Software Project Management
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Lecture – 16
Project Estimation Techniques

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So, good afternoon, today we will discuss about little bit of project planning and basics of Project Estimation.

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See first let us see what makes a successful project? So, if there are we can deliver the project in proper time with agreed functionality, that has been what discussed with the end user. And, then at the agreed cost, at the mutual cost that is decided with the user and then with the required quality. What is the quality the user wants, that much quality that we have provided then the user will be satisfied, then we say that this project is successful.

For this we require two stages, that is the we have to set the targets, then we have to attempt to achieve the targets. But, sometimes what happens if the targets are not achievable, the project manager tries to achieve all those targets, but it is not possible to achieve, they are not achievable. Then what he should do? Then actually the projects normally they get failed due to lack of proper planning and proper estimation. So, he has to do proper planning and estimation so that, the project might get success.

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So, let see little so, that is why let see as I have already told you he has to the project manager has to plan properly regarding the activities of the project and do proper estimation in order to get the process project success. Let us little bit say about the introduction to project planning.

We have already seen that before a project starts we have to carry out the project feasibly study activities. Then if a project is found to be feasible, if a proposal is found to be feasible in every respect, like technical it is technical feasible, financially feasible and

operational feasible. Then the project managers will take it for what further steps. So, a project managers activities are varied and they can be broadly classified into two categories. One the project planning and then he has the project monitoring and control. So, the activities project managers activities can be divided into these two categories.

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As I have already told you, that once a project is found to be feasible the project manager then he has to undertake the project planning. So, first he has to make an initial plan, before the development starts. And then this plan is updated very frequently.

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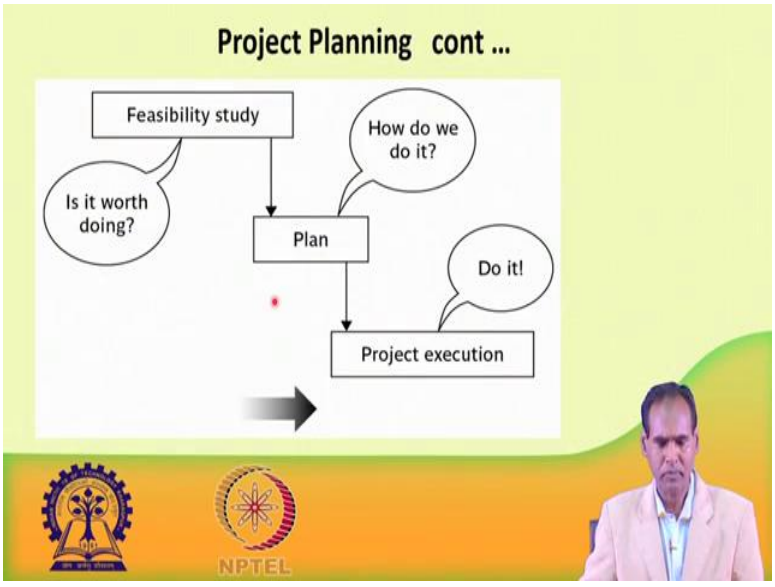

You can say that first the project study is conducted in order to know that whether the project is worth doing or not. Then the project manager has to develop the plan. Here he has to see that, how do he do it? How this project these can he can they can follow it? So, they have to make a plan and finally, project execution step here they have to actually execute whatever plan they have made here, they have to execute the project execution.

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Now, let us see briefly what are the various project planning activities; so, number 1 estimation. So, during estimation phase what needs to be estimated? effort, cost resource and project duration. Then the project manager has to develop a proper scheduling what he has to make a proper schedule, he has to follow some scheduling methodologies.

Then also a staff organization has to be done properly, about how many staffs will be required for this project that has to be planned. Then as we know in a every project contain some risk, some different or some specific methodologies have to be follows for handling the risk, like identifying the risk, analyzing the risk and abatement of the risk. Then there may the project managers may have to follow some miscellaneous plans, that is the quality assurance plan, configuration management plan etcetera.

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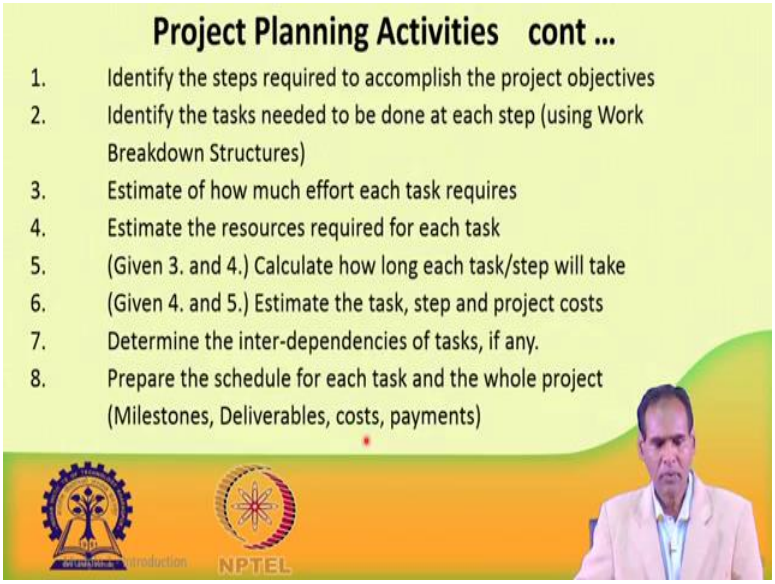

