Software Project Management
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Lecture – 14
Project Evaluation and Programme Management (Contd.)

Good afternoon to all. So, now, let us see the remaining parts of cost benefit analysis ok. So, we have seen three steps of C-B analysis. So, the other remaining two steps are we will see first then we will see the risk evaluation.

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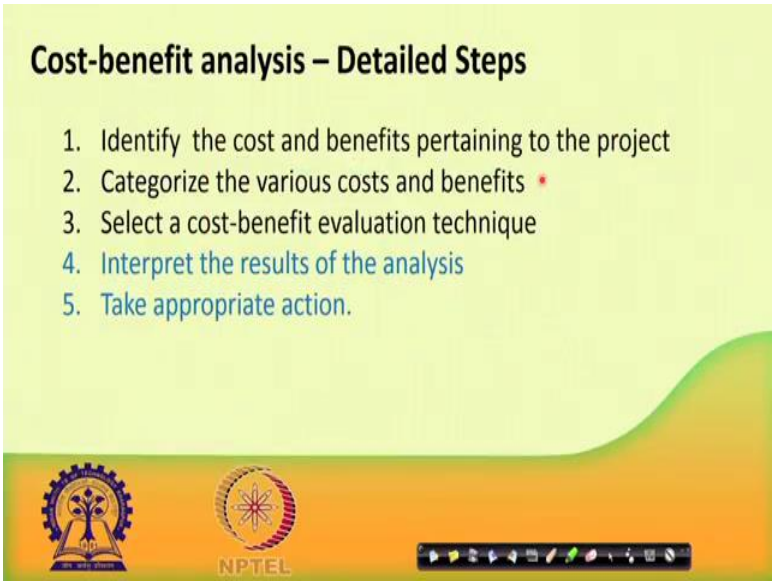

So, the last two steps of C-B analysis are interpret the results of the analysis and then take appropriate action.

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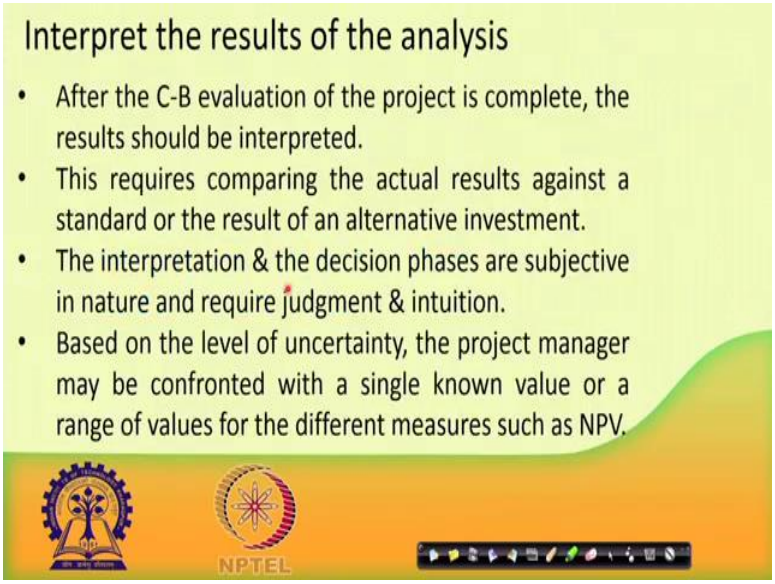

So, after so, we have already seen that, we have already selected, we have discussed the cost benefit evaluation techniques, then depending upon the scenario, we should select or the organization should select a proper and appropriate cost benefit evaluation technique. So, after that cost benefit evaluation or that cost benefit analysis over, then the project the result should be interpreted ok.

So, after the cost benefit evaluation of the project is over the results must be interpreted. So, for interpreting the results it requires comparing the actual results against the standard or the result of any other alternative investment. The interpretation and the decision phases are highly subjective in nature they require the judgment and the intuition capabilities of the project manager. Based on the level of uncertainty the project manager may be confronted with two possibilities.

Either with a single known value or a range of values for the different material such as NPV or that net profit etcetera either you may choose, you may be confronted with a single known value or a range of values.

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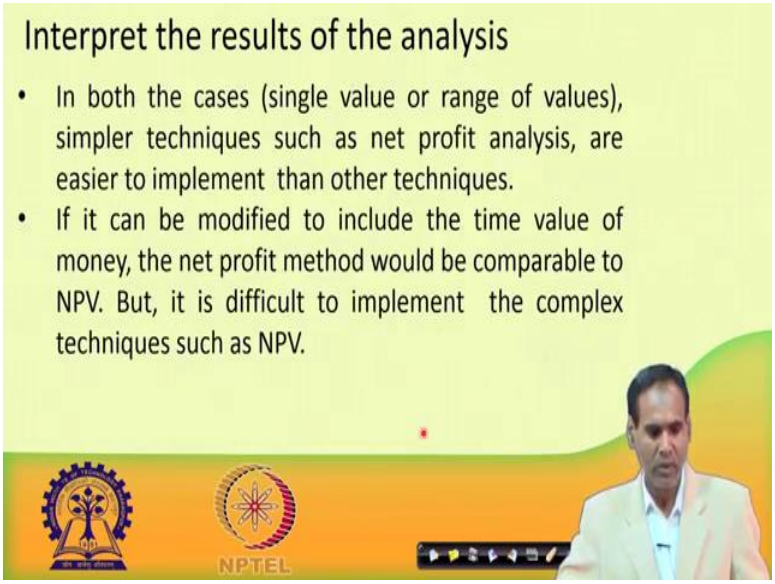

In either of the cases whether it is a single value case or it is a range of values for the what measures such as NPV or net profit or what you are ROI, whatever it may be simpler techniques may be used such as net profit analysis etcetera. May be used they are easier to implement the and other complex techniques.

But, if it can be modified if because we know the drawback of net profit analysis is the that does not take into account the timing value of the investment. So, if it can be modified to include the time value of the money, then the net profit method it probably it would be comparable with the net present value, but you know that it is difficult to apply or to implement the complex techniques such as NPV.

