Course Name -Project Management: Planning, Execution, Evaluation and Control

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Welcome to the course Project Management Planning, Execution, Evolution, and Control. I am Professor Sanjeev Choudhury from the Indian Institute of Technology Kharagpur. In continuation with module 10 model Project Progress and Performance measurement. In this lecture, we will be talking about Forecasting, Project Completion, Time, and Cost. So, the concept we have covered most of these lectures in the last two sessions. Now in this session we will be covering the forecasting final project time and cost for this.

So, how do you do that? You remember that EAC that is estimated cost at completion. So, we have talked about if we go back to this this graph you remember if you go this graph, we have found out this C V, S V, C P I, S P I all this. Now this is the total budget of your project that is budgeted cost at completion. Now we have seen your actual cost was this much, now we have to forecast the estimated cost at completion this you have we have to forecast then only we can get EAC.

So, this what is EAC how you estimate it that we will be talking about it. what actually is being done up to this is the actual cost. That is AC plus your cost remaining the cost to be incurred for the remaining work this you have to forecast. How do you forecast? you take the trend of the cost that is CPI how the efficiency of the cost that is E V by AC what was the trend that trend what you do you extend that trend or you extrapolate extrapolate that trend to get the EAC estimated cost at completion. And difference between budgeted cost at completion minus estimated cost at completion will give you the variance at completion this is the concept.

So, now we will be going for forecasting method. the method used to revise the estimates. what we are doing we are generally the ones is forecasting another case may be options may be revising the estimate. So, method used to revise estimate of future project cost there it may be two ways one may be the EAC that is estimated cost at completion revised another way you can do it you forecast. When do you go for the revising the estimated cost at completion when you your baseline cost because you make a baseline cost that PV plan value is your baseline cost BSE is your baseline cost, but when your baseline is not based on very reliable data and that once you have started the project and

you find out that the baseline is not reliable and accurate nor needs to be revised; experts also feel it has to be revised.

So, then what do you do if the EAC revised how then what are the formulas generally EAC revised are used this is generally what you do EAC revised is actually AC actual cost plus ETC. ETC is estimated cost to the remaining work estimated cost for the remaining work. this will give you ETC revised but another case is the EAC forecasting when you do it? after doing the work starting the work you find that your trend actual cost is following a trend it is not cost efficiency is different. So, you have to extrapolate that. So, that is the EAC forecasting.

So, we will be talking about how to do that forecasting model of EAC finds out EAC. So, how do you find it out EAC this thing is actually actual cost till date plus ETC forecasting. ETC is what is the actual cost ETC is the estimated cost to the remaining work to complete. So, this now, what is ETC? we have to find out ETC. what is ETC forecast equal to the cost of work remaining.

divided by CPI. CPI is the cost trend cost efficiency what you have done. So, what is this? This is nothing, but budgeted cost at allocation minus work remaining is budgeted cost at allocation minus earned value divided by CPI is EV divided by AC cost of work remaining is BAC minus minor, not cost says the work remaining work remaining is BSE minus EV divided by EV by AC. So, then what you find it is how it is coming what is AC into BAC minus EV by EV. Now what is ESEF is now EACF is we found out AC plus ETCF ETCF is AC plus AC AC plus AC into BSE minus EV ESEF is now EACf is we found out AC plus ETCF.

ETCF is AC plus AC into BAC minus EV. divided by EV. So, what do you get AC 1 plus BAC by EV BAC by EV minus 1? This 1-1 cancels. So, what do you get? AC into BAC by EV. So, you can write it down it becomes BAC by EV by AC which is nothing, but BAC by CPI.

So, EACF equal to you can simplify it is EACI forecast is your budgeted cost at allocation divided by your cost performance index CPI it will give you the EACF. Similarly, for a schedule performance originally when should be your similarly EDAC you call it EDAC expected duration at completion duration when it goes it becomes what you can find it out it will be the original planned duration divided by SPI. I will give you the example. Now let us go here and refer to this. So, here we have found out BAC that EAC is nothing, but BAC divided by CPI that cost performance index CPI it will give you the EAC forecasting.

Now variance is what BAC minus EAC variance. So, here is what we found sorry what we found we found here EAC forecast is how much BAC divided by CPI. Now if you see the schedule, was supposed to be here know say 45 weeks, but it has it has stretched to 50 weeks but 45 was the original duration. Now what should be the planned duration was 45 what should be the expected duration now it will be the original duration by SPI. So, the next graph if you go here, you will find out this EDAC expected duration at completion this is scheduled the date of completion was this it was 45 it was scheduled and this is expected duration.

So, how do you find out the similar way you can find out EDAC's expected duration at completion is the original duration ODC which is called originally planned duration this is original planned completion duration divided by SPI. it will give you the EDAC. So, similar way, we have found it out. So, we have found out the forecasting model that original planned duration also, you can find out about EACF. we have found out OK.

