Software Project Management
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Lecture - 43
Project Monitoring and Control (Contd.)

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Good morning. So, now, let us see the another aspect of Projector Monitoring and the Control. We will see about something a different concept called as earned value analysis and then we will see the fundamental concepts of a baseline budget.

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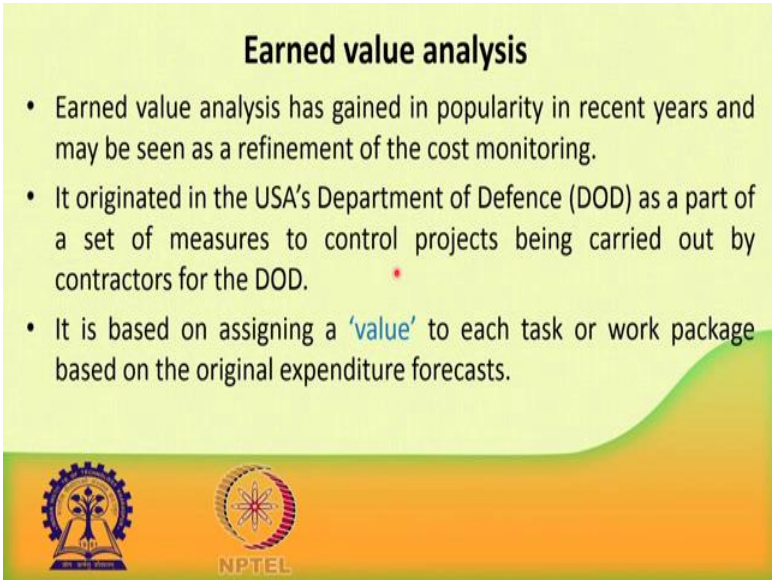

So, yesterday in the last class we have discussed about cost monitoring. So, earned value analysis nowadays has gained in popularity and it can be viewed as a refinement to the cost monitoring process that we have discussed in the last class. So, this earned value analysis it was originated in the USA's department of defence as a part of a set of measures to control different projects which are being carried out by contractors for the department of defence. This concept is based on assigning a value we have to assign basically a value to what to each of the tasks or the work flow packages. You have studied the WBS work breakdown structure, there you have seen how a job is divided into several work packages.

So, this early earned value analysis a concept this analysis is based on assigning some value to each task or work package in case of a WBS based on and the original expenditure forecasts or based on the original expenditure prediction.

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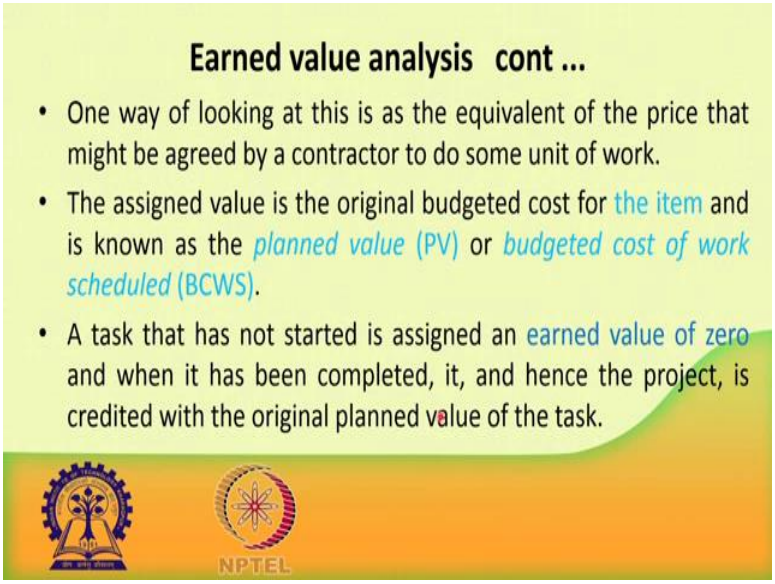

So, let us see an analogy with this earned value analysis. So, this earned value analysis it is similar as viewing and the price that might be agreed by a contractor for doing some unit of work. The assigned value is the original budgeted cost. So, that value will be assigned it to a task or the planned what the forecasted the cost we can say the estimated cost that the assigned value is the original budgeted cost for a particular item or a particular task we can say and it is known as planned value or it is also known as budgeted cost of work schedule or BCWS.

So, planned value can be considered as the value which is the original budgeted cost for some item or for some a task. Now a task that has not started yet it is normally assigned an earned value of zero ok. So, a task that is. So, far not started a task that has not started yet is assigned initially an earned value of zero and then when it has been completed, then the project this task as well and hence the project is credited with the original planned value of for that task.

