Project Management: Planning, Execution, Evaluation And Control

Dr. Sanjib Chowdhury

Vinod Gupta School of Management

IIT Kharagpur

Week- 03

Lecture- 10

Welcome to the course Project Management Planning, Execution, Evolution and Control. I am Professor Sanjeev Choudhury from Indian Institute of Technology, Kharagpur. Today we will be covering module 5 that is Estimating Project Time and Cost. In this lecture we will be discussing about estimating guidelines and methods of estimation and top down estimation that will be followed by others. So, the concepts that will be covered in this lecture are say factors influencing the quality of estimates, then estimating guidelines for time, cost and resources. Then we will also cover top down estimation and method for estimating project time and cost, these will be done in this lecture.

In the next lectures we will be covering the rest of the topics of this chapter. Now to start with what is estimating, how do you define it? The process of forecasting or approximating time and cost for completions of project deliverables that is called estimating. It requires the balance you know estimating if you go on increasing it is accuracy, then the cost of estimation will increase. So, you try to strike a tradeoff between your required that accuracy and the and the cost of estimation, but it is always preferable to have a good estimates.

Now why estimating time and cost are important for the project? In this say a good estimation accurate estimations of time and cost will support your good decision making because your decisions are based on accurate information. So, it will give you a qualitatively better decision. Then if your estimations are more accurate, then it will help you to draw your schedule of work that will be more appropriate for you. Then develop the budget, the budgets also require cost estimations is required for more accurately otherwise the utilizations of the budget will be greatly affected. Then the cash flow you know the in the project when you are executing it and it is a big duration projects say what happens you need the cash flow that the project cost does not given you at a lump sum at one point of time it is given over the over the life of the project project or the project execution.

So, it is always a time faced budget. So, you have to prepare a time faced budget and you know how the cash flow will be coming on different periods. Then the it will help also to make a plan and check the progress monitor the progress of your plan like you must have a

baseline budget or baseline that time schedule estimation against that it will help you to monitor the progress of the project. That is why time and cost estimations are very important for a project. Then types of estimates what are the different types of estimates there are mainly two types of estimates one is the macro estimates and another is the micro estimate.

Macro estimates are also called top down approach and the micro estimates are bottom are called bottom up estimates. This top down and bottom up estimates we will be discussing in detail in the next few slides. So, conditions when you will be using top down estimates and when you will be using the bottom up estimates. Usually top down estimates are used by the by the senior management because senior management do not have that detailed granular estimated levels and that knowledge because they generally use with the top level say major deliverables and all that lines. So, and also that when the projects are being initiated or in the conceptual stage that time you do not know the projects work breakdown structure or the project design and all.

So, you cannot make a bottom up estimates there. So, you have to make to start with to initiate you must have a ballpark estimates ballpark number. So, those are so, for the strategic decision making if you see here strategic decision making generally you do the top down estimates. When the cost and time are very important then you have to go for the bottom up estimate. Bottom up estimates are more accurate that is being done at the work package level.

These work packages if you know the allocations of time allocation of resources allocation of cost and who is assigned to it then these work packages from the lower level it can be rolled up and you can you can make out the time durations you can make out the budget or cost and which level of management is responsible for that. Then when there is high uncertainty then you do not know for sure what are your work packages that how much time or the cost it will take in that you do top down estimates. What is top down estimates we will be discussing it more in the next slide. Then internal and small projects those are small duration projects small cost project or internal because bottom up estimates are always costly and time consuming. So, for this small things you do top down estimates.

Then fixed price contract if you are bidding for a contract and all there you require more accuracy because you have to compete it with the others in the market. So, it becomes that time it requires more accurate estimates. So, that is bottom up estimates. When customer wants details then also then you require the bottom up estimates and when your scope is unstable it is undefined it is not firmed up. So, in such cases you cannot go for the bottom up estimates you have to do the top down estimates.

Now to say what is the top down estimates top down estimates are the done by the senior management they do it on consensus basis or discussion basis and coming to the conclusion that and they take analogy or they take a ratio methods and all things and all. So, to come to

a initial estimates because you have to start with somewhere know bottom up estimate requires work breakdown structure detail design and all. So, initially at conceptual stage it is not possible to have. Now what are the factors influencing quality of estimates? There are different factors that influences the quality of your estimates. One is the planning horizon as all of we know if the duration or the horizon of estimates increases then the forecasting becomes less accurate.

Suppose if you wanted to forecast one month or one week it will be more accurate than forecasting of one year or longer. So, longer the forecasting horizon or the durations it will be less accurate that is known to us. Then project durations especially for new technology, new technology the project duration generally gets extended income rather than the proven technology, proven technology it is much more accurate. So, new technology, unfamiliar things and all your project duration generally increases. Then people you should employ the people who are conversant with that sort of work, who are conversant for estimating that type of project those are very important.

