Project Management: Planning, Execution, Evaluation And Control

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Week- 02

Lecture- 05

Welcome to the course Project Management Planning, execution, evaluation, execution and control. We will be first solve the problem on the project selection financial matrix criteria, then go for the non-financial multi-criteria project selection model. So, the concepts that will be covered in these lectures are the financial matrix that is we will be solving problems on NPV, payback, prior, profitability index and all. Then we will be talk about non-financial criteria of project selection and multi-criteria selection, then also we will talk about managing portfolio systems. These will be covered in this lecture. So, these are the problems we were discussing in the last lecture and now we will be solving this problem. So, we have already discussed in the last class about the problems and all.

So, let us solve the problem here. So, the problem is given. So, what we have to do? We have to find out NPV of project X and project Y and find out which one you should choose and another is you should find out the profitability index of project X project Y and also payback period of project X project Y. Now, what is given in the problem? In the problem, the cash flow from year 1 to year 5 for both projects are given and the initial investment that is outflow for both the projects.

Now also you need the discount factor. So, discount factor is also given, it is 14 percent plus there are 2 percent for the inflation throughout this. So, how do you find out? So, in this we find out is the discount factor first. Discount factor is how much? Discount factor is D, equal to 14 percent, is given and inflation also is given. Inflation is given how much? It is given 2 percent.

So, what is your effective factor? Now discount factor is 14 percent, so you can write it 1 plus 0.14 into 1 plus 0.02 minus 1, is your nominal or the effective discount factor. So, if you do the calculation you will find that it is 0.1628, that is effective discount rate, it will be 16.28, which you will be requiring. Now we have to find out the NPV of the project. Now what is the NPV of project X. We have already found the NPV formula. So, NPV of project X is, say for, first year what is the cash flow? say 100,000, divided

by 1.1628, plus second year it is 200,000 divided by 1.1628 to the power 2 plus 300 K that is 1000 into 1.1628 to the power 3, plus 500,000 divided by 1.1628 to the power 4, plus for 5th year, it is 300,000 divided by 1.1628 to the power 5, plus is what minus 800 K (initial investment) minus 800,000. So, if you solve this you will find NPV X will come say 39.35000, that is NPV X is coming like that. Now similar way you have to find out NPV Y, NPV Y equal to how much it is 200,000 divided by 1.1628 plus 300,000 divided by 1.1628 to the power 2, plus 400,000 divided by 1.1628 to the power 3, plus 500,000 divided by 1.1628 to the power 4, minus initial investment is 850,000. So, this is for NPV Y. So, how much it is coming? If you solve this you will find it will be coming 71.79000. So, NPV X and this is NPV Y. So, which one you will choose NPV X or NPV Y? Whichever will give you the highest wealth, highest profitability that you will be choosing. So, NPV Y is far more than NPV X. So, we will be choosing NPV Y. So, this way you can solve the problem.

Now we will also find out the profitability index. Now the profitability index of X is what? It is 1 plus NPV by I (0) We have done it, we have derived this formula, equals to 1 plus (NPV of X is) 39.3535 by 800,000. So, it becomes 1.0491. Similarly, profitability index of Y equals to 1 plus 71.79000 divided by 850000 equals to 1.084444. So, which one has the highest profitability index? For Y it is 1.08 and X is 1.09. So, you will choose the project Y. So, similarly now you can also find out the payback period, payback period of X is how much? payback period of X: you have invested how much? you have invested say 800000. Initial investment is 800000 for X. Your influx, cash inflow is 100,000, 200,000, 300,000 that makes 600. So, it will take minimum 3 years plus then 200 left and the fourth year it will be part of that 200, will be part of this fifth year.

So, what will be the things? So how we will be going through that 100, 200, 300, 300 plus 300, 600, 600 and 200 is left. So, profitability index of X will be 3 years plus 200 divided by how much 300? is it 300? 600 divided by 500. This is 6 divided by 500. So, it becomes 3 plus 2 by 5, is 3.4 years. Similarly, the payback period of Y will become 2 years plus 850 minus 500 divided by 400 equals 2.875 years. So, payback period is less, less one you will take, less is for Y it is only 2.875 whereas in X it is 3.4. So, you will be choosing Y. So, NPV of Y is higher, profitability of index of Y is higher, payback period is less in Y. So, we will be choosing this project Y in preference to project X. So, we have solved this problem. Now this problem can also be solved in Excel file using Excel.