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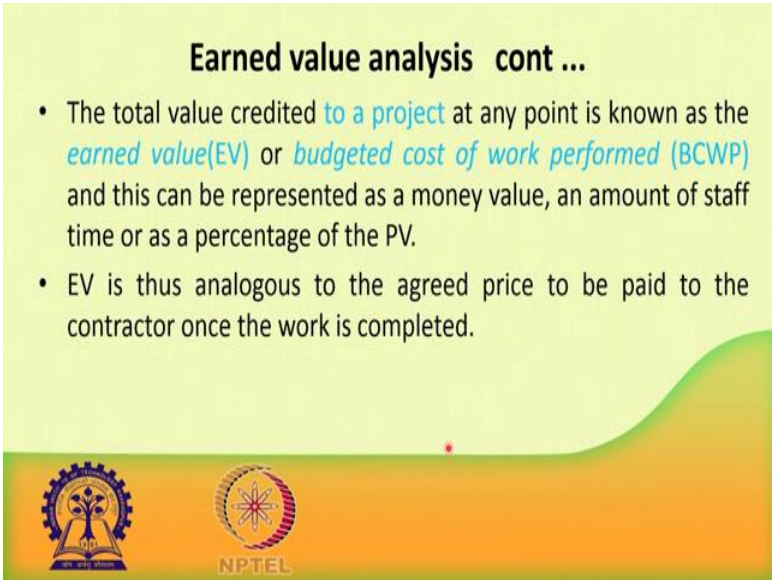

The total value credited to a project at a point of time is known as the earned value ok. So, we have already seen about what is this planned value, the total now we will see is something about earned value. Earned value is the total value which is credited to a project at any particular point of time this is known as earned value, this is otherwise are known as budgeted cost of work performed or BCWP. So, this value can be or this earned value be represented just we can think of as an analogy like this. So, this value can be repented as a money value or an amount of staff time or a percentage of PV. In any of the either ways the EV can be represented maybe in terms of money or an amount of staff time maybe in terms of personal months or so, or as a percentage of the PV.

So, similarly just we have seen analogous to PV present and that value we have already seen an analogous to this planned value, now similarly let us see an analogous to the earned value. Earned value can be thought of as the agreed price that has to be paid to the contractor once the work is completed.

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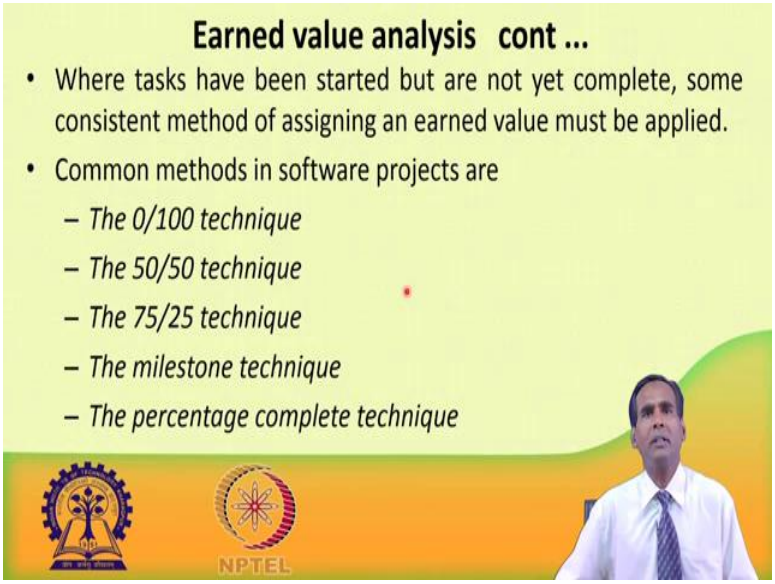

So, now let us see in case of when a work is started how we can assign these what values the earned values. See there are different techniques when the task has been started, but it is not completed so far, then how to assign the earned value. So, where tasks have been started, but are not yet completed then some consistent method of assigning an earned value should be applied. In software project development these are the common methods which are applied for the tasks which have been started.

But so, far they have not been completed in order to assign an earned value this techniques are 0 by 100 technique, 50 by 50 techniques, 75 by 20 technique 75 by 25 technique, milestone technique and a percentage complete technique.

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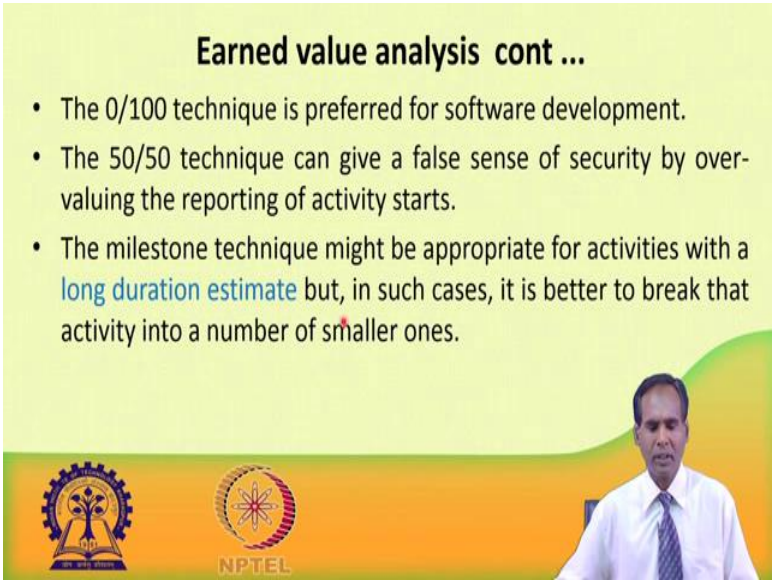

Now let us see one by one these above techniques. First we will before going to the techniques let us see some common general things on these techniques, you can say that the 0 by 100 technique is normally preferred for a software development we will see why it is more useful. If you will use 50 by 50 technique this then this may give you a false sense of security by over valuing the reporting of activity starts say it is not so far say completed 50 percent but the what developer may say that we have done 50 percent.