If you can put if you put anyone and all those who do not have that idea or familiarity with that type of project or estimates. So, it will be a poor quality estimates. Then it is the project structure and organizations. What does it mean? We have seen in module 3 that there are different types of project structure like it may be the functional structure, dedicated team structure, matrix structure, projectized structure. So, and we have seen that dedicated team when your if you put a dedicated team what happens your project durations comes down, but the cost dedicated team means you are putting some people exclusively for one project.

So, the cost increases whereas, in the matrix structure you are sharing people those dedicated those people are being shared. So, cost decreases, but the project durations may increase will. So, when your priority is the completion of project within certain time then you go for dedicated project team. Then your criteria is utilizations of your resources optimally then you go for matrix structure. So, these also influences the quality of estimates.

Then padding estimates what is padding estimates? Suppose I say that when you will be able to submit your assignment then generally people students what do they do? They keep a safety margin for if they can do it in one day they will tell two days that is called padding. Similarly suppose if you are if you are asked how long will you take to drive to the airport you will give a 50-50 chance you will give say 30 minutes with 50-50 probability. Now if I say how fast you can drive to the airport you will tell it 20 minutes. Now the same questions if it is asked say how long will you take to go to the airport if you are asked to meet your CEO at the airport then you will take a safety margin you will tell most probably 50 minutes. So, that you want to be sure that you reaches there well before.

So, these are the padding. Similarly everyone every individuals does so, that that should

keep some safety margin with their work packages or the deliverables sub deliverables and all. Then organization culture some organization covertly encourages padding some organizations discourages padding because if each work packages each elements of the task and all you put a padding and all it the project duration cost resource the amount and all it increases hugely and if you are going for say competitive bidding and all you hold no chance. So, some people some organization discourages the culture of padding. So, other non project factors like equipment breakdown say equipment breakdown say if you know within few hours it can be rectified, but it may happen it goes for few days to repair it or unwanted breakdown they say then the vacations national holidays all these also contribute to the non project factors that for quality all these factors influences the quality of estimates.

Then we will be talking about what are the guidelines for work package estimates that is estimation of time cost resources how do you make a good estimates for the work package. So, these are you must employ people with familiarity as I told the people who have handled such type of project who has experience is estimating time cost resources they should be deployed there for the estimation. Then use several people instead of individual, individual estimations is always have a biasness if the a group of people familiar with that project they estimates then the it becomes a more rationalized judgment it the extreme that low or high this things are narrowed down and come to a conclusive one that gives a better estimations several people doing rather than an individual. Then normal conditions when you estimate time cost resources you must consider the conditions are normal what does it mean normal conditions are and efficient using efficient methods and using normal resources what is assigned to you these are the normal conditions. Suppose your for normal resources are given to you say you require 5 bulldozer now it may happen so, that you are having only 3 bulldozer then the work which could have been completed in 5 days may stretch over to 8 days.

So, not these are the normal conditions then when you estimates you must be careful about the time units time units depends on the nature and type of project some projects may be time units you may use minutes or it may be hours it may be days it may be weeks it may be months anything it can be depending on the durations and type of the project. So, mostly it is most of the projects are expressed in number of days and you must be very consistent for this time days this time units like suppose in a medical surgery and all there if you have to use minutes you know minutes are and some places it may be the seconds ambulance and all fire fighting the response time will be in second. So, and in bigger projects and all building constructions and all it may be days it may be weeks. So, you must be and also you must be careful to take calendar days or weekdays because number of days are in a week are also you have to specify or also you may have to specify the worksheets some play some plant and all it works for 2 2 ships somewhere it works for 3 ships. So, whether 8 hour ships or in the 12 hour ships and all this you have to specify then independent task the what is this when you are estimating a work package you have to estimate the you have to consider that you are estimating it that work is independent you are it is not you are not

influenced your estimation is not influenced by other work and all because this when you are doing it you are doing it for independently for that activities for that task.

So, you must be careful for that then what you do do you include contingencies in work package estimation generally I when I ask to students I get the answer yes empathetic yes, but it is just the opposite you should not keep contingencies in the work packages contingencies are for the overall project. So, if you take a contingencies for each and every work package or activities then what happens it will be inflated your time cost resources will be inflated hugely. So, what you require you require a contingencies for overall project and wherever it will be required if required you put use that. So, you do not include contingencies in the work package estimation then the last is the risk assessment you will be very required to do risk assessment. So, that you do not become surprised risk assessment for each work packages and all are a good indicator and the good practices.