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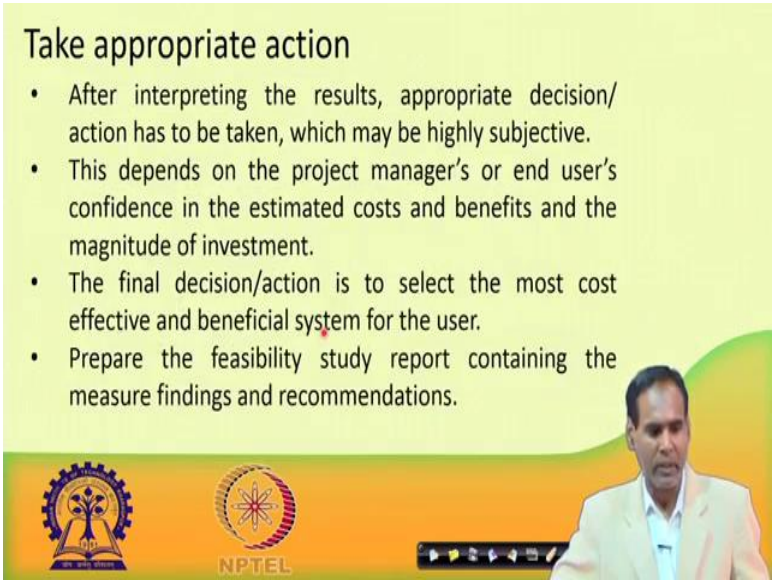

Now, after interpreting the results after analyzing all those results we must take the appropriate action the project manager must take the appropriate action. So, after interpreting the results the appropriate decision or action they has to be taken.

And this taking the decision it is highly subjective in nature, this depends on the project managers or the end user confidence in the estimated cost and the benefits. And the magnitude of the investment, the final decision or the action will be to select the most cost effective and beneficial system for the user.

So, the final action of the cost benefit analysis is to select the most appropriate the most cost effective and beneficial system for the user, then the a project manager has to prepare the feasibility study report which contains the major findings and during the analysis process on the suggested recommendations. This is how the final action has to be taken after interpreting the results. So, this is something about this C-B analysis.

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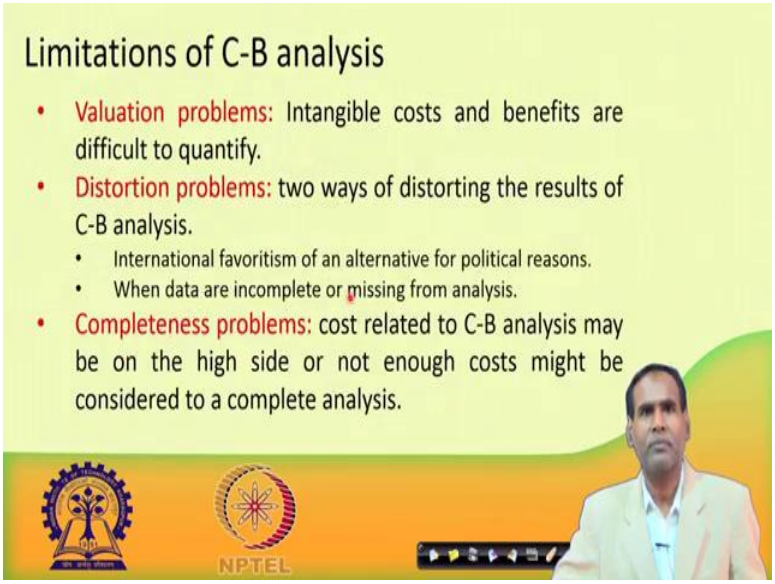

But, what are the limitations of C-B analysis? So, there are many limitations of the C-B analysis number one is valuation problems. I have already told you in the last class that there are different types of cost and benefits. So, the particular categories of cost and benefits or such intangible cost and benefits they are very much difficult to identify measure and quantify, can that be quantified easily. That is one of the most difficult problem in most difficult challenge in case of cost benefit analysis, that is intangible cost and the intangible benefits, they are difficult to identify may be difficult to what measure and quantify.

Another problem is known that the distortion problems, there are two ways of distortion in the results of C-B analysis one, there may be intentional favoritism of an alternative for the political reasons. And the two when the data are incomplete or they are missing from the analysis it is may difficult to take an appropriate action. And the next problem is completeness problem here the cost the cost related to C-B analysis may be on the high side.

The cost that have been estimated they may not represent the actual cost, there may be on the higher side or the estimated cost of the they may not be enough or not enough cost might be considered the project manage manager might not have consider enough cost for conducting a complete analysis. So, this could be the possible limitations of C-B analysis.

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Now, we will see that I have already told you, the contents of business case; one content was the based one risks we know that every project has some kind of risks. There are two types of risks we have discussed earlier; one is project risks, another is business risks. You may know that the business risks they are related to the threats to completion to a successful project execution whereas, business risks are related to the factors which will threat the benefits of the delivered project.

So, in business case the main focus is on business risks. So, right now we will discuss how to evaluate the business risks, the project risks will be discussed later on.

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So, let us see what are the risk evaluation methods particularly business risks. So, we will see about risk identification and rank and ranking, then risk and net present value, cost benefit analysis method for handling risks, then risk profile analysis and using decision trees.

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Let us quickly say about this risk handling and ranking. So, here in any project evaluation we should identify the risks first. So, before handling them in any project evaluation we must first identify the risks. And we should quantify their effects how it

will affect the business. One approach to now what identify the risks and the quantify their effects is to construct a project risk matrix a special type of matrix will construct, that is known as project risk matrix, which will utilize a checklist of possible risks.

So, what are the possible risks that will appear in that matrix? As well as then we have to classify the risks according to their relative importance and likelihood. What is the possibility that this risk will occur and then what is the importance of that risk, how far it will affect the business, how far it will hamper the business? So, that is the importance.

So, we can give values like a high H for high, M for medium and L for low; that means, the importance can be high and importance can be medium or importance can be what low similarly, possibility of occurring this could be or the likelihood could be high low or medium high, medium or low. So, then as I have already told you this matrix will mainly consists of the possible types of risks, then we have to classify by using the relative importance and the likelihood.