So, they may ask for the payment for the 50 percent. So, it might give a false sense of a security by just over valuing over rating the reporting of the activity starts. The milestone technique is a suitable for the activities with a long duration estimate. So, for the activities we are having long duration activity long duration estimates, in those cases a milestone technique is more appropriate. But while you are applying milestone based technique say, it is better to first to break the activity into a number of smaller tasks, then you can apply milestone based technique for this earned value analysis for assigning the earned value.

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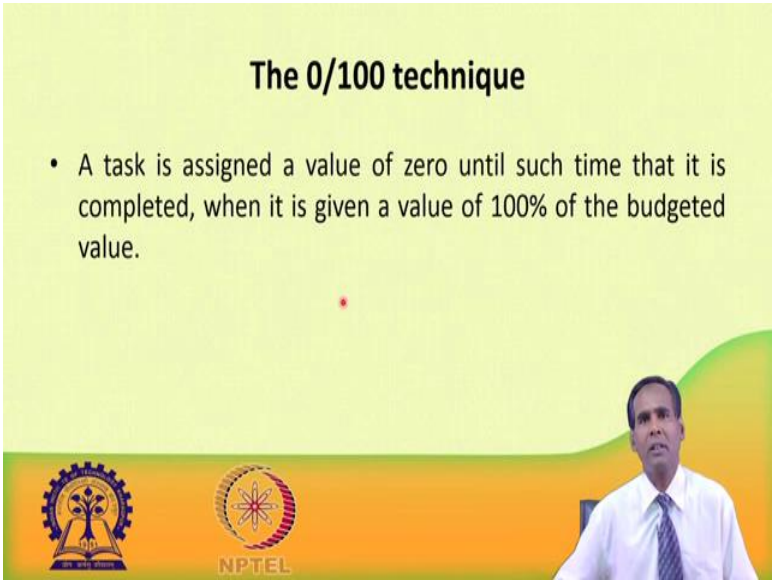

Now, let us see the first technique that is 0 by 100 techniques. So, in this technique a tasks is assigned a value of 0 first initially. So, in this technique a task is assigned a value of 0 until what time? Until such time that it is completed. So, until it is completed no value is given. So, a task is assigned a value of 0 until such time that it is completed, but when it is and when it is given a value of 100 percent of the budgeted value. So, when the tasks is completed, then only totally 100 percent the value of 100 percent of the budgeted value is assigned to that tasks this is known as 0 by 100 technique.

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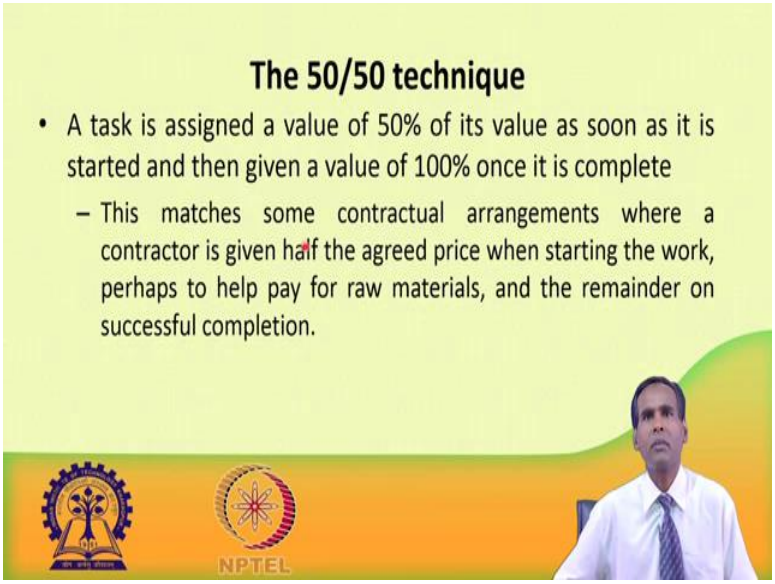

50 by 50 technique says that a task is assigned a value of 50 percent of its value as soon as it is started. So, as soon as the tasks started, a value of 50 percent of the total value is assigned and the rest 50 percent is assigned once the task is completed and they are given a value of 100 percent once it is completed. So, this matches some contractual arrangements where a contractor is given half the agreed price when starting the work, suppose you are considering a building construction.

So, the contractor has been what agreed to some price and then the 50 percent of the price you have to give when he starts because he might have to what a pay for raw materials and the pay for labour works and so, like that. So, first 50 percent you will you have to pay as soon as he starts the work and the rest can be paid upon successful completion of that project. So, this is something known as 50 by 50 technique as I have already told you this might work for building construction other projects etcetera.

But software development this may not work because how to measure that exactly they have done what some 50 percent what will be the 50 percent that will difficult to what compute. So, that is why here it may not be suitable and for software normally software development we use 0 by 100 technique.