So, now, the forecasting model and all we have we have come to know now what we will be doing now we will be trying to solve a problem. when we solve a problem then our concepts will be clear. So, let us solve this problem please go through this problem I think this was clear that EACF BAC by CPI. So, yeah variance so, here the variance was, what is the variance? Variance means the VAC variance at completion is BAC minus EAC this is the variance at completion. So, now, we will be going for the problem solving.

Yeah, the problem says given the following project network has been given baseline, and status information, develop status reports for periods 2, 4, 8 and complete the performance indexes table calculate estimated cost at completion forecast and VACf variance at completion forecast based on your data what is your assessment of the current status of the project? at completion? So, these are the network given for the project. So, it is it takes the 12-time units out of that 12-time units what is the we have to develop a status report for period 2, period 4 and period 8 for the management. So, you first go through the problem and understand the problem then we will be solving it. Yes so, this is the budget time faced budget it is given in the problem. So, this budget these are the the these are the periods time units say it may take 12 weeks.

So, or the so, these are the 12 weeks budget allocation activity A, B, C, D, E, F budget is 40 it is time faced at first 4, 4 time unit then B 5 weeks then C for this because this follow your this allocation follows the your network say A is from 0 to 4 days then B is 0 to 5 days C can only start from the earliest start is 4 earliest finish is 8 it has a slack of 2. Similarly, this will start at 5 and 10. So, these are given this way it is allocated. So, now, we have 2 status report we have to fill up this is the problem given the task A, B at the this is period 4, period 8 what is the earned value we have to find out actual costs are

given actual costs are given we have to find out earned value, planned value then cost variance then schedule variance then for each period we have to find out SPI schedule performance index and cost performance index and PCIB that is percent completion in terms of budget and VACF all these we have to find it out. Now, let us solve this problem in the excel sheet before going to the excel sheet I just wanted to inform you that one may one thing I would like to remind you that that one thing we have not covered not told you must know this like here in this integrated cost schedule graph what you find out the schedule variance say SV is not expressed in time or duration.

it is expressed in money terms, in cost terms, in dollar terms.what is SV schedule variance is earned value minus planned value what is this planned value planned value is a 300 million dollar at at 25th week that is 75 percent of the project budget. So, this is expressed in dollar terms or the cost terms not in duration time duration it is expressed. So, this is I wanted to remind you to now let us solve this problem on the excel sheet Yeah this is the Excel sheet here your time phase budget is given and you here you can see that your network diagram is also given time phase budget is also given. Now, we have to find out status report ending period 2, period 4, period 8 and performance index summary we have to do.

Now, by seeing this task A has been completed 75 percent at the end of period 2. So, what an actual cost is given 25. So, what should be the earned value of the at period 2 earned value will be say the budget is 40, say 10 -10- 10 -10. So, then earned value will be the 75 percent of the of the total budget. So, 75 percent of 40 is how much it will be 75 percent of 40 is 30 30 say similarly for B B is completed how much 50 percent has been completed that is what the budget of B is 32.

out of 32, it has been 50 percent is means 16 16 then what is the planned value? Planned value is the of A. So, at the end of period 2 what was the planned value at the end of the period 10 plus 10 is 20. So, these will be 20 and what was the planned value of B? B after period 2 it was 8 plus 4 12 planned value was 12 you see 8 plus 2 because we are measuring at the end of period 2 this is planned value. So, now, we have to find out if CV and SV .CV is the cost variant what is CV value? we know CV is earned value minus actual cost is given.

So, D 3. So, it becomes 5 similarly SV is the scheduled variance is what is equal to EV minus PV. EV is this 30 minus PV we have found out 20. So, C3 minus E3 it becoming 10 Similarly you can find this also similarly drag it. So, we find this also you do cumulative totals we found cumulative totals. we have to do auto sum we get 46 here we have to do auto-sum.

So, we can find out the PV that CV SV and cumulative all this the for the period 2 whatever is given we can find out. Now, status report ending period4. So, here is the status report what is it we have to find out? So, A is 100 percent complete at period 4. So, what will be the E B E B will be 100 percent means 40 is totally it is finished.

So, it is 40 this one is 40. So, this is B. the B is how much 100 percent complete, but planned was 5. So, 100 percent of the budget allocations are how much 100 percent was 32. So, B is earned value is 32. So, what should be the planned value planned value of A was how much it is 40 planned value was also end of this thing was 40.

So, what is the CV here CV would be equal to EV minus AC. So, this S V schedule variance will be equal to EV minus PV you got it. So, what we do we drag it. So, what we do here PV is how much planned value we have to find out for B. planned value was how much? planned value was 8 plus 4 plus 8 plus 4 up to 4 now period 4.

