Software Project Management
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Lecture - 38
Resource Allocation (Contd.)

Good afternoon, let us see the; remaining portion of Resource Allocation. In the last class, we have seen that there are different outcomes of resource allocation.

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One is activity schedule then resource schedule and cost schedule; last class we have discussed about activity schedule and cost resource schedule. Now, today the main focus will be the cost schedules. We will see about how to allocate resources to individuals, then how to publicize the resource schedule, in what forms, then the cost schedule and what will the scheduling sequence.

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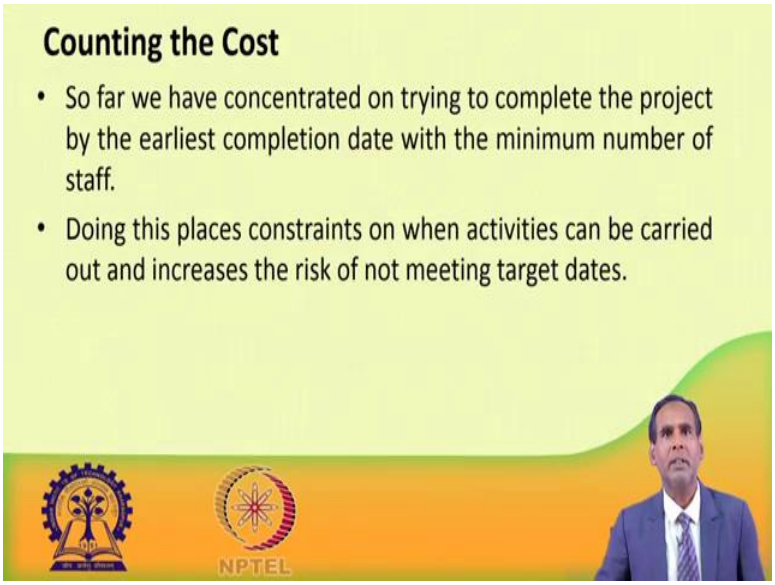

So, far we have concentrated on trying to complete the project by the earliest completion date technique with the minimum number of staffs. I have already told you the in the resource scheduling; this resource scheduling was based on the concept of earliest start date and earliest complete date. So, we have tried to complete the project by the earliest completion date where minimum number of staff is required. Doing this it will place constraints on when the activities can be carried out, this also may increase the risk of not meeting the target dates.

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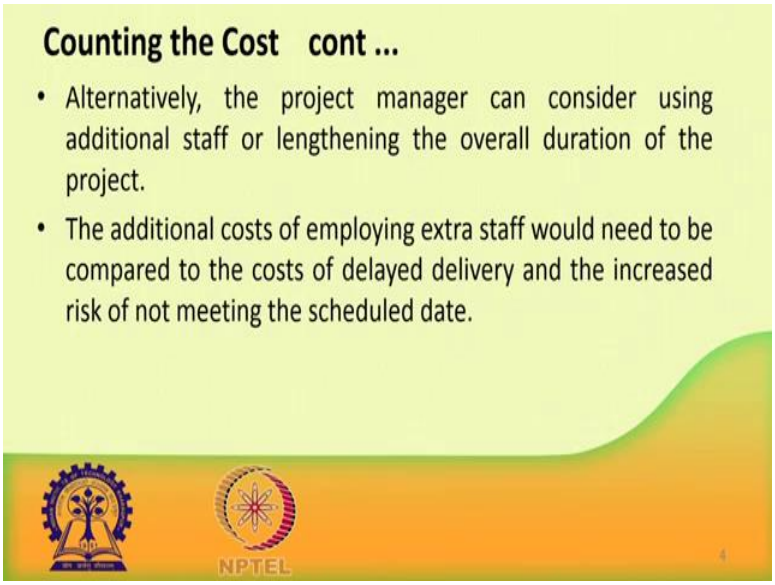

So, there are some alternatives; the alternatively the project manager can consider using more manpower, using additional staff or he may lengthen the overall duration; he may extend the overall duration of the project.

Of course, the additional cost of the employing extra staff; it would need to be compared with the cost of delay. So, if we will add some extra manpower what will the cost required; we say this if this delivery can be delayed and how much risk will be include. So, all those things they have to be compared ok. So, the additional cost due to employing extra staff that has to be compared to the cost of delayed delivery; as well as the increased risk of not meeting the scheduled date.

Then an appropriate action the project manager may take; either he will delay the delivery date or he will if it is so, urgent that you have to meet the target date, then he has to employ extra manpower so as to complete the job complete the project in time as per the prescribed schedule.

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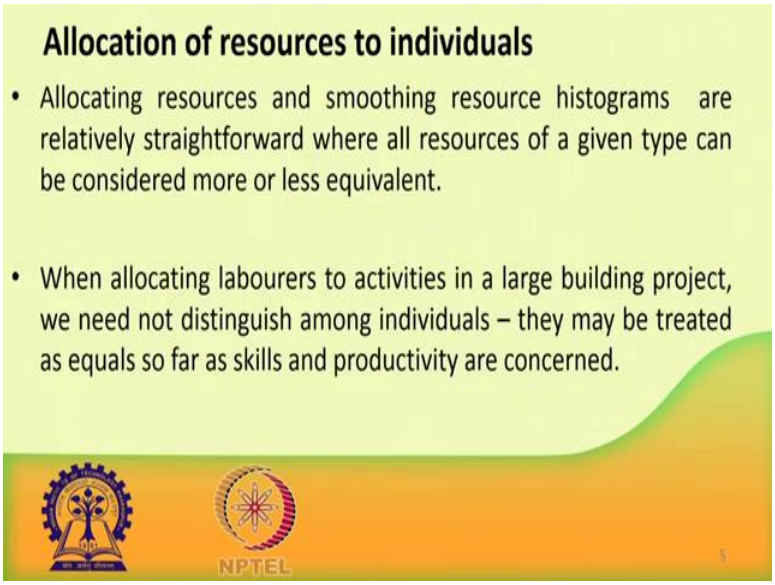

Now, let us see how the project manager can allocate resources to individuals. Allocating resources and smoothing resource histogram, they are relatively straightforward where all the resources of a given type they can be considered more or less equivalent. But actually you will see all the resources they cannot be of same important, they cannot be considered in practice they cannot be considered as equivalent.