So, you must do this these are the guidelines for work package estimates. Next we will be going to what is the preferred approach for estimating time and cost the preferred approach is say when you start with initially you do a rough top down estimates because when you are in the conceptual or initial stage you do not have the entire picture or the work breakdown structure or the design. So, you make a rough top down estimate then you develop your work breakdown structure then organization breakdown structure thereafter when it is done you can do the bottom up estimates bottom up estimates at the lowest level from work package you roll it up. Then when the bottom ups are done then you draw your schedule and budget then after this you reconcile this with the top down bottom up you reconcile this. So, this is the preferred approach for estimating project time and cost.

Then now we will be talking about top down approach for estimating project time and cost. There are few things the top down approaches are it is done by the senior management it is a bulk park estimate and it is there are these are the methods for top down approach like consensus method, ratio method, apportion method, function point methods and learning curve methods. We will discuss one by one each of the thing each of these methods for top down approach. So, what is first let us come to the consensus method. Consensus method is the senior management and the middle management they discuss they come to a consensus group consensus.

So, what should be the project cost and time requirement and the resource requirement. So, they come they come through it through the analogy or mathematical relationships or similar sort of projects done in the past or by in the by the competitors. So, these are the consensus rigorous discussion takes place and they come to a consensus this is a macro type of estimates. Now, if you wanted to do more rigorous consensus method you employ Delphi method I hope all of you know what is a Delphi method. So, next is the ratio method what is ratio method it is also called parametric method it is suppose you know that the you are suppose want to make a building office building.

So, you know what is the square cost per square foot square feet. So, suppose the score cost per square feet is rupees 10000 this ratio method we are talking about ratio. Suppose this is your cost per square feet is 10000 rupees 10000 10000 per square feet and suppose you wanted to make say 50000 1 lakh square 2 lakh square feet and you wanted to develop a 200000 square feet 10000 per square feet. So, what will be your cost? Cost will be 200000 into 10000 10000 rupees equal to it will be how much 2 into 2 into 200000 k 200000 k you it will be your this is called ratio method and suppose also you can make the time also suppose it takes say similar things similar building 7 storeyed building to 2 years. So, you can say your building will take 2 years time duration these are the ratio methods that is the contractors and all they generally do it for this.

So, next is the apportion method apportion method is what apportion method is similar extension of the ratio method extension of ratio method and here also you put the apportion the your cost and all like you have must have seen it I will just say total project cost is 500000 dollar. So, we say 20 percent is given to design 30 percent given to program total testing given 40 percent. So, 200000 so document 5 percent again design under design D1 D2s are given. So, 10 percent 10 percent. So, these are called the apportion method you must have experienced it when you are taking a loan for house building a loan for from the bank how does bank disburse the amount they will give you up to plinth area when you finish they will release 20 percent of the total sanction budget for the for the loan.

Then when you go to the casting of the roof level they will release another 30 percent. So, if you go to then first floor casting. So, second floor casting they will release another 20 percent or 25 percent. So, they have slabs these are nothing, but the apportion method of allocating project cost using the WBS. So, this is called apportion method then there is also function point methods what is the function point methods? It is used in the software industry it is not the constructions of the build industry software industries they generally use you know a weighted weighted macro variables such as they these variables may be number of inputs, number of outputs, number of inquiries, number of data files, number of interfaces these are given some weighted value and they are combined with the they are added with these variables are added with some given weightage to each and this weightage and all they calculate with the regressions with of the past data and all.

So, one person month person month is one person month in US software industry is given as one person month is equal to five function points functions point they use it means one person if working average for one month they will earn five function points this is used specially for software industry. Then the last one is called the learning curves learning curves all of you must be knowing it is used extensively in the aerospace engineering industries or the labour intensive industries where it was apparel industry where it is found that if your output volume doubles then your cost unit cost of productions or the if the time consumed and all comes down in a in a constant manner. So, if you are doing repetitive job what happens you a managers and all know the time estimates or cost estimates it will come down learning curve all of you know I will that it is follows a curve like this where in

here is the volume volume or output and this side is the your unit cost unit cost or labour hour. So, suppose it increases with what it increases it decreases at a constant rate each when your volume of productions doubles every doubles. So, these are the top down approach for estimating project times and cost.

So, the in conclusion we will talk about this chapters deals with estimations of project time and cost there are mainly two types of approaches for estimating project times and cost namely top down approach such as consensus method, ratio method, apportion method, function point method for software and system project and learning curves and bottom up approach we will be discussing in the next lecture and that we will be doing it later. So, the references that you can go through for these are the books you can consult for this module these will enhance your knowledge and you will be benefited. Thank you very much for attending today's lecture.