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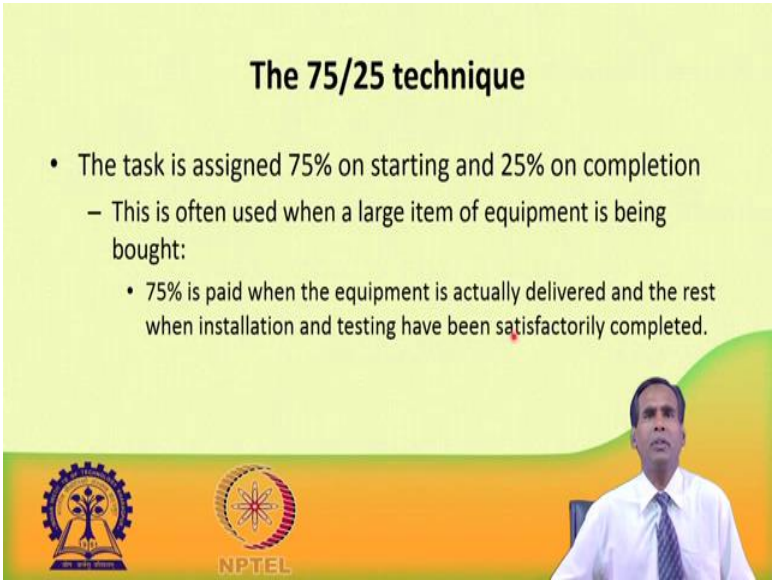

So, it is just a similar to 50 by 50 technique there is another technique called as 75 by 25 technique. So, here the task is assigned is 70 percent on starting as soon as the project is started. So, 75 percent value is assigned and the rest of 25 percent is assigned on

completion of the project. So, this is often used when a large item of equipment is being bought. So, for example, you are purchasing a very large generator or a very vast a huge server you are purchasing. So, while you are purchasing you the what contractor he may say that, I want 75 percent because I have to immediately know what purchase and give it and the rest 20 percent may be given on successful installation ok.

So, this technique may be used when a large item of equipment such as big generators big what servers etcetera or clouds etcetera they are being bought. So, on in the in those cases 75 percent of the total value is paid when the equipment is actually delivered and the rest of 25 percent may be paid after successful installation and the testing.

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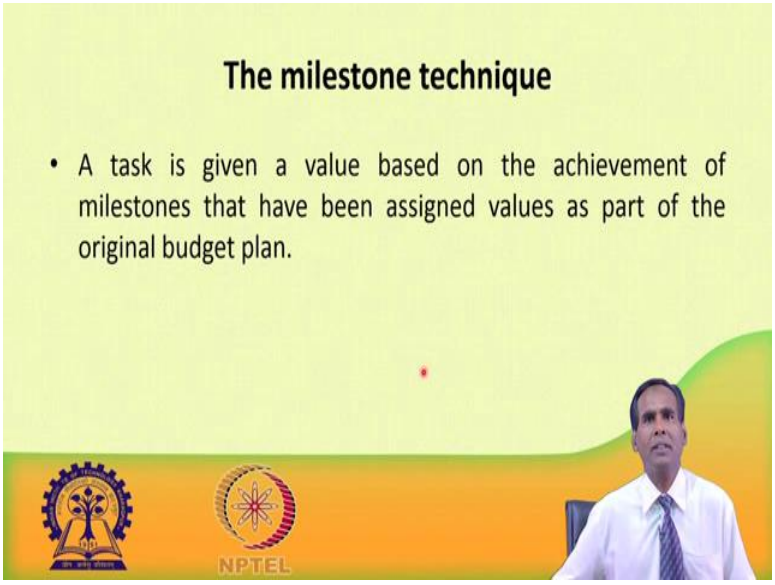

So, next technique is called as milestone techniques. So, here a task is given a value based on the achievement of some milestones. So, here we do not use that what a 50 by 50 or 75 by 20 etcetera the value they assigned based on achievement of some milestones what could the milestones? The milestones could be suppose requirement analysis over SRS is successfully prepared 1 milestone. Design is your for we have successfully prepared the data flow diagrams, UML diagrams etcetera design is over.

Another milestone could be that coding is over, another milestone could be that testing is over. So, normally here the value will be assigned based on achievement of some milestones. So, in this technique a task is given a value, it is assigned a value based on

the achievement of the milestones that have been assigned values as part of the original budget plan.

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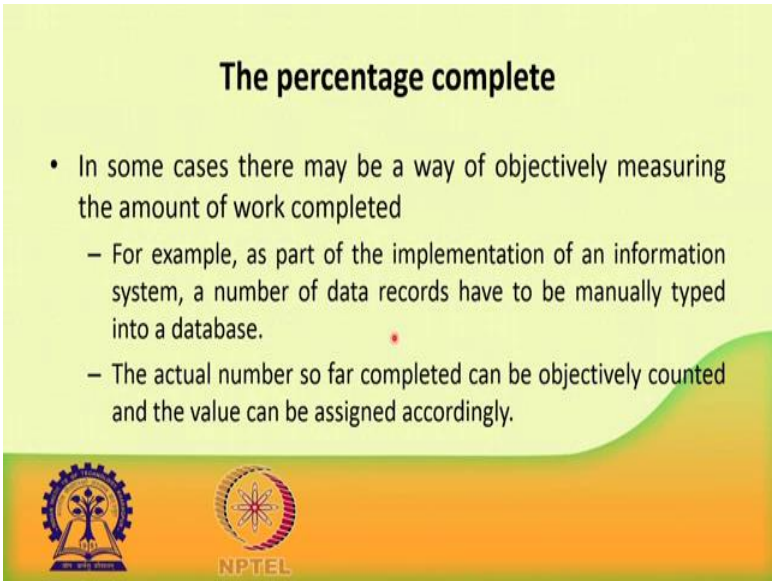