When allocating labours to activities; let us take a small example; suppose you are building a what project and when allocating the labours to activities in a large building project. You are constructing a large building say 50 storeyed building also, there we need not distinguish among the individuals; we will treat the labours at part. We will treat the labours as what similar they will be treated at part; they may be treated as equals so far as their skills and productivity are concerned, but this is not the case while developing software projects.

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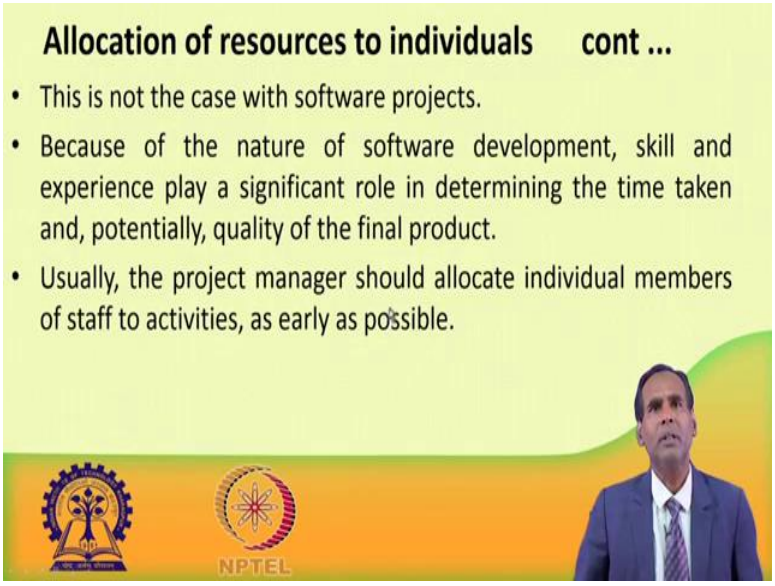

Because of the nature of the software development skill and because due to the or because of the nature of the software development; here the skill and experience of different personals, they cannot be treated at work, they cannot be treated equal.

So, skill and experience they play a significant role in determining the time taken and potentially quality of the final product. So, depending upon what the situation; we have to assign different persons, different experienced persons to different what jobs different tasks or different activities. Usually the project manager; so allocate individual members of staff to activities as early as possible so, that if some problem happens; some time will be there in the managers hand he can do the; he can take the remedial action.

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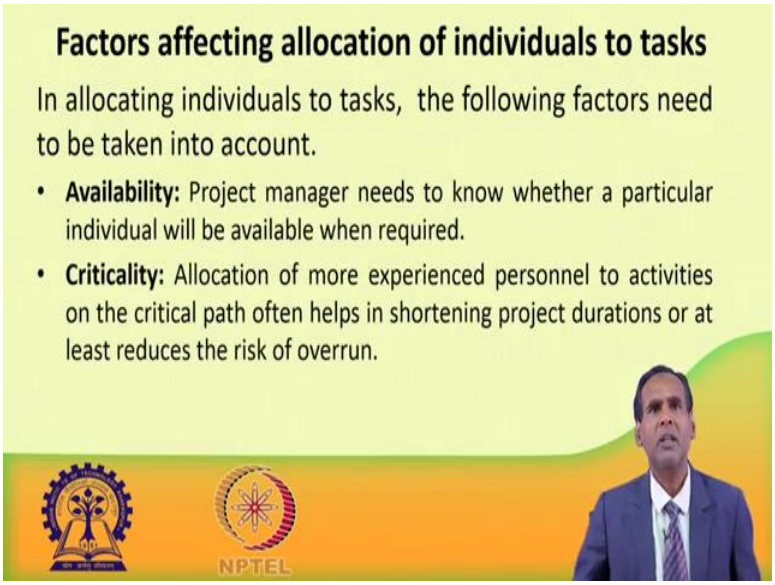

In allocating individual to tasks, several factors are there which need to be considered. The following factors may be considered while allocating the individual to tasks. Number one is availability; that means, in the project manager needs to know whether a particular individual will be available when required. See you are requiring now certain programmers, but these programmers; they are busy in developing some other projects; so during your need so they are not available. So, that is another that is one of the main important factor you have to take into account that is availability.

Whenever the project manager or whenever you as a project manager need a particular individual; you should know whether that is available or not. So, that is why it is sufficient before, in advance you have to say that for this I require 5 programmers to the central pool, so that 5 programmers can be what employed for your project in the due course of time.

So, project manager needs to know whether the particular individual will be available when required or they are busy in some other projects so they; so that they cannot be what allotted to your project immediately. Next factor is criticality, allocation of more experienced personnel to activities on the critical path often helps in shortening the project duration or at least reduces the risk of overrun.

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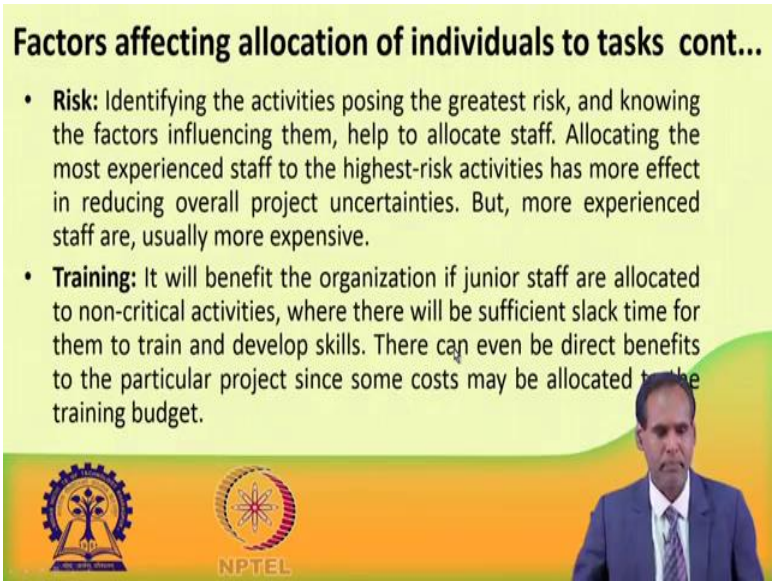

So, which are more critical activities? So, as a project manager you should allocate more experienced personnel to those critical activities this will help in shortening the project development or the project duration also this will reduce the risk of over run.