So, the point of speaking is that the importance of the risks as well as the likelihood of the risks, they need to be separately assessed, which should not what consider them together they should be separately assessed. Because, see we might be let us concern with something or some risks that although serious, but is very unlikely to occur.

So, some kinds of risks are there they are very serious, but the very unlikely they occur the chance of occurring them is very less. So, we may not be very much serious about that, but there are some less serious risks there are very less serious risks their effect is very what less their importance is very less, but that is almost certain the probability that will occur is almost based certain say 90 percent. So, we must be very much what concerned about this.

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For example, say there is a project A which appeared to give a better return, but it could be very risky. So, we should treat it differently. Similarly, another project could be another project B, it might give what very less return, but it is what we can say there is less risk. So, you may go for that has to be debated. So, I have already told you that in order to classify the risk their importance or the we have to construct a project matrix, we could drop a project matrix for each project for assessing the risks. Here, we are consider two important factors the importance of the risks as well as the likelihood the probability that the risk will occur.

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See we have taken a example of a project risk matrix, where as I have already told you we have first write down what could be the possible risks, then what is their importance and what is their likelihood? So, here we have taken this example for an e-commerce application. The possible risk could be like the client rejects the propose look and the propose look and feel of the site, because the GUI part is not very good.

So, he has rejected he has not accepted the client is not accepting that one so; obviously, the importance will be very high, but the likelihood is this dash line means it is unlikely, very unlikely it may occur. Similarly, competitors under cut the prices might also happen, if the it happens it is consequences is very high. So, importance is high and likelihood is medium, warehouse is unable to deal with the increased demand.

So, it is importance is a medium and likelihood is also less. So, online payment has security problem, problem it might happens. So, importance is a medium likelihood is also medium and a maintenance cost may be higher than the estimated, this it is importance it is effect on the business is less and likelihood is so, it is less. So, response time deter ate the purchasers.

So, it is importance is medium and likelihood medium from some study this has been analyzed. So, in this way for any given project in order to classify the risks, in order to evaluate the risks, we have to construct a project risk matrix, matrix by considering the importance of the risks and the possibility or the probability or the likelihood of the risks that they will occur.

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So, next we will see the next method that the risks and the net present value. Here where a project is relatively risky it is a common practice to use a higher discount rate to calculate the net present value. So, the in the last class I have already told you, while calculating the net present value, we are considering different discount rate such as 5 percent, 8 percent, 10 percent, 12 percent or 15 percent things like that. So, when we observe that a project is relatively risky.

Then what we should do? So, it is a common practice that we should use a higher discount rate to calculate or for computing the net present value. For example, this risk premium might, for example, be an additional 2 percent for a reasonably safe projects. So, if a project is a reasonably safe we may use an what additional 2 percent for this discount rate, but if the project is a fairly risky one, then we have to consider additional 5 percent of this discount rate. For example, if we are considering 10 percent normal discount rate. So, if a project is reasonably safe we may consider the discount rate as 12 percent, but if the project is a fairly risky one you should considered, you should take the discount rate as 15 percent.

So, projects may be categorized as high. So, just like we have done in this case of what previous approach, we are considering the matrix. So, similarly while considering the net present value the projects may be categorized as high medium or low risks using a scoring method, and the risk premiums designated for each category.

So, we can also rank them as high risk or medium risk or low risk projects using some scoring method using some formula or given by using some weights and a risks and the risks premiums designated by each category.

For if it is a very high, what the risk project we may considered like a 15 percent. For example, 5 percent extra may be 15 percent what premium, risk premium or discount rate and if it is a medium risk project, we may used might be what we can take 13 percent or so, of this what discount rate, if it is a very low one we can take 11 percent or 12 percent as the discount rate and then we can classify them.

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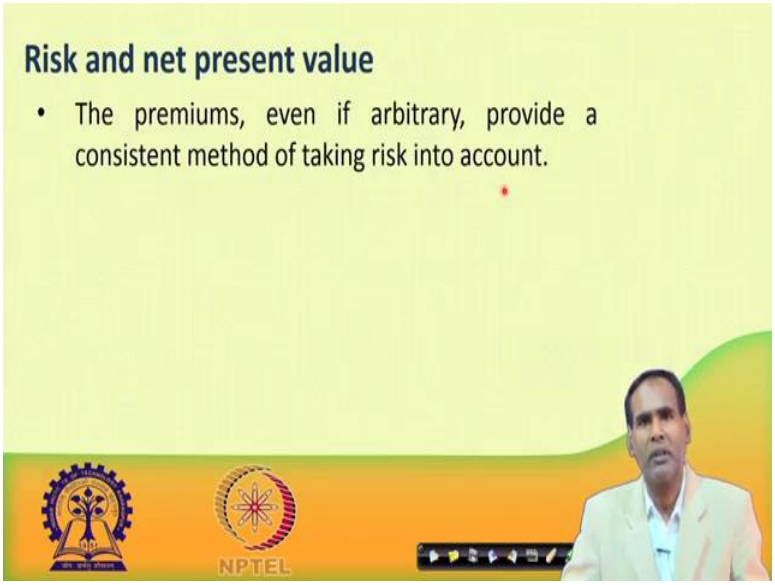

So, the premiums even if you are consider a arbitrary if you have even if you have taken them arbitrarily, but still they provide a consistent method of taking risks into account.