So, planned value was 8 4 8 4 is 24. So, what would be this the CV is 8 and SV is also 8. So, now, what is the total of this? the auto sum is 72. 72 is the total earned value of this. then we go for drag it and the actual cost total cumulative is 59 this planned value is 64 then C B is cost variance is 13 this is 8. So, we get at the period end of period 4.

then status report ending period 8. that pending here this 8 what is the status report. it says A is 100 percent complete that is its earned value is 40. PV is here Planned value is 32 because it was up to 8 that it is all has been completely done it will be 32 hm this will be 32 PV, EV 40.

AC PV is 32 hm. So, this is 40. this is sorry EV is 40, PV is 40. So, what will be the CV? CV will be EV minus AC then SV is equal to EV minus PV hm 5 and 0. Now we have to find out B is an end of year week 8 it is fully 100 percent complete means 32. The earned value is 32 and PV is the end of this PV is also 32. PV planned value at is end of this is also 32.

So, what will be they will be the CV is 8 and SV is 0. Similarly, what is C? C is 100 percent complete let us see C is the allocation is 12. 12 from 4th 5th 6th 7th 8th at the end of 8 it is all 48 100 percent is 48 is complete. Now PV is how much? PV also 48 it is given PV is also 48 at the end of the 8th period. So, what is the CV? CV will be EV minus AC and this will be this will be 0.

this is 16 then D D is 33 percent complete that D is this what is D up to 8. What is the budget of D budget? The budget of D is 18. So, out of 33 percent of 18 is one-third that means it is 6. One-third is finished PV how much? PV is for D is up to 6 plus 2 is 8 plus

2 is 10. So, if it is 10 is 6 plus 2 plus 2 is 10 is the planned value.

So, what will be the CV? CV is minus 14 and EV S B is how much? SV is minus 4 SV is minus 4. This is 6 minus 20 is minus 14 .6 minus 10 minus is 4 Then E is 100 percent complete. E is 28 8 plus 8 plus 12. 100 percent complete then earned value is 28 then PV is as per plan it is also 28 it is also completed at 8.

So, P B is also 28 ok. So, what is this CV 8 and 0 Now we will do the auto- sum total AC is 131 for the period of 8. I can drag this 131 is the actual cost. 154 is the EV cumulative. PV is 158 then C V is 23 and minus 4.

So, we have done that. now what do we have to do? We have performance indexes summary period 2, period 4, period 8. So, period 2 what is the EV in period 2? this is 46. The EV is 46, AC 37, and PV 32 it is period 2. So, then period 4 is equal to this. So, now, if I drag it ok 72 ,59, 64 and period 8 is equal to 154.

So, we get 154, 131and 158. Now S P I we have to find out CPI, PS I we have to find out what S P I is equal to EV divided by PV. So, this is this 1.

438. So, all SPI EVs by PV. we can do that EV by P. What is CPI equal to EV by S E oh sorry ah C P I equal to E B divided by S E. So, we are getting 1.243 that is more than 1 is the cost is efficient it is desirable.

So, we can get for 8th period C P I is 1.176. Now, PCI what we have found out PCI in terms of budget is what it is EV by we have found out know EV by BAC. What is BAC here budgeted cost at completion is what BAC is given this total budget this 206. So, we will P C I be is what? EV divided by BAC 206. it is 0.223 for period 2 than period 4 period 8 you can find out period 8 it is 0.

748. So, we have found out the P C I-B now we have to find out the EACf is the estimated cost at completion you are forecasting it. So, what we have got we have we have formulated derived that formula E S E F equal to B S E divided by C P I. So, what is we will find out what is BAC is how much BAC is 206 divided by that C P I P I is 1.

176 at the end of 8th period. So, divided by this. So, how much it is coming it is 175 and VAC variance at completion we have also found out equal to BAC minus EACf E is equal to VACf 6 minus EACf is 175. So, you will get VACf is 31. So, because it is at the end of period 8 and this project is for 12 weeks. So, we have worked out on the status report ending period 2, we have found out all the parameters E V, P V, C V, and S V. Similarly, for period 8 we have found out the E V, P V, C V and S V then performance

summary indexes for period 2 period 4 period 8 and we have found out S P I, C P I, P C I- Band also estimated cost at completion and VAC variance at completion.

So, we have now you can do the problem such problems by yourself. Now, we will be going to the other part ok. We have so, we have done filled up this one. So, now, to summarize what we have done in this lecture we this session we have discussed the forecasting method to determine the final project cost and time that are generally used by the practitioners. For better understanding it has been demonstrated by solving a problem and numerical.

So, these are the references for this chapter and the module you must go through it and enhance your knowledge further. Thank you very much for attending today's lecture.