is concerned. So, let us say there are 4 projects this similar to what we have done in previous slide.

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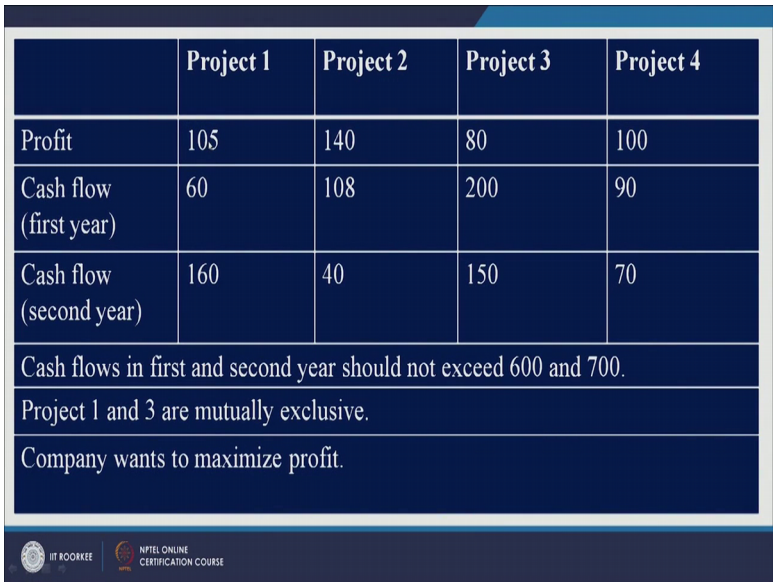

So, there are 4 projects you have got project 1 2 3 and 4 then these are the profits cash flowing first year is this 60 and 90 for forth project cash flowing second year 160 ad 74 forth project. Now you have got 2 constraints here cash flows in first and second year should not exceed 600 and 700 rupees project 1 and 3 are mutually exposing it means if you are selecting project one you cannot select project 3 and if you are selecting project 3 you cannot select project one.

And the company wants to maximise profit right. So, how would you solve this or how would you formulate this problem you have to formulate in a way what we did in this slide right. So, let us look at how to formulate a model. So, this is 1 0 5 X 1 1 for X 2 X 300 X 4 subjected to cash flowing first year is what the budget is this 600 right. So, 60 X 1 plus hundred and 8 X 2 200 X 3 90 X 4 less than or equal to this the second constraint would be 160 X 1 40 X 2 150 X 3 and 70 X 4 less than or equal to 700, but you also want to satisfy.

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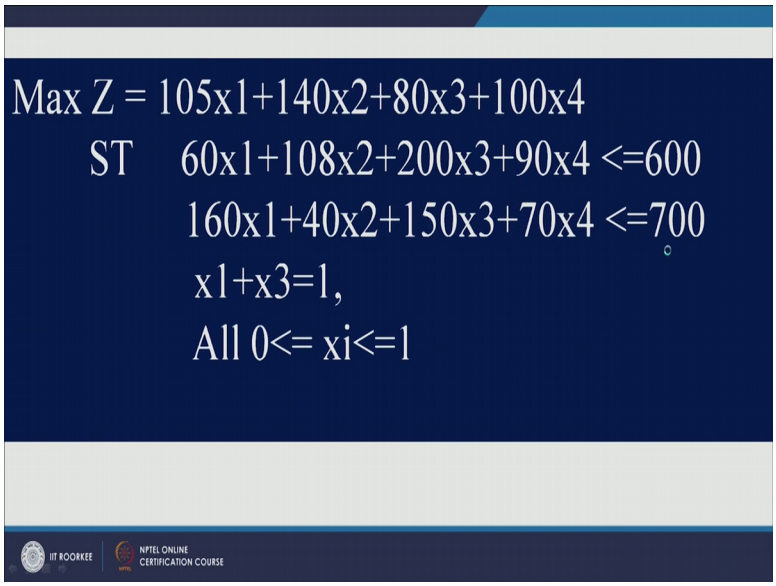

This particular constraints; so, either you select one or 3 right, so, what you should do X 1 plus X 3 is equal to 1. So, if you are selecting X 1 for example, this constraint if X 1 is equal to 1 if you selected first project then definitely this would be 0 and when you select X 3 this would be 0.

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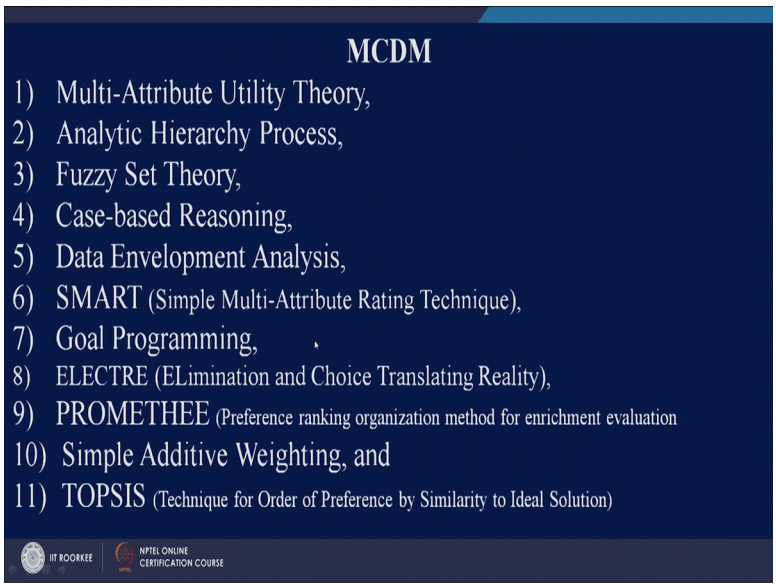

So, this how you can formulate a model right now; so, far we have seen linear programming as well as integer programming techniques for project selection in next

class we will see couple of a multi criteria decision making techniques for project selection.

Thank you very much for watching this video.