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

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Welcome to the course Project Management Planning, I am Professor Sajeev Choudhary from Indian Institute of Technology Kharagpur. In continuation with the model 10 that is project progress and performance measurement. In this lecture we will be dealing with development of performance indexes for monitoring. The concepts that will be covered in this lecture are development of an earned value system cost and schedule system, then indexes to monitor project progress. Then when indexes are such as performance indexes, development of project percent complete indexes, technical performance measurement, additional earned value rules, and thereafter we will rest of the topic we will be doing in the subsequent lecture. Now before we go further, we must define what is the we must be a familiar with these terms say so, I will request you to go through these terms which we will be using.

EV is the earned value, earned value is for a task to simply the percent complete times the original budget and to stated differently EV is the percent of the original budget that has been earned by actual work completed. Actually, this is budgeted cost of work performed, then PV is the planned value the planned time phase baseline of the value of the work schedule and approved cost estimate of the resource schedule in time phase cumulative baseline. This is called that BCWS that budgeted cost of work schedule is the planned value. AC is the actual cost of the work completed AC that CV is the cost variance it is the difference between EV minus AC that is earned value minus actual cost.

Similarly SV is the schedule variance and it is the difference between EV minus PV, EV is the earned value PV is the planned value. Then BAC the term will be using is budgeted cost at completion that is total budget cost of the baseline or project cost account. So, EAC is estimated cost at completion, ETC is estimated cost to complete remaining work and VAC is cost variance at completion. So, these are the terms we will be using it because and subsequently you will be knowing this in the subsequent slides what the each of these how it is calculated what each of these means. Actually, this terms you stick to one set of terms because different authors different books you will find they have they have used different terms again different software projects use different term.

So, it is very confusing. So, unless you fix in one term that is why it is important to use these terms for lesser confusion. So, now that integrated cost schedule graph how does you do the methods of variance analysis, how do you compare earned value of schedule and cost. So, you go through this this graph carefully and from here we will explain all this terms and all the performance indexes that have been developed we can explain. So, to to go through it this is the cost schedule graph and it has x axis is having the time that is the project duration and y axis is the cost that is the budgeted cost of the project and this is again has put it in in this this is the absolute cost and this is put in graded in some percentage, percentage of the cost that is in dollar terms this percentage are in in terms of cost.

So, you find it you see here the there are 3 curves one is the this is called earned value earned value curve this is your planned value PV planned value means you when you do it that means, it is a baseline baseline cost and durations this side is the duration and this side is the cost we were now doing the cost schedule and cost integration integrated approach. So, this is the planned value is the baseline durations and schedule and this is your actual cost this is AC the earned value is EV PV is the planned value actual cost AC suppose now at these are your project duration say 50 weeks or 50-time units. So, now, today is the say 25th week after 25th week of the project management want to know how the project is performing is it ahead of schedule or behind schedule, over budget, or under budget. So, how do you know from this there. So, you try to know this like here it is earned value and this is actual value and this is planned value.

So, what is CV? CV is the difference between EV minus AC. difference between your budgeted cost of work performed and earned value is budgeted cost of work performed that is EV minus AC, AC is actual cost. So, here EV is this much you have project progress is value is this, but the earned value is this, but the actual cost has gone is much higher 8340 million dollar and it here earned value is only 200 million dollars. So, it is negative. So, similarly, this is called cost variance.

Similarly you find out the schedule variance. schedule variance is EV minus PV is the schedule variance. So, here your as per baseline planned value should have been this 75 percent or 300 million dollars, but the EV your earned value is only 50 percent you have completed of the project 200 million dollar, but, but so, your schedule performance is negative. So, now, you can see here the this is BSE budgeted cost at completion I will come to this is bit later otherwise you will get confused and EAC these are the forecasted one we will be discussing it bit bit late later. Then now let us go to the next one this is a similar way projected time over this is the similar curve here AV is the accounting variance it is means PV minus PV minus AC is the accounting variance these are the earned value budgeted cost of work performed this is the BCWS budgeted cost of work

schedule that is planned value and this is AC actual cost ok.