Another factor in which will; which may affect allocation of individual personnel to different task which risk. So, identifying the activities which are posing the greatest risks and knowing the factors which are influencing them will help the project manager to allocate the staff. So, you must identify which activities are posing greatest risk; as well as we have to know the factors which are influencing them, this will help in allocating the staff members to the different tasks or the activities.

So, as the rule states; allocating the most experienced staff to the highest risk activities. So, as a project manager you should allocate the most experienced staff to the highest risk activity. Because this has more effect in reducing the overall project uncertainties, the risk will be reduced; the project uncertainties will be reduced; if I will you will allot the highest or the most experienced staff to the highest risk job. So, but you know that more experienced staff; obviously, they will be more expensive; they will require more salary or more what you can say they are more fees for that; so more charge. So, more experienced staffs are usually more expensive.

Another factor that may also affect the allocation of individuals of tasks is training; it will benefit the organization if junior staff are allocated to non critical activities. So, which are very critical activities, which are very what important activities we must allot

very senior and experienced staffs to those activities. But which are little bit not so much critical, non critical activities ordinary activities you can say; so there we can apply there we can allocate junior staff members.

Because there will be sufficient float time there will be sufficient slack time or there will be sufficient free time for those activities, so that those junior staff members they can learn, they can train and they can develop their skills. There can even be direct benefit to the particular project; since some of the some cost may be allocated to the training budget. So, training is also another factor while allocating or while taking the decision regarding allocation of individuals to different tasks.

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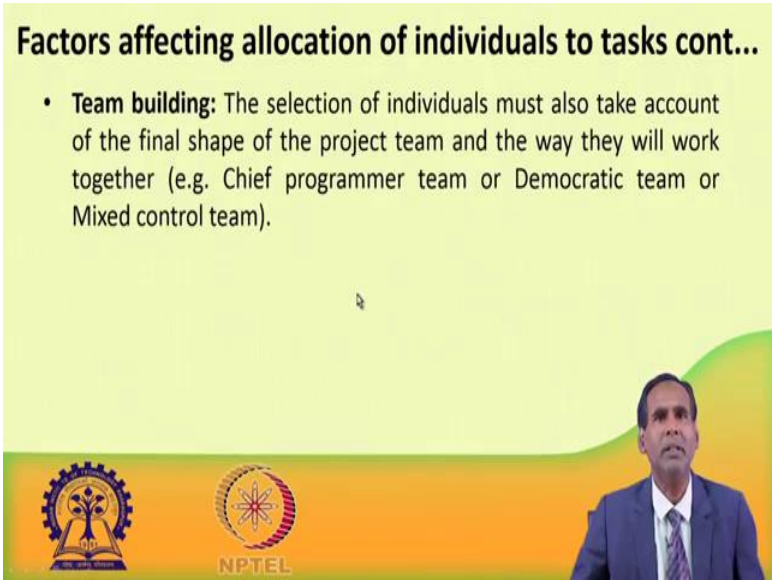

And the last one is team building; so the selection of the individuals it also take into account the final shape of the project team. How the project team its structure will look like and the way they will work together. You know that there; there could be different team structures like chief program or team structure or democratic team structure or mixed control team structure.

In chief programmer team structure you know, there will be a single programmer as the chief the boss under him there are some what programmers are working. And under each individual programmer, there are some sub some what subordinate staffs are working. So, these subordinate staffs will report to the programmer and in turn the programmers;

they will report to the chief programmer. So, this is one type of structure called as chief programmer.

Similar, another one is democratic; in democratic team structure each developer or each programmer can communicate to every other what programmer or every other developer; so there is no bar they will what report to a single boss. So, all can communicate among themselves. And another is mixed control of team; that means, here this is a hybrid team structure here both the features of single chief programmer team as well as democratic team; what the both the features are there.

Because each phase each team structure has its own advantages and the disadvantages. In order to avail the advantages of both the team structures; so a mixed control team structure is followed. So, that is why while allocating the individuals to different tasks, you must see that what will the team structure; where this individual will work whether he is working in a chief programmer team structure based project or a democratic team structure based project or a mixed control team structure based project.

So, based on this team structure or the final shape of the project; you should decide that which individual you will allow; you will allocate to that particular project. So, this is how team building also has to be taken into or the also it should be considered while allocating individuals to task ok. So, that is why the team building also plays another important role while allocating individuals to the task.

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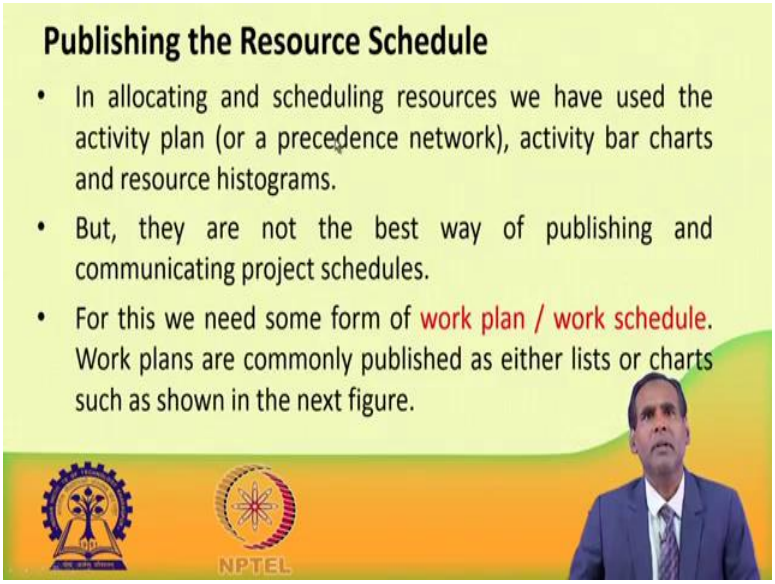

Now, let us see so far we have already seen about how to prepare this, how to allocate the resources. First we have prepared this resource requirement list and then we have mapped to a resources histogram. So, then let us see how efficiently we can publicize the resource schedule.