So, let us see in detail, what the how the activity it is a project planning activity they will be followed. First the manager has to identify the steps required to accomplish the set project objectives or the targets. Then they he has to identify the a task which are needed to be performed at each of the step, he may use for this is the work break down structure etcetera. Then he has to estimate how much he put each task requires, also he has to estimate how much resources are required for performing each task.

And if 3 and 4 are known given item number 3 and 4, then the project manager he has to calculate, how long each task or step will take; that means, he has to calculate the project duration. Similarly he has to estimate the task step and project cost, how much cost will be spent for developing this task or for individual step or for the whole project. He has to also determine the interdependencies among the task if any and finally, he has to prepare a schedule for each task and the whole project. So, here he may use milestones deliverables cost and payments etcetera.

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Now, let us see why you should go for project planning, because project planning requires utmost care and attention. Because what commitments to unrealistic time and resource estimates result in the followings. If the project manager committed some unrealistic times, which he cannot achieve at all and some resource estimates which is not feasible at all then the following problems might arise.

What could the following problems? It may unnecessarily make delay the delivery of the projects. So, that the customer will be irritated and customer will be dissatisfied. Hence there will be adverse effect on the team morale and due to poor quality work there will be adverse effect on team morale and it may be even if it may be the case due to improper estimation etcetera. So, the project might get failure. So, that is why it is very much important we should give at most care and attention to project planning.

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So, sliding window planning is a special type of planning which involves project planning over several stages. So, it does not make the plan in one step, at a single step rather, it prepares the project planning over several stages. Here the normally it protects managers from making big commitment too early. Because what to do normally managers do are the very early requirements phase they make a commitment that will develop or we will deliver the project by this state, which they may not actually achieve it.

So, that is why in sliding window protocol or sliding window planning the managers they will be prevented from making big commitments too early. So, this principle just like a java, sliding, window, protocol that you have studied in networking yes, networking. So, then more information becomes available as project progresses. Say initially only less information available, what are the progresses. So, the more and more on the updated information they are coming.

So, this updated information which are received later on so, they will facilitate for accurate planning. So, that is why instead of making in one window or in one what, a one phase the managers they should perform the planning in several stages or in just I using this some concept of window in the what in the phase up several stages.

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So, finally, as you know that every stage of this classical water fall model it some output should be there. So, similarly what is the output of this software project management? The output of software project management is this SPMP document which is known as software project management plan document.

So, after planning is complete, the project manager he has to document the plans where in a document called as software project management plan document. What will be the organization? What will be the contents of the organization?

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The following content should be there in the SPMP document. First there should be little bit of introduction of the project where the objectives and the major functions etcetera should be described. Then the various project estimates they have to mention like the historical data, the estimation techniques used the estimation for cost effort and project duration etcetera.

They have to be placed in this section, project estimate. Then project resources plan it will contain the, what are the resources they will be required by the project might be the people, hardware, software and any special resources. If any schedule in this content the following so, what item should be there like the you may use work break down structure, the; what task network, Gantt chart and PERT chart etcetera.

Then another what content might be risk management plan. How you will handle the risk for that you have to put what kind of different types of risk? What risk analysis you have performed? How to identify the risk? How to what estimate the impact of the risk? How to abandon or mitigate the risk? So, those things has to be explained in the risk management plan.

Similarly, project tracking and control plan; how you are tracking the project; how you are controlling and monitoring the project the plan regarding that should be discussed here. And finally, one miscellaneous section should be there in the SPMP document which will contain like the process tailoring, quality assurance aspects, configuration management aspects they will be described in the SPMP document, under the heading of miscellaneous plans.

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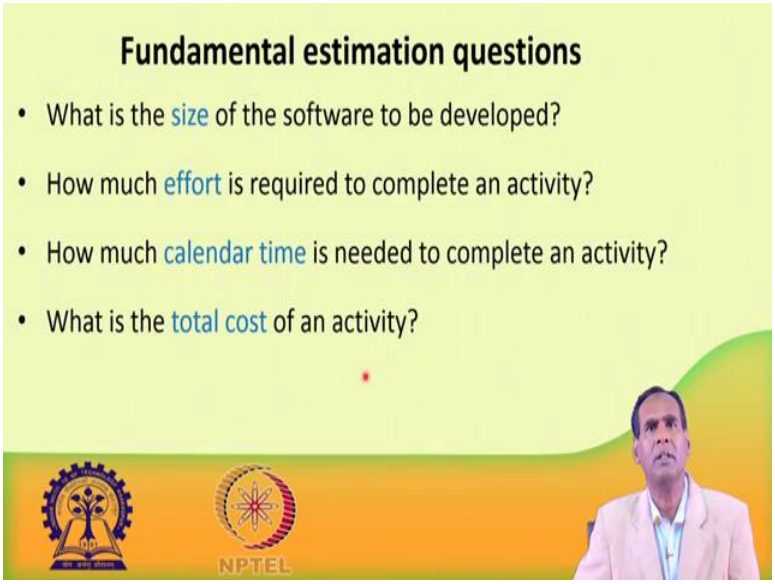