The next is the percentage complete. As its name suggests percentage complete here we have to count we have to measure the amount of work completed, then we can say that what is the percentage of completed 10 percent 20 percent 50 percent like that. In some cases there may be a way of objectively measuring the amount of work completed how much what is the total work and so far what percentage of work we have completed let us take a let us take an example. As part of the implementation upon information system, a number of data records have to be manually typed in the database. Say in an institution there are 10,000 students and for each for each student you have to create a record.

So, and those are what student records has to be typed manually. So, that and they will be saved in a database. So, in this case the value and can give in terms of percentage. So, after 1 month, you say that only what to the 1000 students record has been entered; that means, 10 percent is completed. So, based on that 10 percentage data entry we can assign a value. After say 2 months we have seen 20 percent 2000 records have been completed; that means, say 20 percent work has been done.

So, basically we are counting here the number of data records and based on this what amount of work or the number of records have been completed we can assign some value this is something known as the percentage complete. So, as I have already told you in

this example, suppose as part of the implementation of an information system a number of data records have to be manually typed into the database, then the actual number so, far it is completed can be objectively counted, it can be objectively measured and then the value can be assigned accordingly. This is known as something this percentage complete method.

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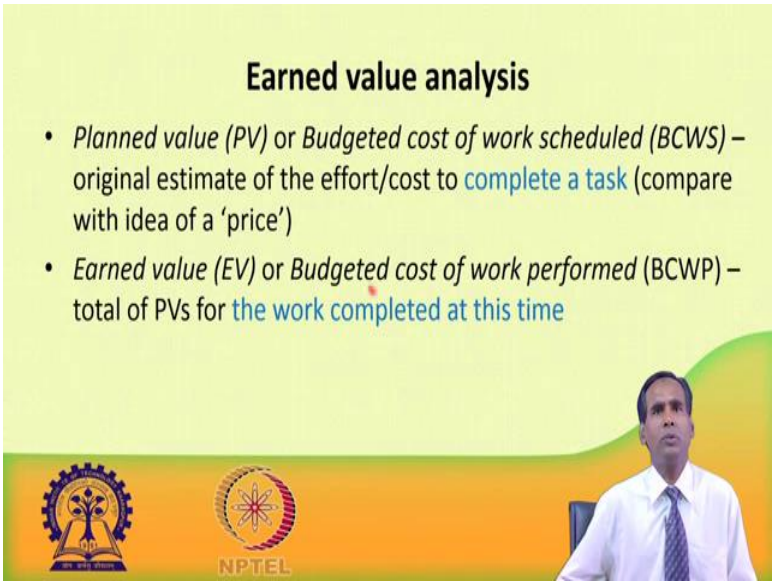

Now, I have already told you two important terms, planned value and earned value. So, planned value it can be considered as that the original estimate of the effort or the cost to complete a task. So, in order to completed a task what is the original estimate may be in terms of a effort or person months or a cost this is known as what planned value or PV, where earned value or budgeted cost of work performed this may be considered as the total of the planned values for the whole work completed at this time ok. So, earned value may be considered as the total of the PVs for all the task for the whole work completed at this time this is known as earned value. So, with this you will move further.

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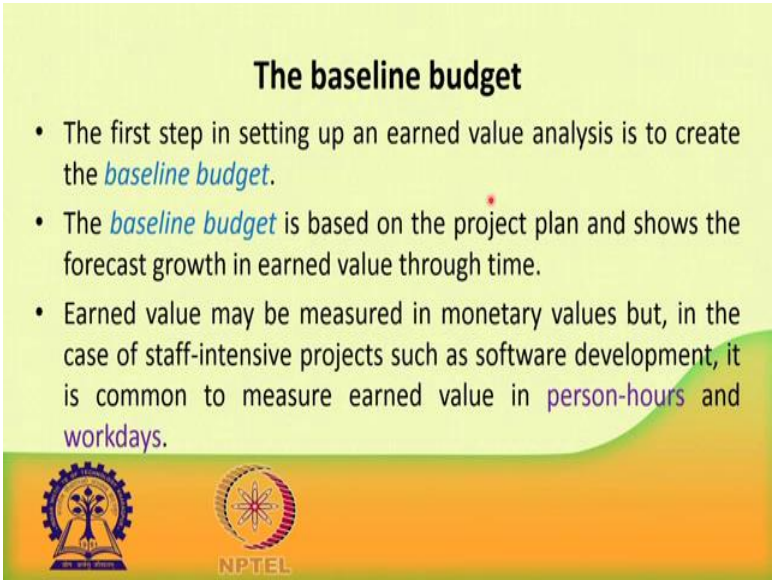

So, the we will used those terms earned value and planned value etcetera in the subsequent slides now let us say about this baseline budget. What do you mean by a baseline budget? So, the firsts step in setting upon earned value analysis is which create a baseline budget

So, we are discussing now on the earned value analysis, the first step in setting up or in preparing the earned value analysis its to create a baseline budget. So, what is a baseline budget? The baseline budget is based on the project plan ok. So, we have already discussed planning earlier and so, this baseline budget is based on the project plan it shows the forecast growth in earned value to time. So, as time passes what is the forecast growth what is the estimated growth or what is the predicted growth in earned value this is represented by the baseline budget.