So, here I will be working on the Excel to solve this problem. How do you find out the NPV and this? So, these are the Y 0, Y 1, Y 0 for X, for project X. So, what we get is the project X, Y0 is given as what, minus project is given minus 800, is it 800? Y 1 is given how much? Y 1 is given 100,000, then Y 2 is given how much? 200, these are the

inflows, Y 3 is 300, Y 4 is 500, Y 5 is 300, all are 1000s, project X and the we also know what is the discount factor? Discount factors, we have taken 0.1628, this is the discount factor, discount factor is 0.

1628 and project X. So, what is the NPV? NPV of X, now we have to find out what is NPV of X, let us find out. So, NPV of X is what equal to, see how we can do it, equal to NPV, say it is coming NPV, NPV the rate is, that is the discount factor comma then the inflow, cash inflows from Y 1 to Y 5, this plus, plus your initial investment, initial investments already given minus. So, this will give you the, see NPV, it has given you the NPV, say 39.35, we also got in our calculation 39.

35. Now we wanted to find out the project Y, project Y, project Y what are the cash flows? It was minus, minus 850 is the initial investment, Y 0, then, then it is 200,000, then second year it is 300,000, third year it is 400,000 and fifth year it is 500,000, this and sixth year, fourth year 300. So, these are the cash flows 200, 300, 400, 500 and initial investment 850. Now what is the NPV of Y? Now we find out NPV of project Y. So, here we go for the NPV equal to NPV, we got the NPV, NPV equal to this is the discount rate comma cash inflows are this plus, plus the initial investment, initial investment is outflow minus 850. So, it is given 71.79. So, we also got this 1000, this is 79.79, 1000. So, this is, so which NPV we will take? NPV Y is higher than NPV X. So, we choose the, the, the, the NPV Y. Similarly, we can also find out the payback period and all, we have already done it.

Now I wanted to show you the sensitivity, how it is we have seen in the how the curve NPV with the discount rate, with discount rate increases NPV becomes negative, you know. So how, so you can do it. Suppose this discount rate is 0.1628, if you put it say 0.18, 0.18 say 18 percent, what happens if you see? See it has become, this NPV has the negative NPV, it has become red. Project X is, will have negative things like it will not generate well and project Y also came up from 71.79, 71.79, 1000, it came down to 36. So how sensitive is it? So, if you put it 19, you know, if you put it 19, let us see what happens.

So it is minus 21.66, it is 16. Suppose if it is 20 percent, if you increase to 20 percent NPV, say both becomes, both becomes the, are negative NPV. So, you will not choose it. So, you can see how sensitive you can, sensitive with the discount factors can be with NPV and all. Suppose if it is 15 percent, what happens see? 15 percent it will give you huge, huge, suppose if it is 15 percent, see it has become, NPV has become that so high.

X it is 70.47, 1000, NPV Y 99.64, 1000. So, this is the sensitivity we wanted to show you. This problem has been done. Now we will be quickly going through, through the

other parts of this, other parts of this lecture. So now we will be going further. So long we have discussed about the economic criteria, financial criteria for project selection.

Now there are non-financial strategic criteria also are important. So, what are these criteria? So, we will be discussing this. Like one is the, suppose many projects may not go through the, the only for the economic or financial criteria. Suppose your project you wanted to capture large market share, like what the geo was doing, geo was running in loss, you know, to get the market share. So, it is Amazon in their initial years, they were running in loss, that was not economically viable those projects and all.

But for strategic reasons you wanted to capture the large market share, you go for this. Then create difficulties to competitors to enter the market. Like your, try to block your competitors, you know, big companies and all, Microsoft and all, Google and all, they always do that, that you put some, some sort of blockage or difficulty for the competitors to come in the market. Then develop, enable product to improve the sales of your, the main product. So, enabler products also that will induce the higher revenue for your main products.