So, now let us see what are the fundamental estimation questions; what should be the size of the software that we are going to developed. So, we have to estimate the size. Then how much effort is required to complete an activity. So, we have to estimate here the effort similarly, how much calendar time? How much duration is needed to complete the an activity, that has to be estimated. And finally, what will be the total cost upon activity and what will be the total cost of a project that also has to be estimated these are the fundamental estimation questions.

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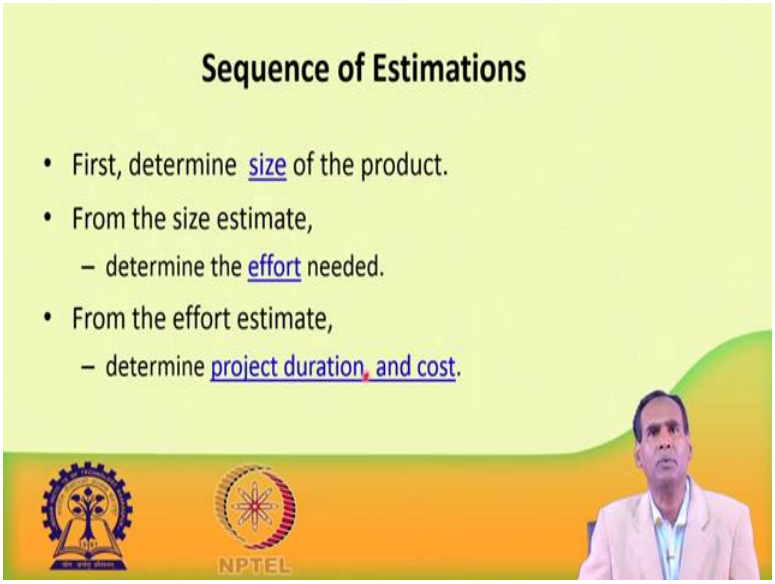

Now let us see, what are the sequences of the estimations that we have to follow. First we have to determine size of the product and if the size is known, from the size estimate we can determine the effort needed. And from the effort estimation from the estimated effort, we can determine the project duration and the cost.

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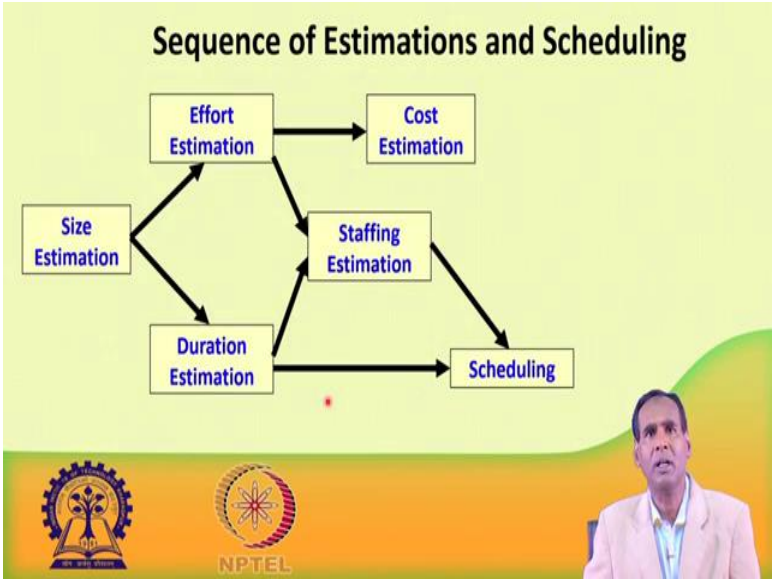

So, this sequence can be represented in the following graph. You can see that first we have to estimate size, from size we can estimate the effort and duration and from effort we can estimate the cost then from the effort estimated effort on the estimated duration we can somebody or the project manager can estimate the staff and then from the duration estimation and staff estimation. So, the project manager can prepare a schedule.

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So, now let us see what are the software cost components? So, we will see that these followings are the software cost components. First is the hardware and software cost. So, the cost require to develop the software and on which hardware it will run on the, what are hardware will be used to develop the software. So, those cost this is the hardware and software cost. Then travel and training cost; that means, the cost that is required to provide training to the employees and the travel associated with that they are also important components. Then another component effort cost which is very important and finally, we have to know what is the overhead that is, that may be required for this project.