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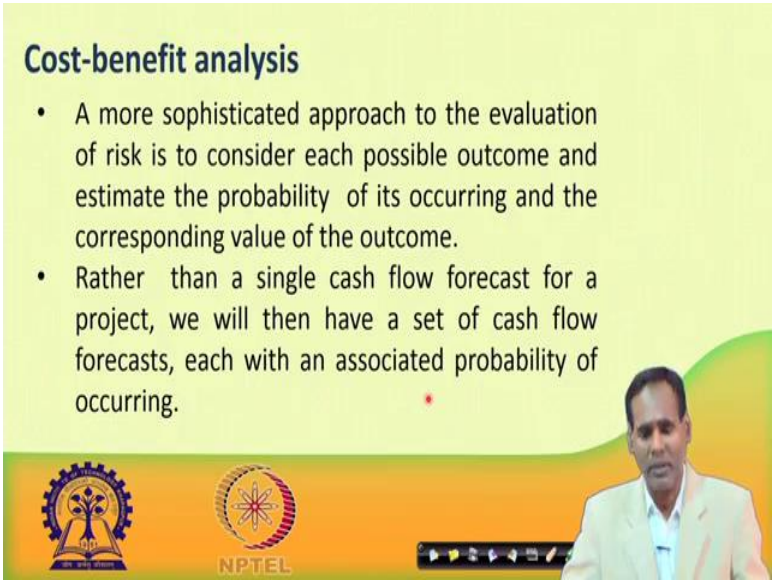

Now, we will see a cost benefit analysis how it can be used for this what evaluating the risks we have already seen cost benefit analysis earlier for evaluating the projects. So, similarly while evaluating the impact of the risks, we can also use cost benefit analysis. This is a more sophisticated approach to the evaluation of risks. So, here we consider each possible outcome on the estimate the probability of it is occurring. So, according to cost benefit analysis we will consider each possible outcome, also we will estimate the probability of it is occurring and the corresponding value of the out outcome, how much benefit we will get the corresponding value?

So, rather than a single cash flow so, rather than taking a single cash flow forecast for a project here will that happens set up cash flow forecast. So, instead of taking a single cash flow forecast, we will may have set of cash flow forecast, where each is associated where each with an associated probability of occurring. So, each forecast ok, each forecast may have associated with a probability of occurring.

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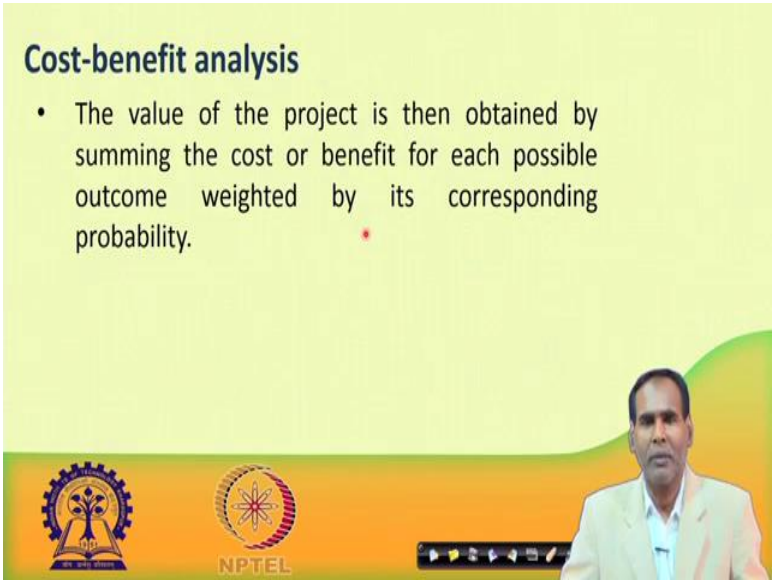

The value of the projects is then obtained by summing the cost or the benefit for each possible outcome weighted by it is corresponding probability. So, here you will take two things that what is the cost or benefit for each possible outcome, then for each one you will give what the probability. So, we have to multiply this cost along with this probability. So, the value of the project is then obtained by summing the cost or benefit for each possible outcome weighted by it is corresponding probability. Let us take an example and then I will say.

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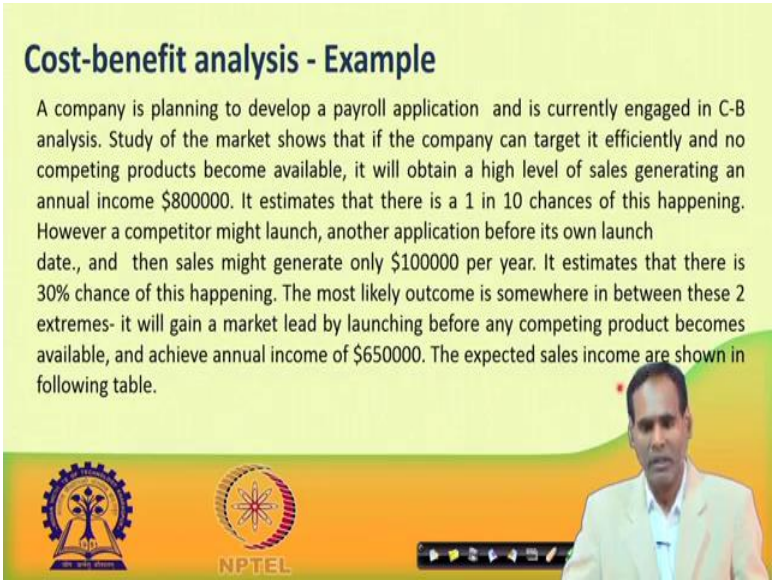

So, suppose there is a company which is planning to develop a payroll application and now currently it is engaged in C-B analysis. So, study of the market shows that if the company can target it efficiently and no competing products become available, then it will obtain a high level of sales generating what on annual income of 800000 dollar.

It estimates that there is a 1 in 10 chances, I mean what 10 percent chances of happening this. However, a competitor might launch, a another competing application like this before it is own launching that and then this sales might generate very a less amount only 100000 dollar for year.

It estimates that there is 30 percent chance of happening this. Then so, this is the extreme case so, these are the two extreme cases the best case is the about 800000's annual income whereas, the worst case is what 100000 dollar per annum. And here the best case chance is 10 percent whereas; the worst case chance is 30 percent. The most likely outcome is somewhere in between these two extreme extremes; that means, between n the 800000's and this 100000.

So, the most likely outcome is somewhere in between these two extremes. So, it will gain; that means, it will gain so, according to the survey, it will gain a market lead by launching before any competing product becomes available and achieve annual income of dollar 650000, which is in between these 800000 and 100000. The expected sales as per the market study, the expected sales income as per the market study are shown in the next table.