So, these we will be discussing a bit later further. Now, you see here if tell me now for here that earned value is this actual cost is this and PV 3 curves are high. So, what is a CV? CV is cost variance. it is EV minus AC if EV is less earned value is less actual cost is high it is negative. Similarly, planned value SB is the schedule variance it is also negative earned value is less than the planned or the baseline value.

So, what does it mean anything negative is undesirable EV is negative that that is a CV. CV is negative means cost variance you are over budget you have not utilized your money or the budget efficiently. Similarly, schedule variance is negative means it is your project is behind schedule you say Now here this is you see here What is PV? What is the EV? EV is the AC is this. So, cost variance is negative. So, it is over budget, but the schedule variance is positive because here PV planned value was this, but you have earned value is higher than this.

So, you are ahead of schedule it shows that. Similarly, you can find out CV is positive here and the SV Schedule Variance is positive means your project is ahead of schedule and under budget means less it has it has utilized less fund than it was then it was required. So, here it is similarly you find out CV is positive and SV is negative. SV negative means your project is behind schedule, but your cost is positive means CV is positive means your it is not overruns it is cost is within the budget. So, these are the interpretations of the earned value and planned value.

Now now what is PV? PV is actually planned value is budgeted cost of work schedule you will find it the in MS project and they still use this BCWS. BCWP also use EV and all both are there. So, then what is earned value? Earned value is budgeted cost of work performed BCWB then the actual cost of work performed is known as AC then budgeted cost of total work BCTW that is nothing, but we will be using budgeted cost at completion hm. So, BAC and this was the old terms that budgeted cost of total work. So now, after these terms you know now what is cost variance? Cost variance will be how much cost variance we have already talked about now what is cost variance? Cost variance is CV equal to EV minus AC we know this know cost variance then cost variance expressed as CVP is CV divided by EV hm this is CV.

CV divided by EV into 100 is the as a percentage then what is schedule variance? Schedule variance SV is EV minus PV planned value then what is schedule variance expressed as percentage? It is ah SV divided by EV. So, schedule variance per expressed. So, accounting variance we told it is nothing, but planned value minus actual cost is the accounting variance. So, you know all this ah next, we will find out further more at hm 2

more indices are very important. One is cost performance index that is called CPI what is CPI? CPI is the EV by AC it is nothing, but EV by actual cost this this cost performance index index denotes what? It denotes the cost efficiency of your project the cost efficiency you have accomplished to you for your work till date till date suppose the CPI is 0.

8 what does it mean? That means, earned value is less than the actual cost. So, so 0.8 means you have done 0.8 worth of work done for every 1 rupee spent. So, you are over budgeted you are spending your you have done work of 0.

8 8 rupees worth till date for every every 1 rupee spent. Similarly schedule performance index it is EV by PV is the schedule performance index what does it what does it what does it indicate? It indicates the schedule efficiency of the work accomplished till date hm if it is. So, this performance index should be desired should be more than 1 otherwise what happens if it is below 1 means you are underperforming hm. So, EV by PV if it is 0.8 it means that your you you have your work has been done 0.

8 worth of this accomplished till date against 1 rupee has been spent ok this is EV by PV. Then there are percent complete index in terms of budget in terms of budget what it is PCIV in terms of budget is EV by BAC. Then percent complete index in terms of in terms of cost it is AC divided by estimated cost at completion hm estimated cost at completion hm. Then variance at completion variance of completion is actually BAC it is BAC budgeted cost at completion minus EAC that is estimated cost at completion we will be talking about it later on hm. Then there are TCPI to complete performance index this is this is what this is BAC minus EV divided by BAC this is BAC minus AC.

So, these are the cost performance index you will be you should know it, but before that I will explain this otherwise it will not be clear to you I have to explain to you all of this. So, you can see this diagram here what you are finding out finding that your cost variance we told what is this cost variance is EV minus AC EV your earned value minus actual cost is this your earned value is suppose your earned value at the at 25 week this is say 25 week is now in the midway it is you have done 50 percent of the work performed that is 200 million dollar, but you have your actual cost is say a 85 percent you have exhausted that is 340 million dollar. So, your CV is here in according to this CV is how much CV is here it is ah ah ah ah EV is 200 minus AC is how much is AC? AC is 340 340 equals to 1 minus 140 no. So, you're this thing is coming minus 140 minus 140 is your CV. So, what is SV? SV is you can see it SV is EV minus PV is your SV.