In allocating and scheduling the resources, we have used the; what we have used the activity plan or a precedence network. We have also used the activity bar chart as well as resource histograms. So, these three things already we have discussed in the last class how to what construct activity, plan or precedence network and a activity bar chart and a resource histogram in order to or for allocating and scheduling the resources. So, these already have seen, but these are not the best way of publishing and communicating the project schedules.

Let us see one of the; efficient way or best way of publishing and communicating the project schedules that we call as a work plan or a work schedule. So, for this; that means, for publicizing; for publishing the communicate for publishing the project schedules, we need or the project manager needs some form of work plan or work schedule. So, what is the work plan?

Work plan is a commonly work plan and it is commonly published as either a list or a chart ok. So, normally the work plans are they are commonly published either some kind of lists or charts one example I will show in the next slide.

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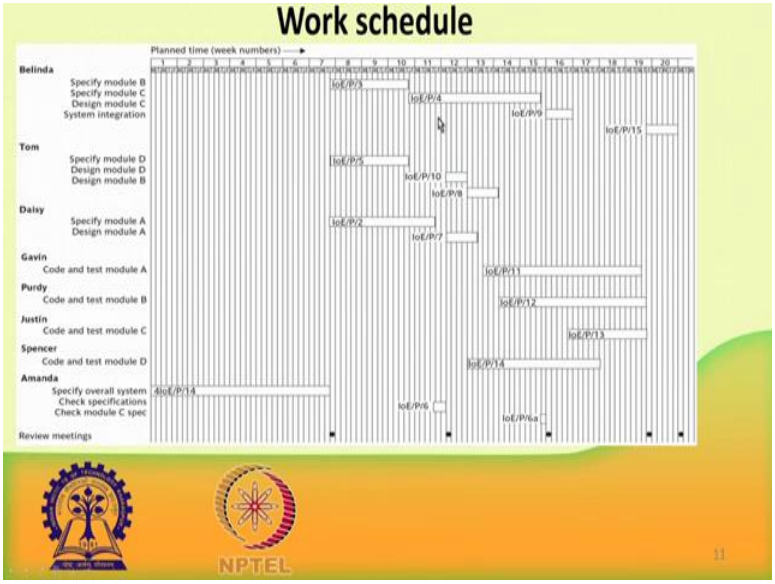

See here this is one example of a; this is the example of a work plan or work schedule we are writing who are the resources? The manpower, the name of the what developers or analyst or testers. Then what activity they are supposed to do? Then the week numbers and under week each days are given ok.

These are the activities and as you know there are two parts the scheduling part as well as the float or the slack time everything has been shown. So, this is a better way of representing or publishing the resource allocation. So, work plans or the work schedules are the best ways of publishing the schedules; the resources schedules.

So, here basically we show the name of the; the name of the employee, then or the name of the personnel. Then what activities they are supposed to do and then we will see that the weeks will show, under each week the days we are showing and here we show the progress; what the schedule we want show here. So, in this way the schedule can be shown ah; the resource schedule can be shown in the form of a work schedule.

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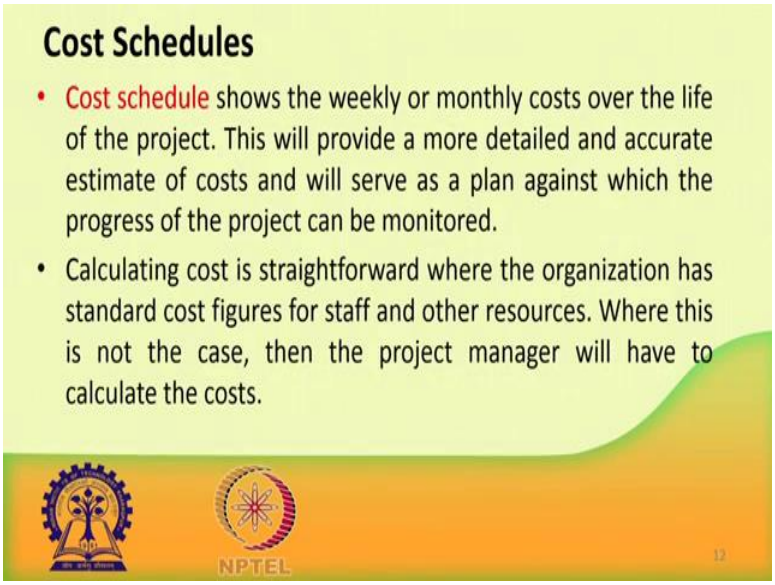

Now; so now, we have to see something about this cost schedule. We have already seen the activity schedule, we have also seen the resource schedule; now this is the time to discuss something on the cost schedule. So, cost schedules normally they show the weekly or monthly cost over the life of the project.

So, during on the life of the project what is the weekly cost or what is the monthly cost that can be shown in the form of a what figure or a diagram that we call as cost schedule; this will provide a more detailed and accurate estimate of the cost. So, this cost schedule it will give you a more detailed and accurate estimate of the cost. This will also serve as a plan against which the progress of the project can be monitored.

You want to; if you want to monitor the progress of the project then you can use the cost schedule ah. So, this can be treated as a plan against which you can measure the progress of the project against which you can monitor the progress of the project. Calculating the cost is normally straightforward where the organization has standard cost figures for different staff members and other resources. But where this is not the case, then the project manager you will have to first calculate the costs then he can or first estimate the cost, then he can prepare the cost schedule.