So, out of this all the cost hardware cost the dominant factor, in most of the projects and here the salaries of the engineers involved in the project. So, that is why it may be what the most dominant factor, it will contain much of the percentage of the total costs. Then overheads; so, overheads could be like the it is not for what single project, but maybe what for different projects also. Here we have to take into account the cost of building, heating, lighting etcetera. Cost of networking and communications, cost of shared facilities, just like as library staff restaurant etcetera. So, these may be treated as the, what overheads. So, these are the different the software cost components for developing a project.

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Now, as I have told you one of the most important cost component is effort. So, how to measure the effort? So, in order to effort the measure; in order to measure the effort one terminology you require that is known as person month which is very very associated; which is very much associated with the effort. So, suppose a project is estimated to take 300 person months to develop. Now what do we mean by this? So, is just one person working for 3 days, same as 30 persons working for 1 day? No, certainly not, then why?

So, let us see in order to answer this question let us see how many hours constitute a man month. So, if we will say that the default value is 152 hours per month; that means so, 19 days some has to be worked at or some person has to work 19 days at 8 hours per day.

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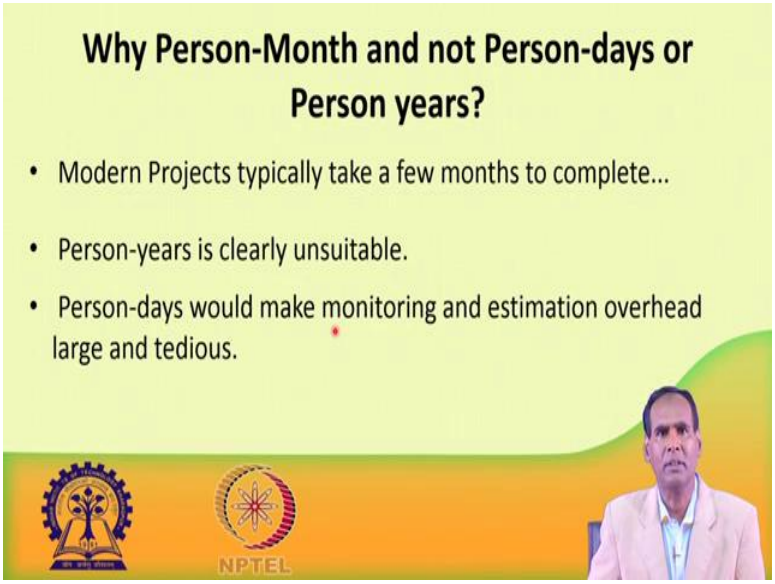

So, why person month and not person days or person years. So, normally the modern projects typically, takes a few months to complete. Some projects may take more than what 1 year, but modern projects they typical take a few months to complete. So, that is why person year is clearly unsuitable to what for these projects.

So, for similarly person days would be too much what small; so, person days would make monitoring and estimation overhead very difficult. It will be large and tedious. So, hence we should try for what this is the middle one that is the month. So, it will be a suitable measure to; it is a suitable metric to measure the effort.

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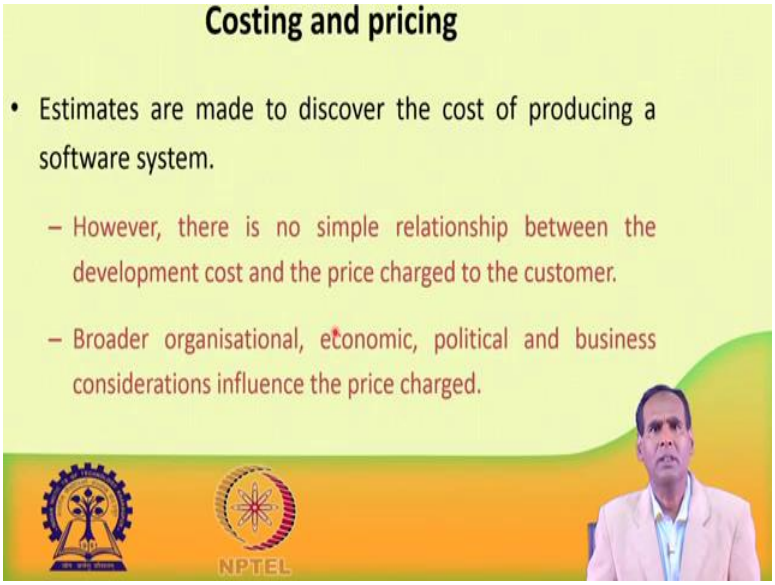

So, now, let us see this costing and pricing. So, estimates are made to discover the cost of producing a software system. So, we have to prepare estimates to discover what will the cost of producing a software system. So; however, you will observe that there is no such simple relationship between the development cost and the price that will be charged to the customer.

So, these you know that this product or organizational what considerations or economic political and business considerations they influence, the price that will be charged to the customer. So, that is why you can see that there is no direct relationship simple relationship between the development cost of the project and the price and that will charge to the customer for what obtaining the project.