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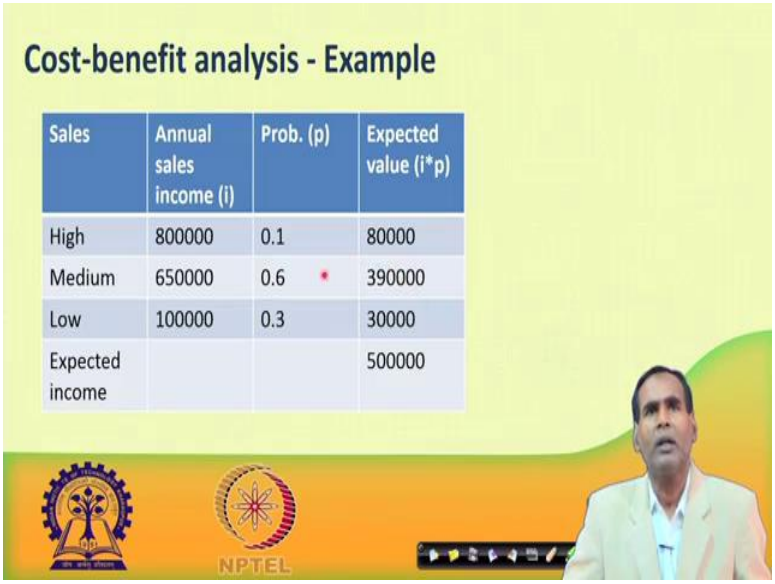

Like this say it is expected that as I have already told you the annual income the best case it will be 800000, where the probability is 10 percent. And if it is another competitor is there then it will be the worst case, where the annual income will be what 100000 and the probability is 30 percent. So, as I have already told you in cost benefit analysis what we will do? The value of the project is then obtained how by summing the cost or benefit for each of the possible in income, which are weighted by it is corresponding probability.

So, you have to see these are the values annual incomes this is the probability we will multiply them. So, these are the values you will get and then the expected income will be around this. So, you can see the expected income for this problem is found out to be how much 500000's now.

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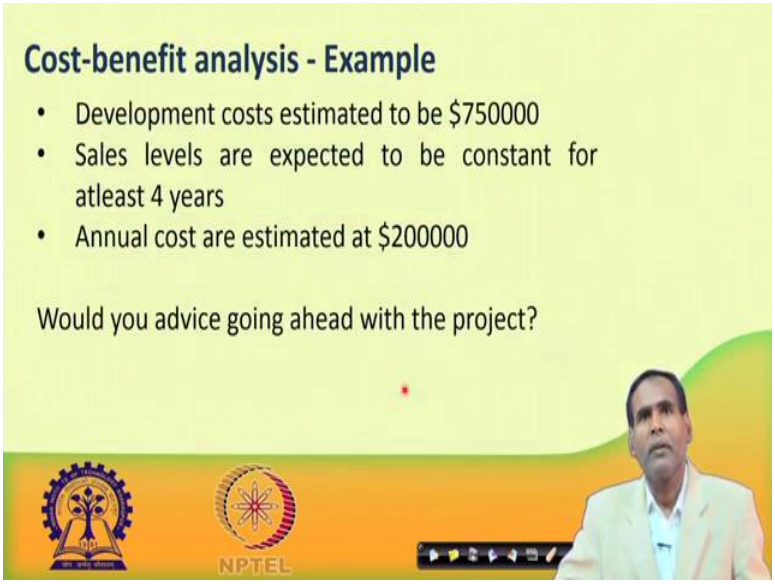

Ah it is also estimated that the development costs are estimated to be 750000, sales levels are expected to the constant for at least 4 years. The annual costs such as maintenance etcetera are estimated at 200000s. So, now, the question is would you advice the project or the company going ahead with the project. Now, let us analyze. So, what will do what will be the advice?

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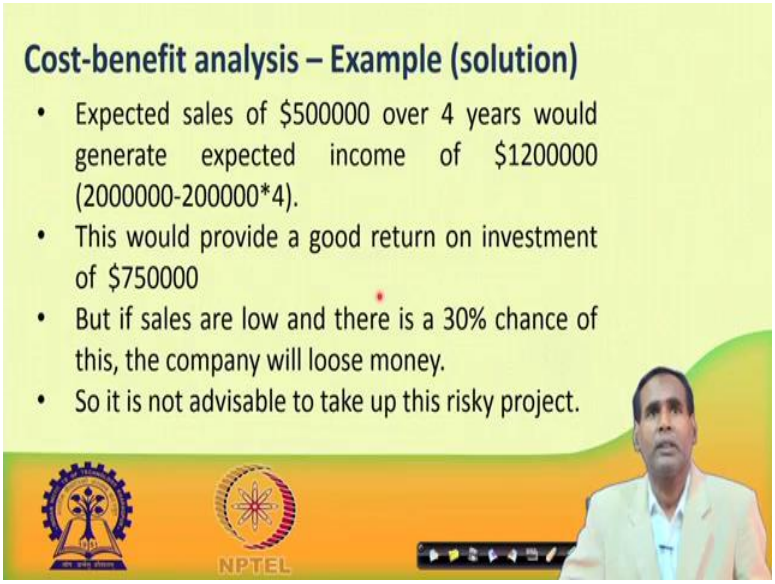

See we have seen that the expected sales is 500000s we have already seen the average the expected income is 500000's. So, and also we know that sales levels are expected to be constant for 4 years and annual costs such as maintenance are 200000's.

So, what we will find out now? The expected sales of what 500000 over 4 years would generate what is the expected income, what will be the expected what benefit, the total expected income will be what the what is the total income? So, 500000's into 4 that is 20,00000's minus, what is the annual maintenance cost? 200000's per year. How for how many years it will be run? So, 4 years.

So, 200000s minus 4 sorry 200000s into 4 that is 800000s, so 20,00000s minus 800000s coming to be how much? 12,00000s. So, the expected sales is coming to be 1200000s. Now, you see what is our, what investment you can see that the development cost is 7,50,000's dollar. So, now, we can see that the benefit that we will get is or the expected sales benefit is coming to be a 1200000s dollar whereas the investment is 7,50,000 dollar.