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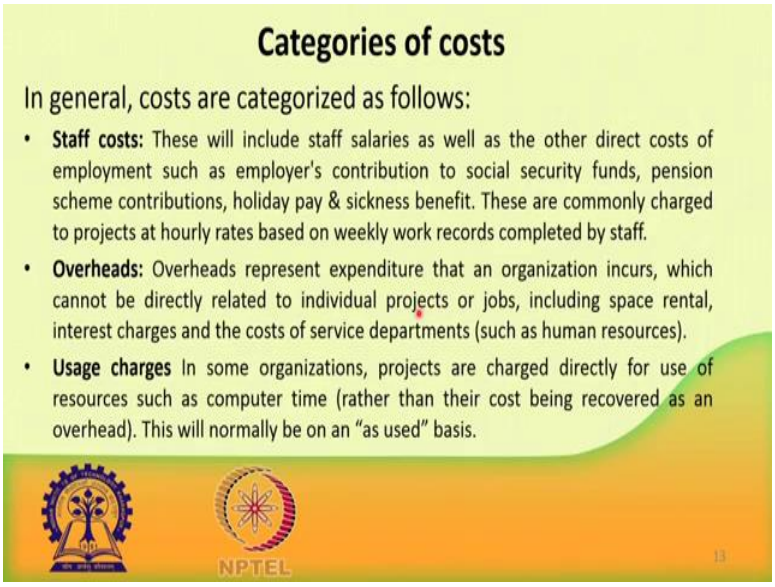

In the beginning of this what course we have I have already told you the different types of costs in different based on different what metric different types we have done. Like we have seen direct cost versus indirect cost, benefit then tangible cost versus intangible costs, fixed cost versus overhead cost; these cost we have already seen earlier.

And now let us see for might be development of software normally the cost are categorized as follows like the staff cost overheads and usage charges staff cost. Staff cost will normally include the staff salaries as well as other direct cost of the employees;

such as employers contribution to social security firms, pension scheme contributions, holiday pays and sickness benefit I mean medical benefits etcetera.

So, these are all coming under staff cost costs; these are commonly charged to the project at hourly rates based on weekly work records of the completed by this staff. And overheads these cost represent the expenditure that an organization incurs which cannot be directly related to individual projects or jobs. So, some of the examples are so these are valid ah, these remain valid for all the projects that the organization undertake.

For example, the for the space how much you are giving space rental how much rents you are paying for the building or the space, then the if you have brought some loan from the bank what is the interest charges. And the cost of the service departments such as human resources etcetera HRA department. So, all those things they cannot be what marked for a particular project; this is valid for all the projects those are undertaken by an organization; so these are all examples of overhead cost. Similarly, usage charges in some organizations projects are charged directly for use of the resources.

For example, if you are using what some computer; so then per hour you may give some money. If you are using this internet for some hours you can give what these what is the charge. If some online tools you are using for that or some online software's you are using per hour basis you have to pay something. So, these are the what charges; these are some of the cost which are charged based on the uses.

So, that is why in some organizations projects are charged directly for use of resources such as computer time etcetera or you can say internet usage etcetera and this will normally be on as used basis this charges will be made. So, these are some of the what charges these are some of the costs that the software development organization may have to incur and then based on this cost, you can prepare the cost schedule.

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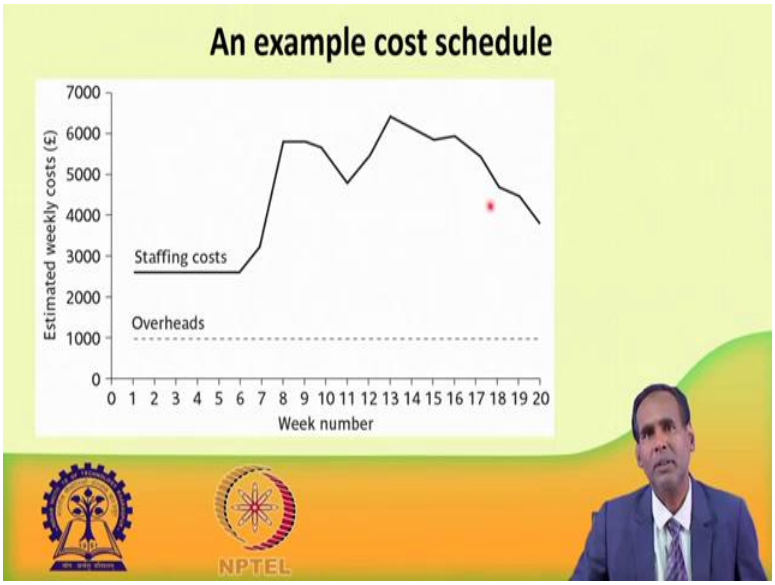

This is an example of a cost schedule; here you can say that in the x axis we have taken the weeks and y axis the estimated weekly cost. So, here we have taken first the overheads and the overheads may be charged in a fixed amount say there are total overhead cost is suppose say 1 lakh and there are 5 projects running simultaneously.

So, the overhead may be equally divided among all the five. So, maybe per project its coming 20000; so, normally this is charged as a fixed rate. So, that is why I see overhead is coming as a; fixed rate here and then the here in this project this staff cost is initially it was a constant. Then there are some what more critical jobs or so, then the more number of manpower required. So, staffing staff cost is increasing rapidly and then gradually it is coming down going up like that; so, in this staffing cost is shown here. So, here for this cost schedule; this is you can see it is given for different weeks; so the we have overheads and the staff costs are shown.

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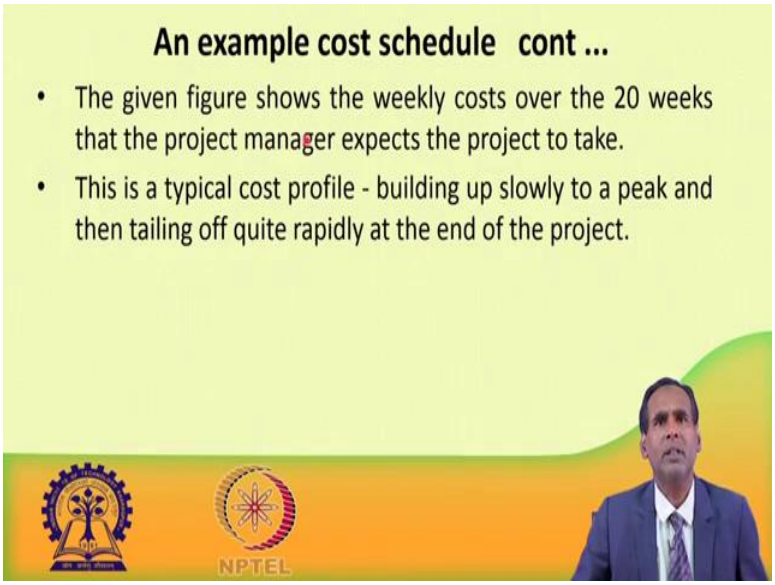

So, in that figure you see it shows the weekly cost near about for over 20 weeks; yes it is shown up to 20 weeks; this project manager expects the project to take ok. So, this figure shows the weekly costs over 20 weeks that the project manager may expect that the project will take. So, this is a very this is a typical cost profile, building up slowly to a peak you can say that this cost initially towards almost constant; then it is slowly it is going up a high amount going to a peak.