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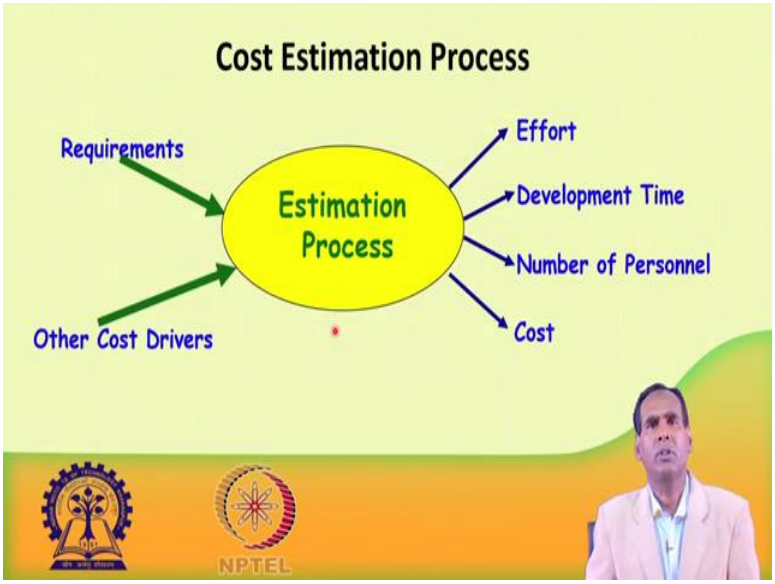

So, the cost estimation process consist of it can be represented like this which takes two inputs, what are the requirements and other cost drivers. And after this estimation process we can get the effort, the development time we can get estimates for the effort development time, number of personnel's required and the cost of the project.

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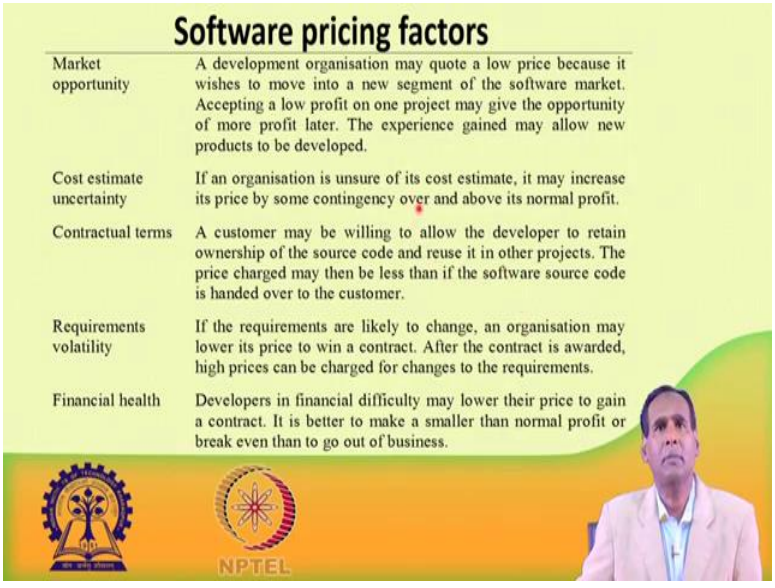

These are some of the what factors those are affecting the software pricing such as market opportunity this what you can say that this cost estimate uncertainty then these

contractual terms requirements volatility. And about what are the financial health they these are some of the factors which may affect the software pricing.

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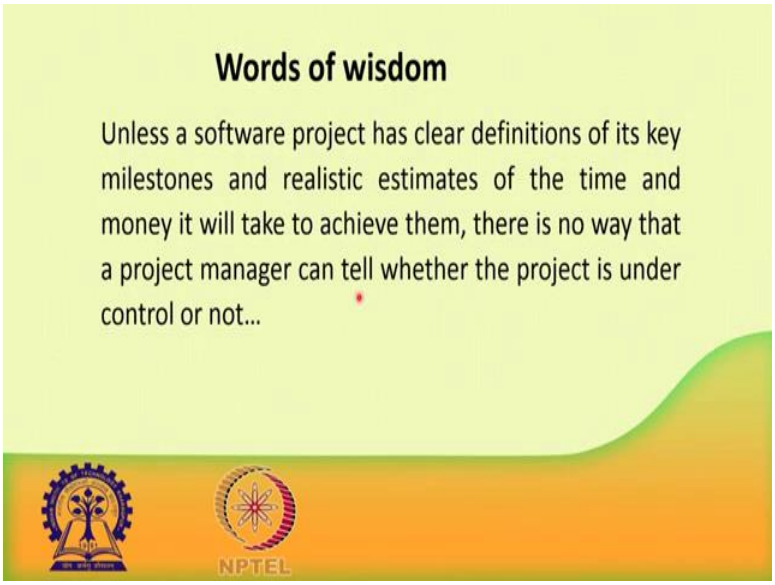

This is so, some words of wisdom are given here. Like unless a software project it has clear definitions of it is key milestones and realistic estimates of the time and the money. Then what will happen, the project manager cannot tell that whether it is very difficult project manager cannot tell whether the project is under control or beyond control.