So, the earned value let us see how it can be measured. Earned value can be measured in monitor values, but in case of staff intensive projects were number of staffs are working such as software development, it is usual to measure the earned value in person hours or person months and in workdays. So, basically earned value will see it can be represented it can be measured in monetary value such as rupees, but for software development organizations normally people use this are people will present the earned value in terms of person hours or person months and in terms of the work days.

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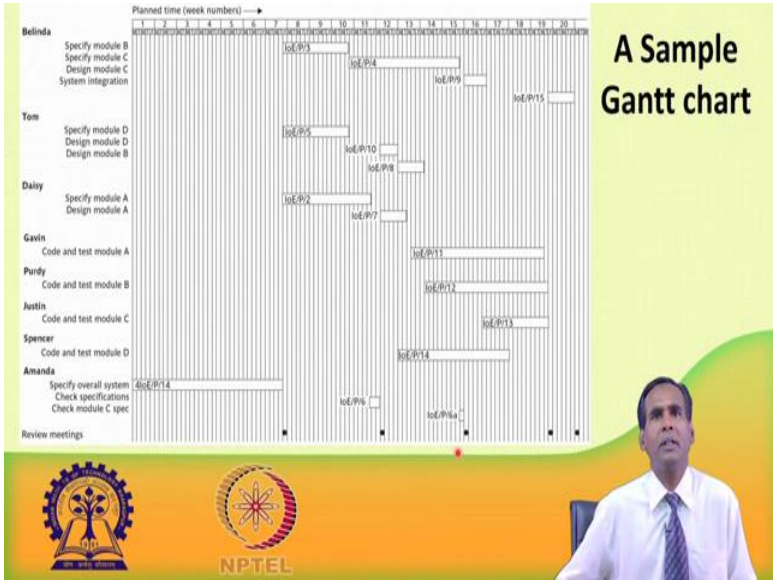

Now, let us see how it can prepare a baseline budget. So, a baseline budget it can be prepared easily if we Gantt chart is already given to you and Gantt chart we have already seen earlier this is a simple Gantt chart is shown this Gantt chart already also we have shown earlier in the last classes. So, here you can say that here in the x axis the weak numbers are taken and here the resources have been considered and here is the showing that from which day of the week it has been started and two parts you can see in these part in the bars.

The one is the shaded part, another is unshaded part and the un shaded part represents the float or the free time or the slack time this we have already seen while discussing about the Gantt chart. Now let us see how you can prepare a baseline budget from thee from given a Gantt chart.

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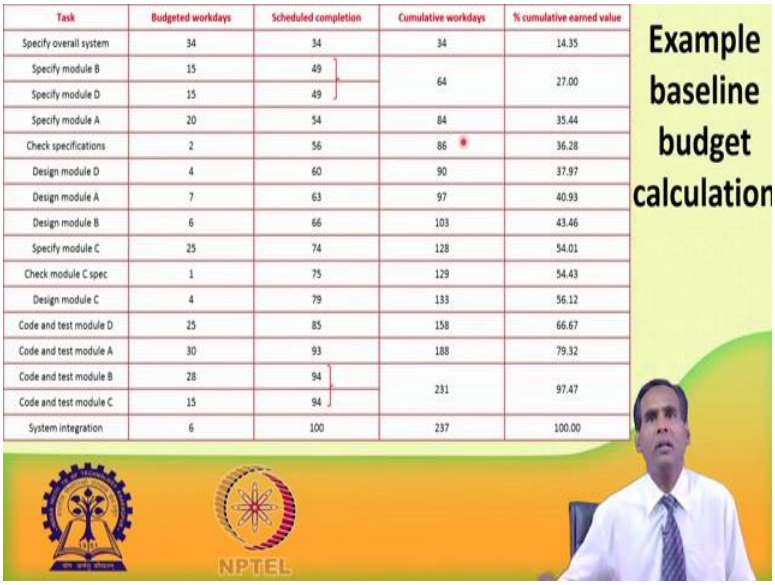

Task	Budgeted workdays	Scheduled completion	Cumulative workdays	% cumulative earned value
Specify overall system	34	34	34	14.35
Specify module B	15	49	64	27.00
Specify module D	15	49		
Specify module A	20	54	84	35.44
Check specifications	2	56	86	36.28
Design module D	4	60	90	37.97
Design module A	7	63	97	40.93
Design module B	6	66	103	43.46
Specify module C	25	74	128	54.01
Check module C spec	1	75	129	54.43
Design module C	4	79	133	56.12
Code and test module D	25	85	158	66.67
Code and test module A	30	93	188	79.32
Code and test module B	28	94	231	97.47
Code and test module C	15	94		
System integration	6	100	237	100.00

See we have to see that we want to calculate these what earned value and we want to first prepare the baseline and budget. So, first you have to list what are the task, the task are already shown here yes the tasks are already shown here on the left hand side. And then what is the budgeted work days? What if the planned work days? You can see from this what Gantt chart the different planned worked the planned the budgeted work days are given like first one is that specify the overall system. So, specify the overall system you can see it is taking 34 days starting from the beginning specify the overall system it takes how many days that it a 34 days.