And then then tailing up quite rapidly at the end of the project and then it is tailing up you can see this is falling down rapidly ok. This is falling and towards the end the staff cost is falling down because by; by that time what we are at the verge of completion of the project. So, that is why this what staff cost is falling down. So, this is how you can prepare a cost schedule ah; maybe a weekly cost schedule for your organization taking into account the staff cost on the overheads.

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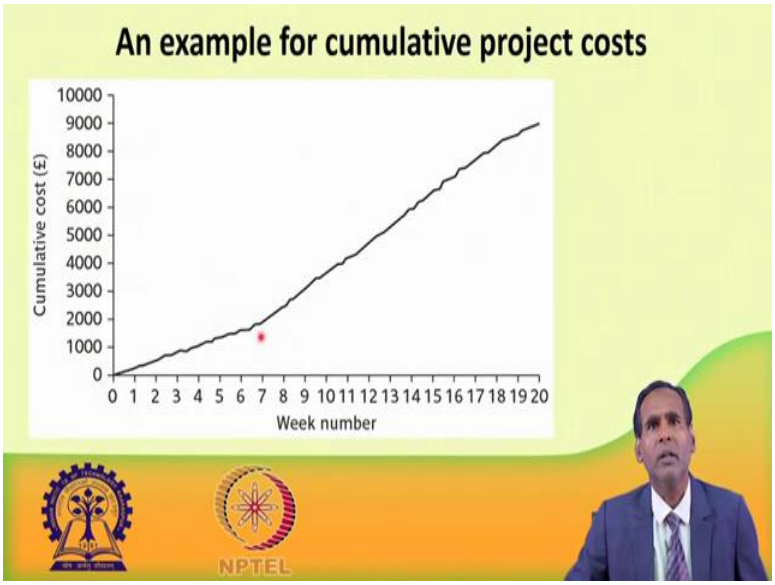

Now, this is another example; here instead of using this weekly what cost you can take into account to the cumulative project costs. So, here again in the x axis you are taking the week number and here instead of taking the just weekly cost we have taken the cumulative costs.

So, if you see the cumulative cost normally the cumulative cost slowly what it increases the number of weeks increases. So, this is another example ah for plotting the cumulative project cost in the form of a graph; so this is another example of a cost schedule. So, these cost schedules can give an indication that whether your; your progress is on the right track as you have planned or the cost is exceeding or so that or it is just as per your expectation or it is below your expectations. So, accordingly you can take remedial action looking at the cost schedule.

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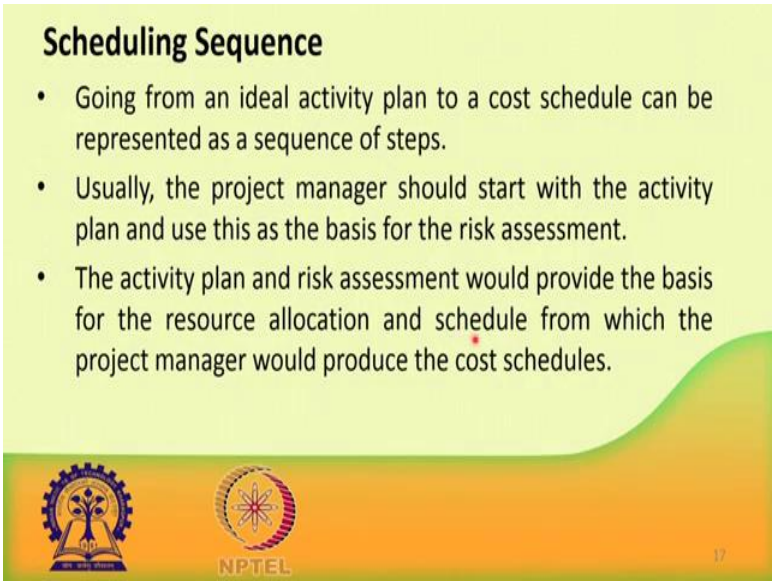

Now, let us see how to schedule the sequences. So, as I have already told you what will the scheduling sequence? First, we have already seen last class that we have to first prepare a activity plan or a precedence plan. So, going from an ideal activity plan till getting the cost schedule; it can be represented as a sequence of steps.

Let us see what are the steps you should follow from what constructing the ideal activity plan to the cost schedule; usually the project managers to start it; he should start with the activity plan. So, in first he should create or build the activity plan, then this activity plan can be used as the basis for the risk assessment just like this figure I have shown.