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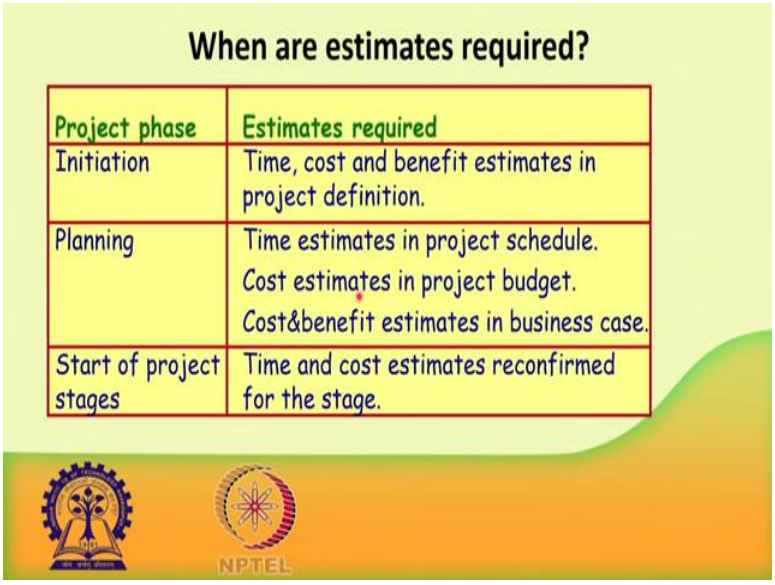

So, next is when are the estimates required? So, during different phases of the project, different estimates are required. Like in the initiation of phase you want what to be estimated the time cost and benefits estimates are required. Similarly do the planning phase time estimates in project schedule cost estimates in project budget and cost and benefit estimates in business case is they are required. Similarly during the start of the project stages, what we require time and cost estimates the reconfirmed for this stage that is required.

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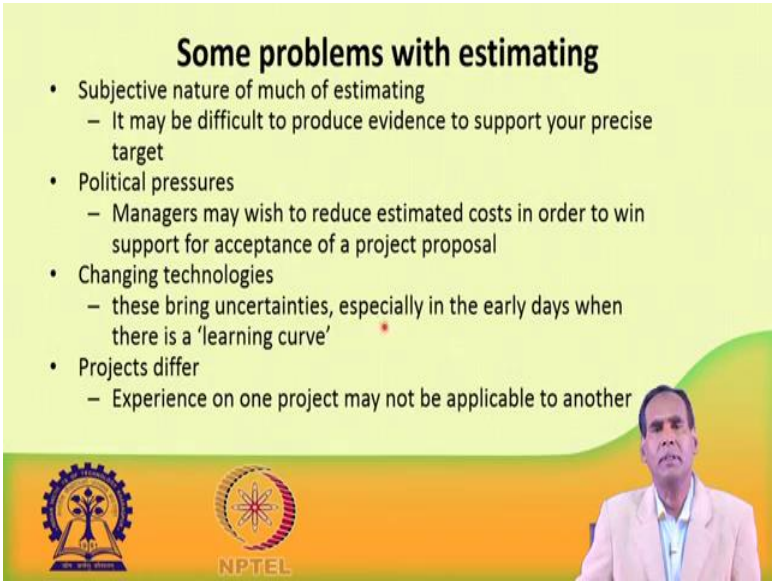

These are some problems actually with estimating you know that this estimation of the project is highly subjective nature. So, the subjective nature of estimating it puts barriers during estimation. Because this is highly what subjective as well as the political pressures, that also create problems while estimation and you know that current technology is changing rapidly. So, changing of the technology also puts barrier for software for project estimation and finally, you know the projects nowadays are the, what clients they are giving. So, they are; while they are largely different in nature.

So, the experience on one project, may not be applicable to the other since their nature they are different. So, that will also what put some special difficulties in estimating the different the various factors, the various parameters.

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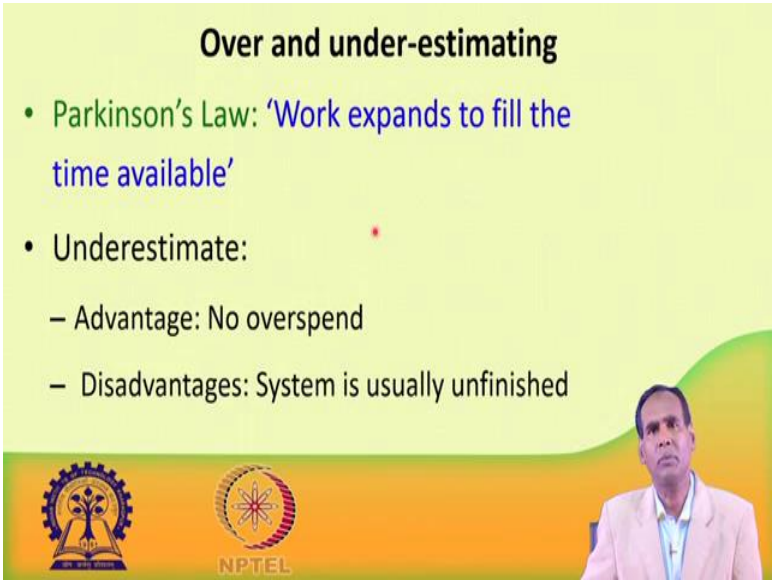

So, now let see two other important problems associated with estimation. one is over under, over estimating and another is under estimating. So, over and under estimating they are guided by two laws. one is Parkinson law, which said that work expands to fill all the time available; that means, if you are over estimated in the place of say 20 days you have assigned of 30 days. Then what will happen that the work that will expand to fill the time available the people they will they will not they will deliberately not work they will try that sometime is still left, we will only so, let us just wait even two days are left we will do those pending works in those days.