So, EV is 200. So, what is scheduled variance is 200 minus PV is your planned value that is baseline value what is this? This is this 75 percent at ah ah ah week 25. So, it is

300 300 minus 300. So, it is minus 100 is your scheduled variance now ah. So, what is CPI? CPI will be EV by AC now CPI what will be CPI? CPI is EV by AC no EV by AC. So, EV is how much 200 at week 25 and AC is AC is 340 340.

So, it is 10 by 17 into 100 to find out then SPI is how much? SPI is EV by PV equal to what is EV is 200 by PV is 300. So, it is how much SPI is 0.67. So, these are the ah cost performance index and this is your schedule performance index. Now, if you see your budget total budget work it was that is BSE that is budget at completion follows this this curve ah it follows your baseline curve this is the baseline curve.

Now, at at the 25th week so, your actual cost is here. So, you have what should be your expected estimated cost at completion you have to make a forecast. So, this forecast goes like what does it follow we will talk about it after a few slides. how do you make this forecasting? So, that is we will be doing that. So, the clear now is that your thing all the concepts of that earned value then planned value actual cost AC CV SV CPI and SPI these are very important.

Now, you just tell interpretations of in these indexes now you tell me when this CPI cost and the schedule SPI. if it is more than 1, What does it mean More than 1 is always desirable. More than 1 CPI is a cost performance index. That means, EV by AC is more than 1 means your you have earned value is more than your actual cost. So, you have spent less than your budget amount ah that is here.

So, what you get that is the EV by AC is greater than 1. That means, that if you have spent less than your budget and schedule is more than 1 SPI is more than 1 means EV by PV planned value is more than 1 means you are ahead of your schedule and this is your budget spent below or spent less than the budget allocated this is. So, what does this mean? 1 means your project cost and schedule both are on course as per the plan it is going then less than 1 say a CPI is less than 1 what does it mean the it your EV is less than actual cost is the actual cost is more. That means you are cost overrun. this is cost overrun and this means behind the project is going behind schedule So, okay this is a cost overrun.

Now, we will be discussing additional earned value rules. So, long we have talked about the percent completions you know rule that is percent completion rule is like for a for a project how do you do the how do you measure the performance and all for that you make a standard like that the over the period of the life cycle of the project you put certain percentage of the physical progresses once that that that physical progress reaches there you assign predetermined some ah some percent completion that is being done. Now, additional earned value rules it says that these are generally. there are 3 rules

are there. 1 is called 0 by 100 percent rule 50 by 50 rule 50 by 50 percent rule and percent complete with weighted monitoring gates.

what 0 to 100 percent rule is applied to the very short duration the project may be a few days in short duration project or small cost project. Here your you when you start a project you do not earn any value as you go on you earn 100 percent of the budgeted value when your project is finished that is called 0 100 percent rule and you are paid accordingly at the end of the project. So, you that is called 0 100 percent rule then there are 50 50 percent rule. this is also for small short duration and or small cost projects here when you start the work then 50 percent of the budget you earn then when you complete the work rest 50 percent of the budget you earn. So, this is called 50/50 percent rule as I told you these are generally used for short-duration and or small-cost projects.

Then another is the most likely we use it is the percent complete with weighted monitoring gates, like long-duration projects or big projects what we do is identify some gates for monitoring purposes how your projects are progressing and you assign subjective assignment of the progress performances. So, that may be ah assigned after consultations with the experts or the project team or along with the clients you can do it it may be subjective. So, when you those are the milestones, some few milestones are will give you that that your progress is up to this percentage. So, this is the percent complete with weighted monitoring gates. So, to sum up what we have discussed in this lecture are the we have elaborated the method of variance analysis such as cost variance CV, schedule variance SV and accounting variance AV.

Various indexes to monitor progress such as cost performance index CPI, schedule performance index SPI, percent complete index PCIB and PCIC etcetera. Then we have also explained additional earned value rules that is 0 by 100 percent rule 50 by 50 rule percent rule percent complete with weighted monitoring gates and so on. So, these are some of the reference books you can go through for and enhance your knowledge and you can get further on it. Thank you very much for attending today's lecture.