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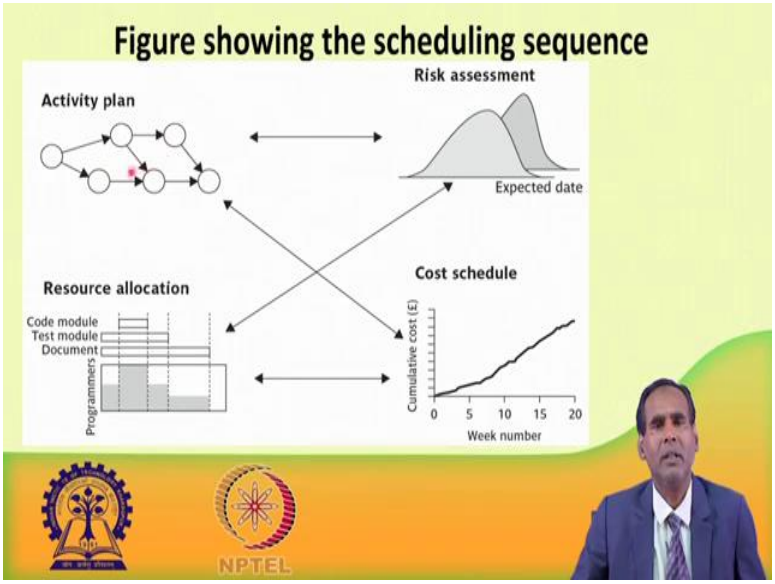

So, initially you have to prepare the activity plan; a kind of graph we have already done possible what the activity plan for our graph our problem last class. Then from this activity plan can be solved as a basis for the risk assessment. And then what will happen? Now, the activity plan and the risk assessment they would provide the basis for the resource allocation.

So, based on the activity plan you can create the what resource requirement list; then from the resource requirement list and the risk assessment ah by considering both the things you can prepare your resource allocation that we have already shown here. The activity from the activity plan the project manager can prepare the risk assessment, then the activity plan and the risk assessment will provide the basis for allocating the resources you can prepare the resource allocation; then from the resource allocation you can prepare the final cost schedule.

So, these are the sequences that you must follow for what preparing the cost schedule starting from the activity plan ok. So, the project manager should start with the activity plan and use this as the basis for the risk assessment. Then the activity plan and the risk assessment would provide the basis for the resource allocation and schedule the resource schedule. Now, from the resource allocation and the resource schedule; you can prepare the final cost schedules like this ok.

So, but you can see that these arrows are bidirectional; that means, each one affects the other one. So, if there is a change in activity plan; there will be a change also in the risk assessment and when risk you are assessing the risks; so you accordingly you might have to divide the activity plan.

Similarly, based on the activity plan you are preparing the; what based on the activity plan and the resource allocation; you are preparing the cost schedule. So, whenever there will be some change in the activity plan or some change in resource allocation; the cost schedule or the estimated cost will be different. So, if you want to again divide the cost maybe what making high values or high value high cost or low cost. Then accordingly you have to revise the activity plan and the resource allocation.

So, that is what I want to say that these components these steps you can say these are dependent on each other. If you want to make any change at any step, the other steps have to be revised accordingly.

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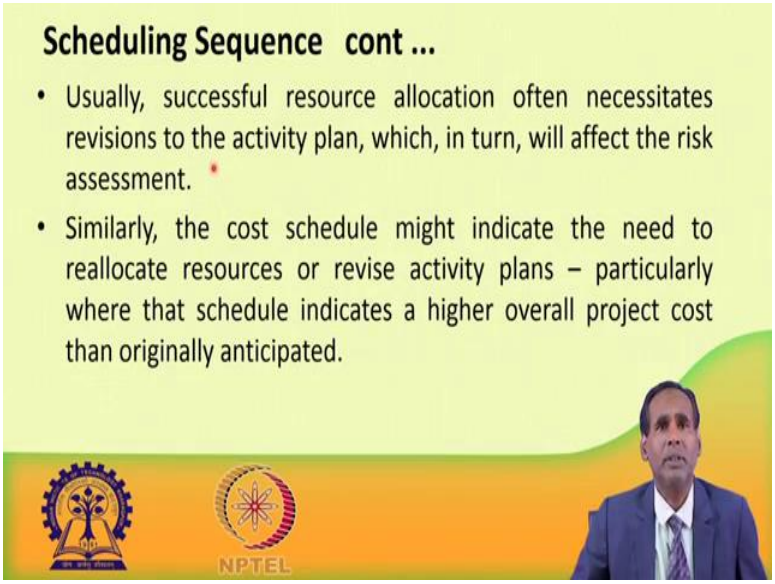

That is why I have to say that usually the successful resource allocation upon necessitates revisions to the activity plan. So, if you want to make a successful resource allocation; you it might be necessary to revise the activity plan. And if you are revising the activity plan then of course, what will happen? You have to this will affect risk assessment; you have to divide the risk assessment because the risk assessment the risk assessment may be affected.

Similarly, the cost schedule might indicate the need to reallocate the resources or revise the activity plan particularly where the schedule indicates a higher overall project cost than originally anticipated. What is saying here according to your previous plan activity plan and risk assessment resource allocation plan what cost you are getting; it is a very high value which you cannot afford. So, what you have to do? We have to now reduce the cost.

So, if you want to reduce cost then effectively you have to what revise the activity plan, you have to revise the resource allocation might be we have to reduce some of the staff members or so. So that is what I want to say here that the cost schedule might indicate that there might be a read need to reallocate the resources or revise the activity plans; When the schedule indicates a higher over overall project cost than originally anticipated.

And this high must this highest or the higher overall project cost, you cannot afford in that case you have you have to reduce you have to revise the cost schedule. And indirectly, since you are reducing the costs schedule; you have to also what since you are you are revising the cost schedule, you have to also revise the activity plan and you have to also revise the resource allocation plan. And you may have to reduce some of the what resources for the use, you might cut down some of the manpower also.

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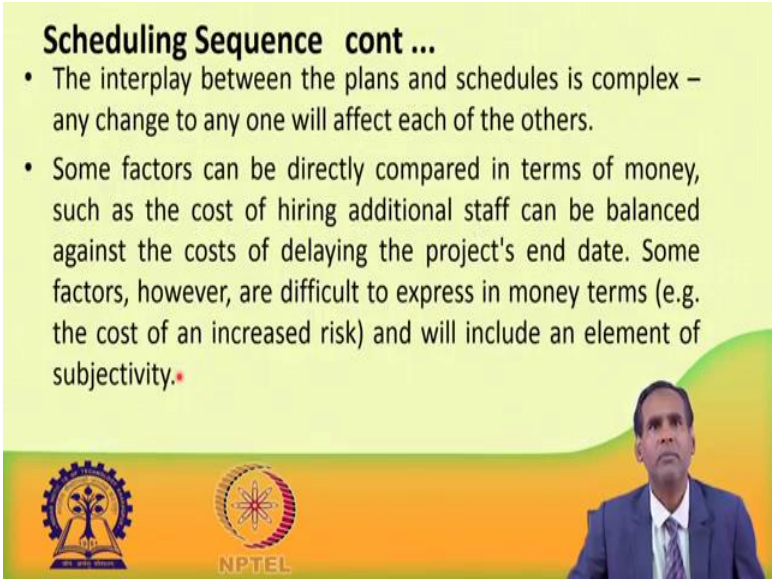

The interplay between the plans and the schedules is complex, you can see that everything is interconnected with everything else. They are bidirectional, everyone is affecting the, every component is affecting the other components.