So, of course, it is a good return. So, the company may go for this project, but please see the other side, you see let us consider the worst case. If the sales are low and another competitor is there then what will happen, that it will lose money. And you know the chance is already 30 percent. It is a significant amount and if this is happen and if this happens then how much you will get? The company will get only 30,000, because see the annual sales income will be what 100000 and since the probability is 30 percent.

So, expected value will be what just what 30,000 very what low value. So, that every possibility that this may occur; because the probability is 30 percent and the company will certainly loose money. So, it is not advisable to take up this risky project. So, in this way cost benefit analysis can be carried out for at evaluating risks.

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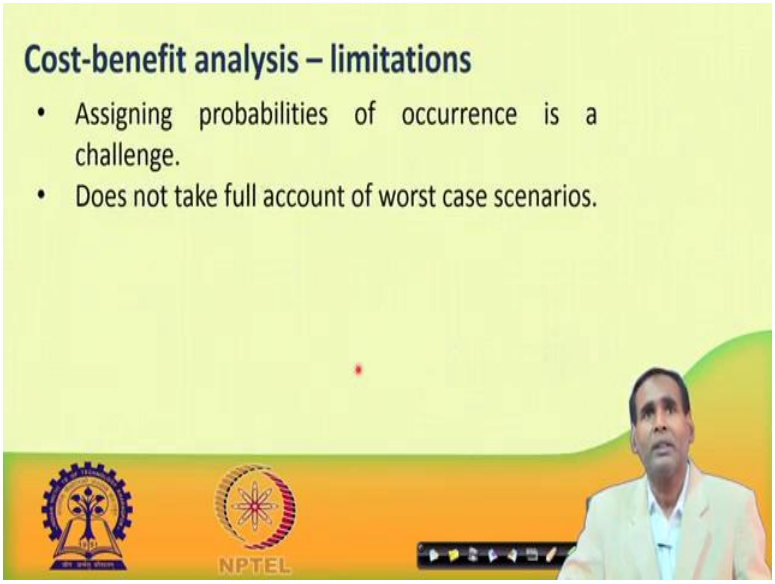

Next, so, the limitations are that, how to assign the probability? So, there were 10 percent, 20 percent, 30 percent. So, assigning probability of occurrence is a challenge, it does not take a full account of the worst case scenario. It only considers the average case scenario, it does not take into account the worst case scenarios.

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So it may take the it may find out it may take the average case scenarios, but it does not handle the worst case scenarios. So, now this risk profile analysis the next method. So, this is an approach which attempts to overcome some of the problems of C-B analysis

method what I have just told by constructing a risk profile. So, here it consider it construct a risk profile using sensitive analysis to evaluate the risks. So, that the some of the problems of the C-B analysis will be overcome, by studying the results of this sensitive analysis, then we can identify the factors that are most important to the success of the project.

Then with a need to decide whether we can exercise better control of over them or otherwise mitigate their effects. So, with this study if we will know that which factors are most important to success of the project, then we need to decide whether we can exercise better control over these factors or otherwise we will mitigate their effects. If, neither is the case if it both the things are not possible, then we must live with the risks or we have to abandon the project, this is how risk profile analysis method works.

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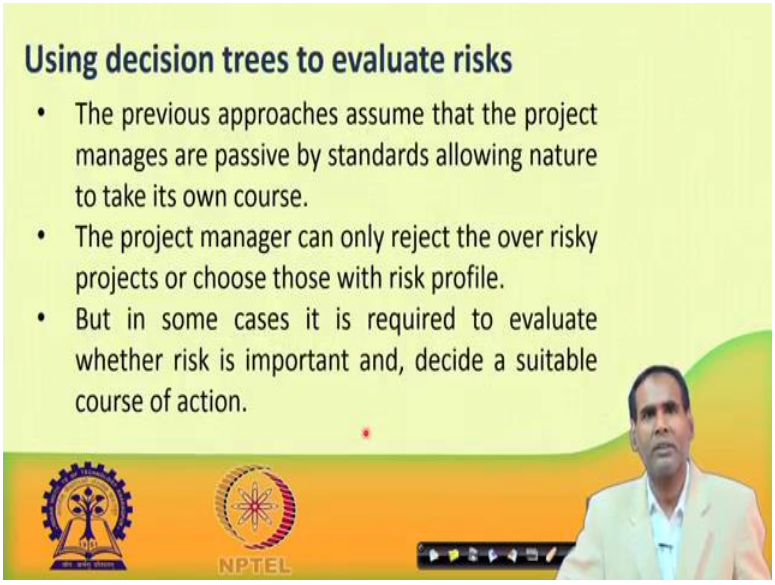

Next quickly see this one, this is using decision trees evaluate the risks. So, I hope decisions trees you must have studied in B-tech career. So, this decision trees can also be used to evaluate the risks. The previous approaches assumed that the project managers are passive by standers, they are by stand they are bystanders the standard this spelling mistake, they are passive bystanders allowing nature to take it is own quotes; that means, only the project manager can only reject the over risky projects or choose those with risk profile.

So, only those which are less risk they may take which are more risky the project manager just simply what rejects those projects. So, but in some cases, it may be required to evaluate whether risk is important. And you decide a suitable course of action always we cannot just what leave projects which are risky, we must have to handle them. So, how to handle them, how to deal with them, that sometimes required we have to take some appropriate action depending upon the importance of the risks.