So, the work expands to fill the time available this will happen if you will overestimate the duration. So, if it is underestimate advantage is that there will be no overspend, but the disadvantage that the system will be usually unfinished and it will be substandard.

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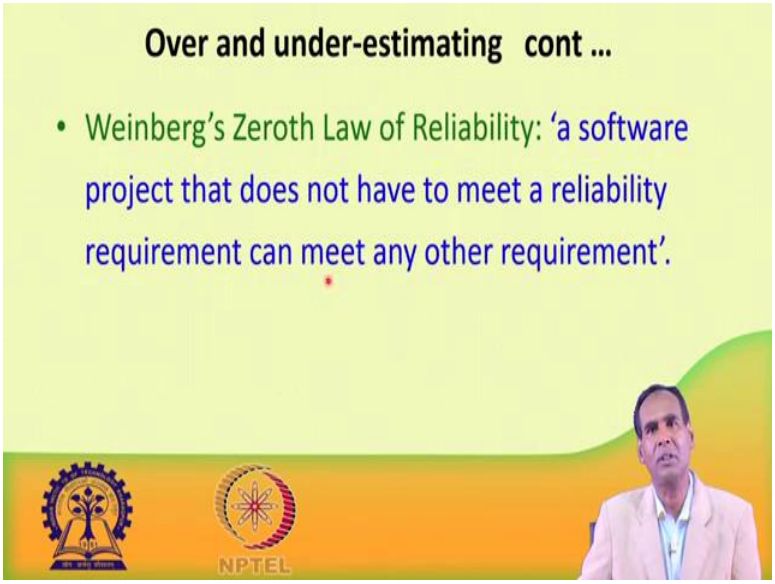

So, another law is that guides this over and under estimating problem, is that Weinberg's Zeroth law of reliability. It says that a software project that does not have to meet a reliability requirement can meet any other requirement. So, if it does not require this reliability requirement it does not have to meet a reliability requirement. It can meet any other requirement which is not desirable.

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So, the effect of under estimate is that the motivation and the morale will be lowered with high aggressive target and under estimation can lead to may be abandoned of the

project. Because that developers they will respond to highly pressing deadline with substandard work. So, since there will be pressure because time is less, they will compromise with the quality and they will produce somewhat substantial work. So, the project may get abandoned ok.

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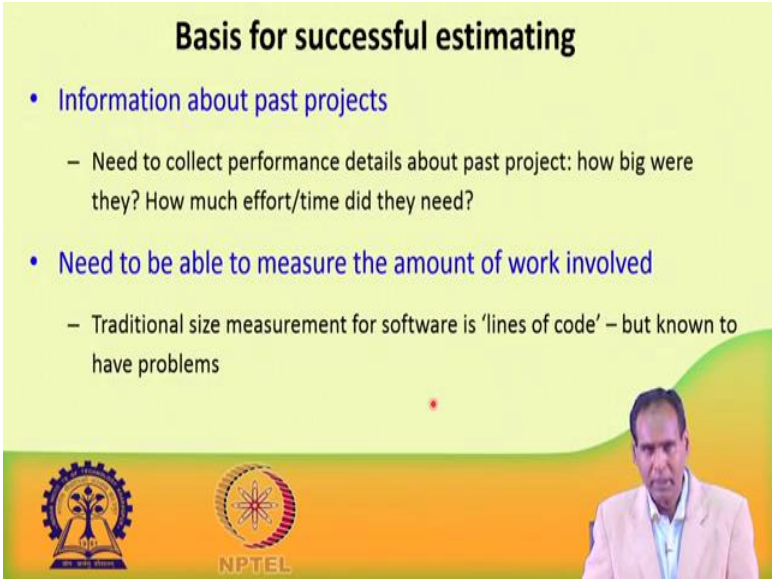

So, now let us see what are the basis for successful estimating. So, two important what things are required, one is information about similar past projects, another is that we should know how to measure the amount of work involved. We need to be or the project manager needs to be able to measure the amount of work, that is involved in the project. So, this will form the basis for the successful estimation ok. So, those things are there.

So, for what measuring the amount of work involved we may use the traditional size measures such as LOC, 'lines of code', but we know LOC of some special problems that we will discuss in the next class.