The interplay between the plans and schedules is very much complex, any change in one schedule will affect each of the others. So, some factors of while preparing the schedules some factors can be directly compared in terms of money. So, charge cost of having additional staff it can be balanced against the cost of delaying the projection date.

So, if it is possible that the project's completion date can be delayed little bit; then we may not go for this what hiring additional staff. But if the project's completion date has to be met strictly; then we have to hire additional staff members. So, that is why some factors can be directly compared in terms of money. For example, cost of hiring the additional staff; it can be balance, it should be compared what should be the cost if the project's completion date can be extended or can be delayed.

But some factors; however, they are very difficult to express in terms of for money; for example, the cost of an increasing risks. So, if we will not meet the; what deadline what will the risk whether some customers; they will go away from our company and they may migrate to another company. So, how to measure these kinds of increase risk if I will not automate these our running activities people because nowadays everybody is going for computerization activities; so if still we are doing our activities manually, so there might be a risks that the clients may migrate the clients may migrate to other companies.

So, what risks is associated here? It is very much difficult to express the cost of this risks in terms of money and it will include an element of subjectivity; of course, these are subjective in nature, we cannot quantify them. So, some factors can be directly compared in terms of money such as the cost of hiring additional staff; which can be balanced against the cost of delaying the projects end date, but some factors; however, they are difficult to express in terms of money for example, the cost of an increase risks and the it will include of course, on element of subjectivity.

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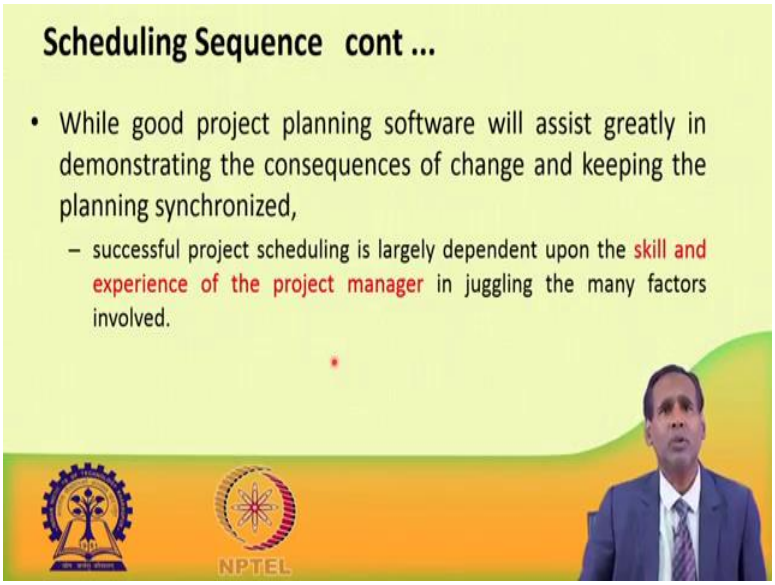

While yeah yes there are so many what the project planning software's are available. While good project planning software; they will assist greatly in demonstrating the consequences of change and keeping the planning synchronized, but successful project scheduling it is largely dependent upon the skill and experience of the project manager;

that matters a lot what is the skill what is the experience of the project manager; that will what affect a lot during this project scheduling; in juggling in the many factors that we have seen they are involved in the project development.

So, while some of the good project planning software; they will assist greatly in demonstrating the consequences of changes and keeping the planning synchronized. The successful project scheduling is totally dependent; it is largely dependent on the skill and experience of the project manager in juggling the many factors involved in the project development this is something about the cost schedule.

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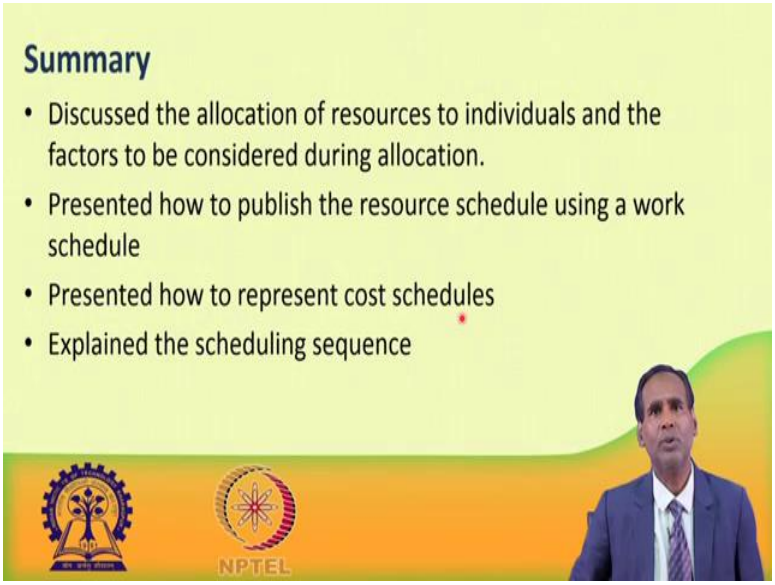

In this way, we have seen on the resource allocations the different schedules we have seen. So, we have discussed the allocation of resources to individuals and the factors to be considered during allocation.

We have also presented how to publicize, how to publish the resource schedule using a work schedule or a work plan. We can better, in a better way you can publish the resource schedule using a work schedule. We have also presented how to represent the cost schedules, we have also explained what is the scheduling sequence starting from the building the activity, activity plans to the cost schedules.

Thank you very much.