That for that you also go for such projects. Then you wanted to develop core technology for the next generation product. Those may not be economically viable now, but those next generation product or next generation technology will be giving you the revenue stream for the future and your companies may be requiring that. So, you, for those projects are also you invest and these are the strategic projects you use the non-financial strategic criteria. Then again it may happen you wanted to reduce the dependency on, from your supplier, especially if the suppliers are unreliable. Suppose you are having a steel plant and your supply iron ore core or the coal, coal pellets and all are required.

Your suppliers for strategic reasons, you also have your captive mines, captive plants and all. So that the, you do not solely depend on supplier, although you know the outsourcing is cheaper than your owning some assets and all. So, this is called reduced dependency on unreliable suppliers and all. These are the strategic reason. Then prevent government interventions and regulation.

So the big companies and all, leaders always lobby with the government and all. You know they have projects for that. Then to improve the corporate image, brand recognition, you invest in some projects. These projects may not give you the economic return, but it will give you the intangible benefits. Suppose intangible benefits like image of the organization, reputations of the organization, brand of the organization, these are intangible, but a huge benefit you accrued.

Then also commitment for corporate citizenship, support the community development, all those things are the projects you invest. Even though those are not economically very attractive, but these are the strategic projects you should look for it. And these are the non-financial strategic criteria. There are, then there are other criteria called multi-criteria selection models.

What are these? There are two types of these. One is the checklist model, another is the multi-weighted criteria model. The multi-criteria selection model, checklist model is the companies may have the, they develop by themselves the questionnaires. All the projects have to be evaluated against this questionnaire and if they, this is the screening process and if they pass through then the project is accepted for implementations or the accepted for approval. These are the, these are some company, the company have the big list of questionnaires which they develop on their past experience and all. For example, what you find like you can find the sample questions those are used in practice, say the topic may be such as strategic, whether the project is strategically aligned with your, aligned with that or not.

Then the, what are the drivers, success matrix, risk involved, benefits or return on investment. So specific questions you ask for that like strategy, what specific strategy does the project align with, drivers, what are the drivers, what are the success matrix, how will you measure success, say risk, what is the impact of doing the project, of not doing the project. So, you find it out. These are some illustrative examples. Similarly, topics may be the organizational culture, is your organizational culture right for this type of project.

Then resource requirement, will the internal resources be available for this project. Then approach, schedule, portfolio, technology on these different topics the project goes through. One advantage of this checklist model is this that lot many projects can come in, you know the projects which might not have looked is the go through the economic criteria and all those things, different departments and all they may also vie for each other. That is the, that is the advantages. But this method has also disadvantaged and major disadvantage is that this method the do not find out your relative importance of the project or cannot rank the project.

It just screens the project whether its is should be taken or not. Suppose an IT project, it may rank high for the IT department but that may rank very low for the production department and the production project may rank very low for the HR department. And similarly finance project may rank low for the logistics department. So, it does not have that a good criterion for selections of the project, the perception therefore, it gives rise to

the organization politics. So, those who are very pushy or they can bulldoze their project, the high-ranking official can get their projects approved.

So, the sacred cow projects, the organizational politics and all comes to play to this. These are the advantages, disadvantages of checklist model. To overcome this what you go, then you go develop for a multi, multi weighted scoring model. What is this? This multi weighted scoring model is you fix a criterion, fix criteria you know that you are always, the organization fixes the criteria for selection of project.

That is a good practice. Suppose this is an illustrative one, the criteria may be stay within the core competencies of the project. The criteria may be the strategic fit, whether it is a fitting the strategic plan of the organizations or not. Urgency, 25 percent sales from the new product, then reduce the defects or wastage less than 1 percent, improve customers loyalty, return on investment. So, these are the criteria, it may be depending on your business, depending on your organization, your competitions, your market requirement, you fix up the criteria.