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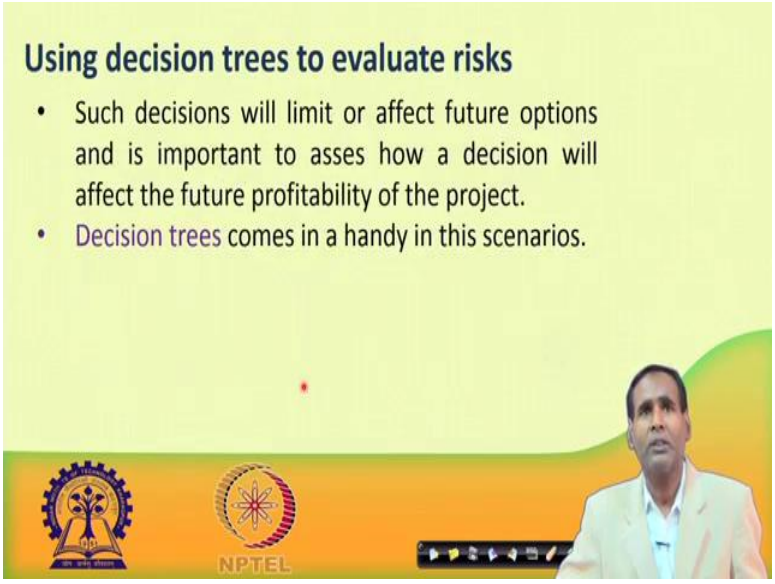

So, such decisions will limit or affect the future option. So, this decisions will affect future options and it is important to assess how a decisions will affect the future profitable project, if risk is there currently at in a project, how it will affect in future. So, decision trees comes in handy for the dealing with these scenarios let us quickly see so, how decision trees can be constructed.

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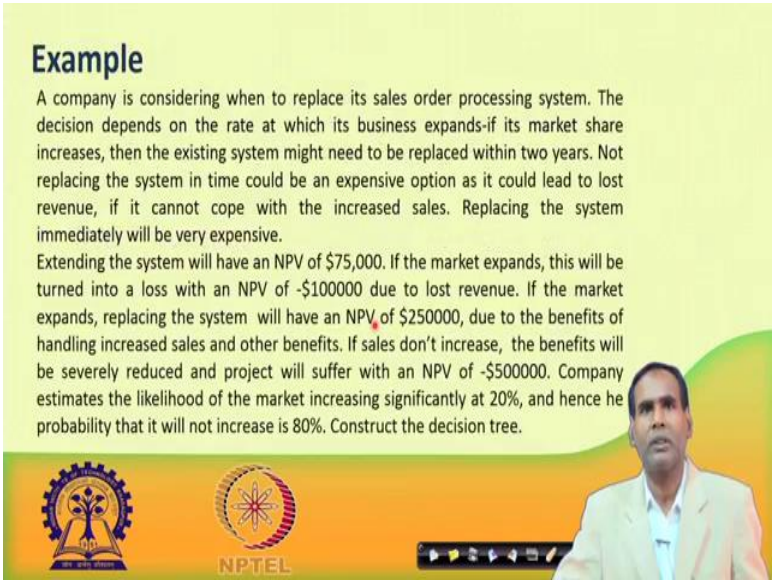

So, again I have taken a simple example. A company is considering when to replace it is order sales order processing system. So, a company currently it is suppose it is running at manually. Now, it wants to replace it may be through one automated system.

So, the decision depends on the rate at which it is business it expands. If it is market share increases, then the existing system might need to be replaced within two years. But no if the company will not replace the existing system in time, that could be this could be an expensive option as, it could lead to lost revenue, if it cannot cope with the increase sales. Replacing the system immediately will be very expensive.

So, now this is one about replacing, but let us see about the extending case extend the system will have an NPV of dollar 75,000. If, the market expands, this will be turned into a loss with an NPV of 100000. So, I think it is a 100000. So, here it is negative sign, because this is loss due to the lost revenue.

If the market expands replacing the system will have one NPV of 250000 dollar due to the benefits of handling increase sales and other benefits such as what enhanced MIS system etcetera. If sales do not increase then benefits will be severely reduced and the project may have to suffer with an NPV of again dollar what some 500000's or so, com sorry 50,000.

So, company estimates the likelihood of the market increasing the significantly at 20 percent. So, it is estimated that that the likely of the market increasing market expands it is 20 percent, the probably 20 percent. And hence the probability that the market will not increase market will not expand is 80 percent. So, now, we have to construct the decision tree and take the appropriate action.

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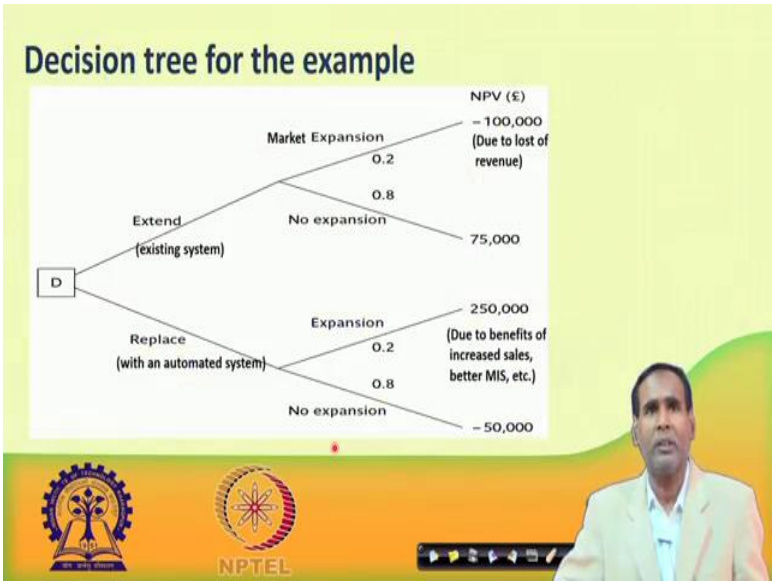

Can say that what problem I have described here, easily you can construct a decision tree like this. And these are the values, these are the probability that I already told you, the probability that much market will expanded is 20 percent. So, of the probably of it will not be expanded as 80 percent. So, this is on what you can say extent, because it is the existing system the existing system can be extended or the existing system can be replaced with an automated system, that the company is thinking.