So, that we have to lists here. So, specify the overall system it takes 34 days and scheduled completion it will start from 0 so; obviously, it will be taken what 0 plus 34 days and cumulative work days also 34 days. So, now, then specify module B and you can see from the diagram above that specify module B and the specify module D also specify module A these three activities these three tasks are started parallely.

These are what a performed parallely after these 34 days of this specify overall system is over. So, this specifying module B takes how many days? 15 days specifying module D also 15 days and specifying module A 20 days. So, that we have to write here that specify module will B 15 days, specify module D 15 days, specify module A 20 days now what we this is the budgeted workdays its planned work days. Now the scheduled completion will be what?

The first activity says specify overload system have started from 0 th date. So, scheduled completion in 34 days module. Specified module B and module D can be started only after this overall system specification over. So, after 34 days you have started how many days it takes? Budgeted work days 15 days. So, 34 plus 15 is 49 this is D and specifying module D and they also started parallely along with B.

So, specifying module A will also take comment at 15 days, when it can be started after this 34 days. So, 34 plus 15 is 49. And now you can see what is the cumulative work days? So, cumulative work days first work job is over on 34 days then next this second job takes 15 days. So, 34 for 15 is how much 49 and next; that means, to specify module D also takes 15 days.

So, 49 plus 15 is 64. So, up to the third activity the cumulative work day is 64 days. So, similarly the fourth one is specified module A this take 20 days after what? After the first job is completed because these three are running parallely we just started parallely. So, after 34 days plus 20. So, scheduled completion is 54 days. So, now, what is this work what cumulative work days? This activity takes 20 days.

So, 64 plus 20 is equal to 84 days. So, cumulative workdays is equal to 84 days. In this way you can find out see the budgeted work days is already available in the Gantt chart then you can find out the scheduled completion and then you can add the what values appropriately, then you will get the cumulative work days. So, up to; so, now, you can say that, the total cumulative work days for completing all the tasks is coming to be 237 days.

Now, we should find out what is the cumulative or percentage of cumulative earned value. So, total cumulative days is 200; total cumulative work dates required is 237 days, now we will take into account the first activity it takes 34 days. So, what is the percentage? 34 divided by 237 into 100 which will come to 14.35 percentage. So, similarly for this second and third activity the cumulative work days is 64 and the total cumulative work days is 237. So, 64 by 237 into 100 is coming to be 27 percentage. Similarly for the fourth activity you can see the cumulative work days up to 430 to each is how much it is 84 total cumulative days is 237. So, 84 by 237 in to 100 is coming to be 35.44 percentage.

So, in this way you can compute the percentage of cumulative earned value. So, I have already told you what is this baseline budget. Baseline budget is the what based on the initial project plan the budgeted plan and the shows the forecast growth in earned value through time as time passes, what will the forecasted rate growth in earned value that is shown in baseline budget and we have seen for this sample example. This is the forecasted the growth this is the forecasted growth in earned value.

So, in this way you can get the percentage of cumulative earned value and of course, finally, the total earned value will be 100 percentage. So, in this way you can prepare the baseline budget for a given project. So, if the Gantt chart is given preparing this will be much more easier preparing the baseline budget or calculating the baseline budget will be much more easier.

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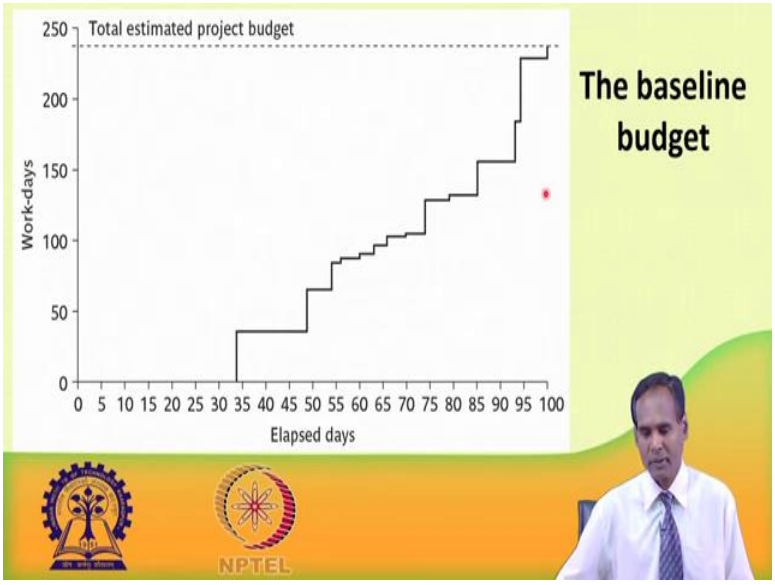

The same thing has been shown in the form of a graph. The same thing we can say from this data, from the baseline budget, from this given data this can be represented as a what graph, let us analyze the graph let us interpret the graph.