Then you give a weightage to all these criteria. It may be any scale. Here for illustrative purpose it is given a scale of 1 to 3, 1 being the lowest and 3 is the highest. Say strategically fit it is the highest say 3 is the thing. This ROI is high whereas, the customer loyalty is least.

So, you give the weightage. These criteria are fixed by the top management and the weightage is also given by the top management or the experts who are knowledgeable about those projects. Then what you do? You list your project, project 1, 2, 3, 4 to up to project 10. Then you rate these criteria within a rate it within the scale of 0 to 10, 0 to 10, 1 to 10, 0 being the least importance and 10 is the high importance. So, when you give this rating, these ratings are given by the knowledgeable people about that project or the expert.

So, what you do? You get a weighted total. Say you project 1, this criteria rating is 1 into weightage 2, 1 into 2, 8 into 3, 24, 2 into 2, 4, 6 into 2.5, 15, 1 into 0. So, you get a weighted total. So, this way you make out the weighted total of your project.

So, you can rank it now. Now which is the highest weighted total? From here we can see project 5 is the highest total. So, project 5 priority will rank 1. So, it will have the priority for resource allocation and which is the least prioritized project is the project 2, it is only 27. So, it will have the least priority.

So, these are the multi weighted scoring model. This way you can reduce the

organization politics, sacred cow projects and all. Here the transparency is more. This is the called multi weighted scoring model.

And now this is another problem. I want you to solve it. Say what that this project says custom by company has set up a weighted scoring matrix for evolution of project potential projects below are the 5 projects under consideration. So, using the scoring matrix below which project would you rate highest and the lowest. So, you have to it has been given. The criteria are given and the weightage are given and the project there are 5 projects the ratings for each criterion are given. Now you have to find out which one is the ranking high, which one is the for-part A.

So you can do this. You solve it at yourself like here it will be 9 into 2, 6 into 5, 30, 2 into 4, 8, 0 into 3, 0, 1 into 2 and 5 into 3. So, you get a total weightage. So, you do find out the weightage and what you will be finding the results will come like this. If the part A it is coming which project is the highest project 5 is the highest.

So it ranks high. It is followed by project 3 99 then which is the least project 2 it is 57. So, you can rank it. Similarly, the B part of it. If the weight for strategic sponsor is changed from 2 to 5 like strategic sponsor now it is changed from 2 to 5 will the project selection change? What are the highest weighted project scores with this new weightage? So here now from sponsors weightage from 2 to 5 it has been given.

Say here it is 1 to 5 weightages. So how does it work? See part B if it is going to the 5 say which projects? Project 3 becomes the highest 117 and closely project 5. So, these are the screening project matrixes. So, I think you have got a good exposure for multi weighted project. Now this is the project screening process.

What we have talked about it? It is schematically showing here. Project proposal idea is first generated then you self you collect the informations and all then you see whether the project is the strategically fitting to the organization strategy or not then your return on investment payback period and the risk you do it and you collect all those then you self evaluates a project by the criteria fixed by the organizations then you what you do? If it goes then you positive you go through it otherwise you abandon it and when you pursue then you go if this goes to the project priority team those who are doing the project 1 they evaluate the proposal review and for the risk balances and all they may ask you for the for more informations and either they may accept or reject. If they accept what happens? They assign the priority of the project, assign resources, assign project manager and evaluate the continuous progress or if the resources are not there then they hold for resources and another is the reject and also in between periodic reassessment of priority. These are a just schematic diagram of project screening process. Now we will

be talking about the portfolio management system that is the design of project portfolio system.

Then we have already talked about classification of project selection criteria. Now sources of proposal, how do you get the proposals? Where from you get the proposals for the project? One way you get it from the within the from the user departments say IT departments they generate their IT project, production department project generates the production improvement projects, finance department. So, user groups are the sources of project proposal. Besides that, another source is you ask for RFP request for proposal. Suppose I know a company which are doing the oil exploration and production, but they had lot of unutilized gas reserves which cannot be monetized because that is in a far away area that is in a one remote area where the industries are not there. So, what they did? They went for developing a power plant 740 megawatt gas based power plant, but the oil exploration and production company does not have any idea about power plant.