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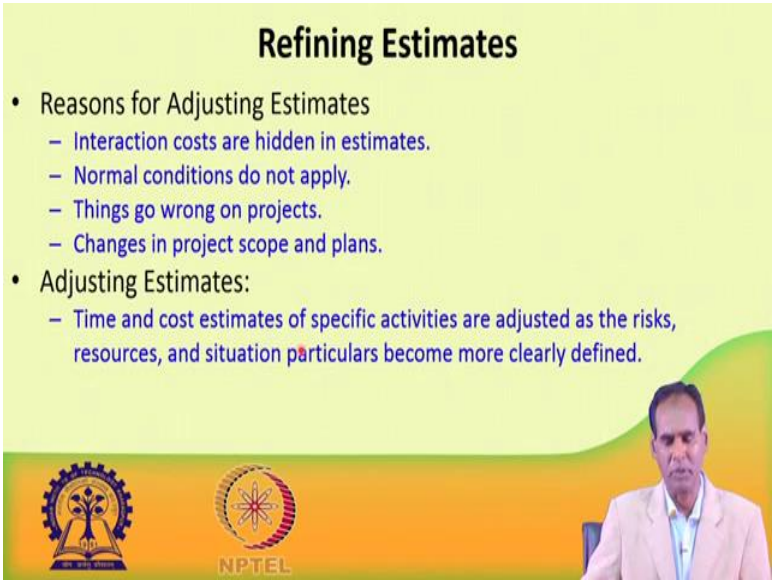

And then refining estimates, how to refine estimates? I have already told you this estimation is not done in one step. You have to first do the initial estimation the project manager has to first do the initial estimation, then gradually it has to be updated it has to be refined. So, now, let us see what is the reason for what adjusting this estimates for refining the estimates or for updating the estimates because the interaction cost are hidden in estimates. What are the interaction cost they are hidden they are not coming out or you cannot you may not find out them which also have some impact.

And normal conditions may not apply. So, things may go wrong on different projects, changes in projects. There might be some changes in the project scope and plans so, in order to incorporate all those things. So, the project manager should refine to adjust the estimates.

So, adjusting estimates means what, the time and cost estimates of some activities that adjusted, they are refined as the risk resources and situation particulars become more clearly defined in later phases. So, there is a need that the project manager should adjust or refine on the time and cost estimates of some specific activities.

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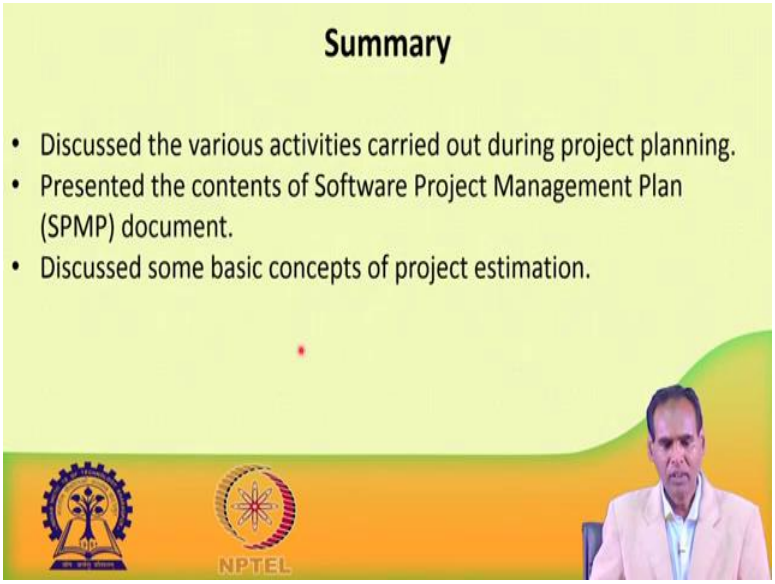

So, finally, we can see that we have first discussed the various activities which are carried out during the project planning. So, that is we have seen estimation and scheduling, staff organization as on some miscellaneous plans these are carried out during about this project planning. We have also seen that the outcome of project planning is a document called as SPMP or software project management plan document.

So, here the contents we have discuss like such as introduction, the various estimates and there will be a section also on the scheduling and miscellaneous ones etcetera. Also we have discussed some basic concepts of project estimation like, what is the basis for project estimation? How do you, why the projects the estimation does not become correct and we have also seen a sliding window estimation; sliding window estimation. Because the project managers should not do the estimation in one step in one phase rather they should perform it in several stages.

So, that the some more accurate information may get or may be obtained at the lateral phases which may be taken into account during the project estimation or the during computing the various estimates. So, that is why you should use this sliding window estimation. And as I have already told you it should not be done in single page rather than first the initial plan is made then gradually as in the some more updated information comes then you can or the project manager can update or adjust this various estimates that will give you what more accurate estimates.

So, these things we have seen right now. And in the next class we will discuss, what are the various estimation, what are the categories of, what are the taxonomy for the estimation techniques also we will discuss about this the size measure. Because I have already told you the one of the initial measure is size. If you can estimate properly the sizes then you can estimate the other parameter such as effect duration effort duration and cost. So, that also we will discuss in the next class like this size estimation ok. So, thank you very much.

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These are the references, and.

Thank you very much.