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So, in this budget out of the techniques we have given. So, you see 0 by 100 technique is used for crediting the earned value to the project what do you mean by 0 by technique in this context? You can see that the project is not expected to be credited with any earned value until their 34.

When the activity specified overall system is to be completed you can say that. The first task is expected to be completed on 34 days. So, till 34 days no value is assigned. So, this means we are using 0 by 100 technique initially no value is assigned when the job is completed then we assign the full value what is the full value here? 34 days because I have already told you earned value can be represented can be expressed in monetary terms in what personal months or in work days.

So, here the work days is taken to account. So, earned value the initially no earned value is given 0 value is given and when the work is completed this job is completed on 34 days. So, on 34 days the value 34 working days value 34 is assigned to this earned value that is what I am saying here you can see also in the graph. This is 30 up to 34 see the value is 0 and from 34 then the value goes how much on 34 days.

The cumulative this work days means the cumulative work days. So, this is the elapsed days the actual days passed. So, on 34 days the cumulative work day becomes 34; that means, earned value of 34 is assigned here and now as the time proceeds from these values you can. So, next is what 64 and that this values can be given when on forty nine.

So, when a 49 days passed here you can see 49 here. The value is what? We are giving to like this. So, you can see. So, when 49 then this is 64. So, that is when it is a 49 days you can see that this is something what 64 it will be given. So, in this way you can give you can assign the different values from this table you find out the different what cumulative work days and you can assign the value.

So, up to 34 no value is given 0 and on the day of 34 full value is given that is 34 is given here. So, in this way you can see that here the 0 by 100 technique is used for assigning earned values. This I have already told you that this project is not expected to be credited with any earned value until day 34, when the activity first activity that is specified overall the system is to be completed.

This activity was forecasted to consume 34 person days and hence it will be therefore, credited with 34 person days of earned value when it has been completed that I have already told you when it is completed 34. So, you see earned value of 34 is assigned here. The other steps in the baseline budget chart coincide with the scheduled completion dates of other activities. So, other steps in the baseline budget chart, they coincide with the scheduled completion dates of other activities. So, then this is running perfectly.

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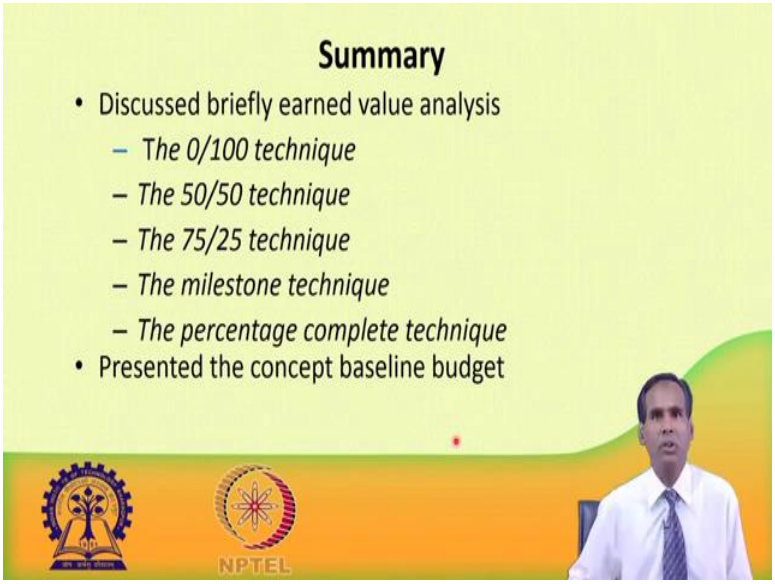

So, now today we have seen about the 0 by 100 technique where initially 0 values assigned and the full value is assigned once the job is completed, then in 50 this is most suitable for the software development on projects and 50 by 50 technique here once the

work is started the job is started 50 percent value is assigned. And the rest 50 percent is assigned after the work is job is completed and in this is suitable for like a building constructions etcetera for paying about labour charges, for purchasing raw metals etcetera.

The 75 by 20 technique it is used in this case where you want to purchase what a large equipment or so. So, they are initially you have to when the you have when the contractor supplies the equipment then you can what assign 75 percent or 75 value you may assign and rest 25 value may be assigned to the earned valued or next rest 25 percent payment may be made after successful installation and testing. And in milestone based technique the value may be asked based on achievement of some milestones of SRS is completed. So, some value in design is completed, some value assigned coding is completed, some value may assign and the testing is completed, this is another milestone some other value some value may be assigned like this.

And in the percentage complete technique here basically here you have to count here you have to measure the work progress and the example we have seen that in a you suppose you are developing a database, where you have to enter 1000s of student records see after the what end up 1 month, if the total records entered to be is 100 sorry 10,000 and you have entered only 1000; that means, a 10 percent what data entry has been made.

So, accordingly the value can be assigned. We have also presented the concept of a baseline budget. So, the concept of a baseline budget will help in the what earned value analysis. So, in the next class we will see how these PV values EV values baseline budgets they will be helpful in monitoring the progress of the project.

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So, this thing we have taken from this book, you can refer this book for further details.

Thank you very much.