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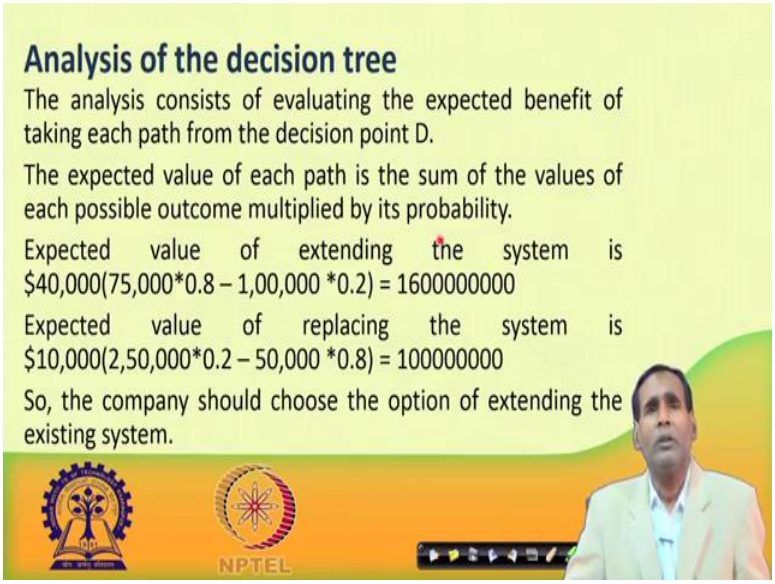

So, now we have to analyze the decision tree you can see that, the analysis consist of evaluating the expected benefit of taking each path from the decision point D. So, this is the decision point D from decision point D, we have to evaluate we have to asses each path. So, this is one path, this is another one path, let us evaluate or asses each path, you can see that the expected value of each path how you can find out.

So, the expected value of the each path can be finding out can be found out by taking the sum of the values of each possible outcomes multiplied by it is probability. So, let us see first case the extending case ex extending value of the expected. So, now, the expected value of extending the system which found out by what. So, extended case is this one, you can see that the NPV, if market expansion happens. Then what is minus 100000 and probability is 20 percent, if market does not expand so, 80 percent probability and 75,000.

So, we can find out the expected value. So, this will how much 75,000 into probability 0.8 minus what 100000 into 0.2, this value is coming to be how much 40,000? So, this path will take up what 40,000? So, 40,000 into what 40,000 coming to be this much value. Similarly, expected value of replacing the system is how much this you can see replacing it is this case.

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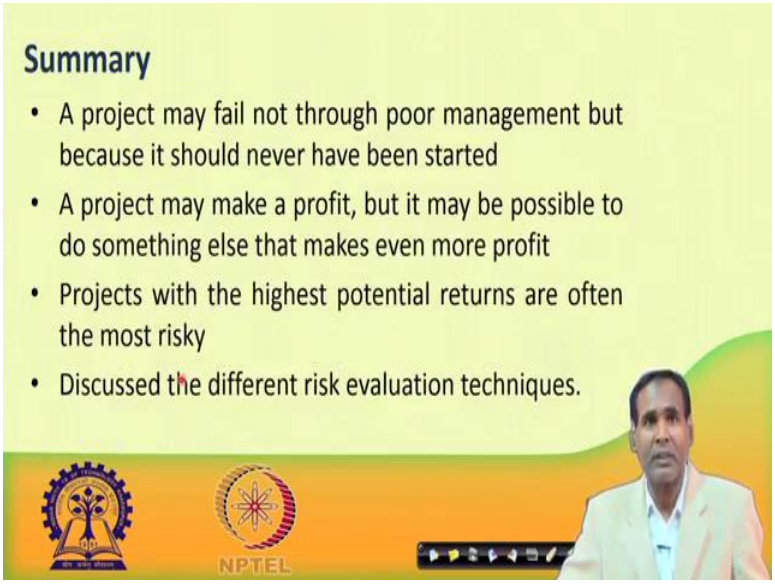

Replacing you can see the value is 2,50,000 if market expands. So, probability is 20 percent if market does not expand, there will loss that will be 50,000 and probability is 80 percent. So, we can evaluate it. So, it will be 2, 50,000 into 0.2 minus 50,000 is 0.8 coming to be 10,000. So, this path now will become the value for this path will be 10,000. So, 10,000 into this value is 10,000. So, 10,000 into 10,000 coming to be this value, if will compare both the values so; obviously, profit will be maximum in this case; that means, it extending system not replacing the system.

So, the company should choose the option of extending the existing system rather than replacing the system, because the benefit will be more in case of extending system rather than replacing the system ok. So, we have seen that different what first we have seen the two phases of C-B analysis, then we have seen what is a risk different types of risks. And how the risks how the risks can be evaluated, we have discussed different risk evaluation techniques? So, this is about the different types of risks evaluation techniques.

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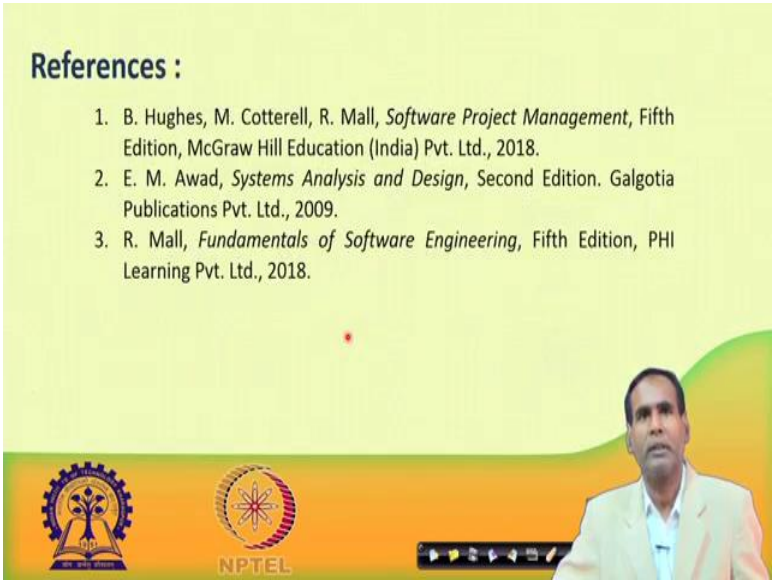

These are the references we have taken and.

Thank you very much.