So, they floated a global tender and all the top companies of the world say General Electric, then Alstrom, Rolls Royce they all bid for it that way company came to know what is the latest you know frame for the gas turbine or the power plants things and all. So, this is another source of proposals. Then evaluating after that you have to evaluate proposal that itself is a subject by subject by itself.

So, we will not go deep to that. Then the managing the project portfolio. This is the last point we will be discussing for the managing the project portfolio what you need? You need the senior management input. As I told what is the senior management input? You need the project selection criteria specifically told by the by the senior management so that there is no organizational politics takes place, no that under hand dealing takes place. Say if the top management gives that your operational project will be 50 percent, strategic projects will be 30 percent and compliance project will be 20 percent. Then not many that is one criterion is given and there are the what should be the discount rate, what should be the financial matrix and what it should be the NPV and all.

All these things are specified by the senior management. Another is the is the they also try to give the how the resources will be allocated. They should rank the project so that resources allocations can be given done with the priority of the project that is senior management input. Then PMO responsibility that is the program management office is also has other responsibilities. We have discussed it in the last lecture. Apart from that one of the main duties for the project management office is to publish the project selection criteria and the priority of the project, ranking of the project.

If you publish this then the people will come to know we what are the criteria was used

and that brings a transparency organization politics is reduced and the projects which are high priority, which are more aligned to the strategic goals of the organizations that may get more priority. So, hard burn, discontent will reduce. This is the duty to publish the transparent and the project selection criteria is one of the duties of PMO. Then balancing portfolio for risk and types of projects. This is the last things we will be discussing up that you know that David and Jim Matheson they studied the R&D projects and came out the project portfolio matrix for the R&D sort of project in terms of technical difficulty or technical feasibility.

High technical feasibility is the means the low risk and low technical feasibility means difficulty is more, risk is more versus the net present value or the commercial potential of the project high low. Now, they have the David and Jim Matheson they have categorized the project in four category which are called bread and butter project, pearl project, oyster project, white elephant project. What is bread and butter project? Here the projects risk is less, the technical feasibility difficulties are less, but your net present value or the commercial potentials are less. These are meaning the you do the existing projects, existing production system, some incremental improvement and or the improve the efficiency, reduce the cost those are called the bread and butter projects. And what is pearl project? Pearl project is here your technical feasibility is high that means your risk is low, project risk is low, difficulty level is low, but it will give you high commercial potential or net present value.

So, these are the called pearl project which will this is the examples are like suppose you have the proven technology, you have the proven technology with that proven technology you increase your revenue market shares and all. So, these are the pearl project. Oyster projects are the difficulty or the risk are high that is high and your return or the net present value are high. So, these are the breakthrough projects you know R and D breakthrough, next generation things say the alloy metals and all or some genetic projects and all. So, these are the next generation projects and all that will the which are very risky and difficult, but also if it succeeds breakthrough innovations then it will give you a head on that heads up that profitability.

And another is the white elephant, here your risk is high, difficulty level is high and the net present value or commercial potentials are low. These were the projects which were promising at one point of time, but today's context these are not promising projects. So, you these are the similar to dock projects and all these are called white elephant. So, these are another way some experts had put the how will you define your project portfolio matrix. Now to sum up today's today's this lecture we can say further to the previous lecture this module solves the problem, problems of the financial matrix criteria such as NPV, then payback period, profitability index using both excel solver excel and

also manually.

This module also illustrates non-financial criteria of project selection which is necessary for strategic and compliance project. This chapter further discusses multi criteria selection models such as checklist model and multi weighted scoring model to design and manage a robust portfolio system. This lecture also explains project screening process and project portfolio matrix in terms of technical feasibility or difficulty or risk and the net present value or commercial potential of project and categorized R and D projects are four types namely bread and butter project, pearl project, oyster project and white elephant projects which were suggested by David and Jim Matheson. So, these are the conclusion and also the references for this chapter.

These are the books you can go through and enhance your knowledge. Now thank you very much for attending this lecture.