Project and Operation Management
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Lecture No. 51
Introduction to Project Management

Welcome friends. So, now we are moving into the last leg of this course on Production Operations Management. And, we want to introduce a very important topic to all of you. And, this topic is a very vast topic and you may have full courses on this very topic. And the name of the topic is Project Management.

Projects are very important part for countries like India. We all around see the huge number of developmental projects, the widening of our highways, development of new airports, development of large number of housing societies around NCR. So, everywhere in our country we see a good number of activities which can be classified under projects. And operations managers have a very important role in the success of a project.

There are two very important aspects in the success of a project. One aspect is related to actually control or monitoring of the project. And, another aspect is related to provide necessary financial support or to give enough lubrication to the project. So, that project can run smoothly.

You must be reading in newspapers, in other debates on televisions, that a lot of projects are suffering because of poor planning. And, in this particular session, we are going to discuss more about the role of operations manager in a project activity because financial involvements are also very crucial for the success of project.

But, we will limit our discussion to the role of operations manager. But, when we go for a full course on Project Management, we can discuss the role of or how to arrange funds for the project. So, that will be not the scope of our discussion at the moment.

Now, when we are talking of a project there are few things which we need to understand as part of basic tenants of the project management. And when we are talking of project, let us first try to understand the characteristic of project, that how project requires a

separate discussion. Why it cannot be covered in other aspects of operations management?

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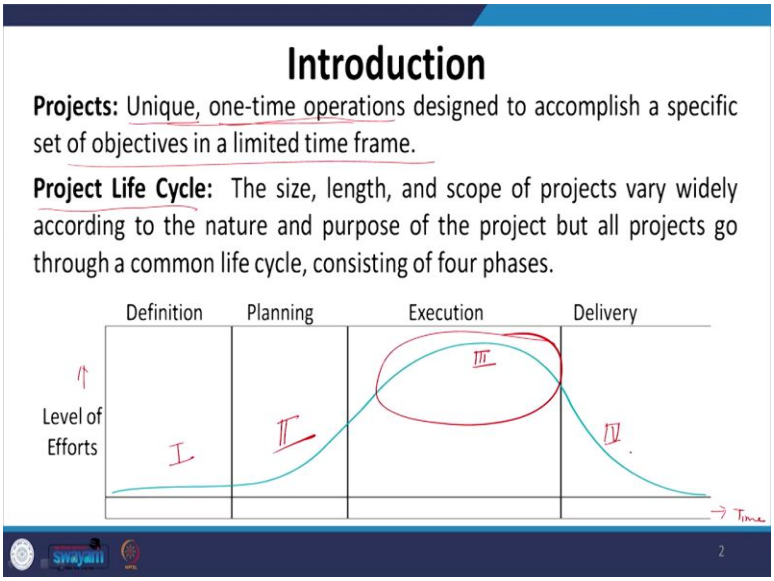

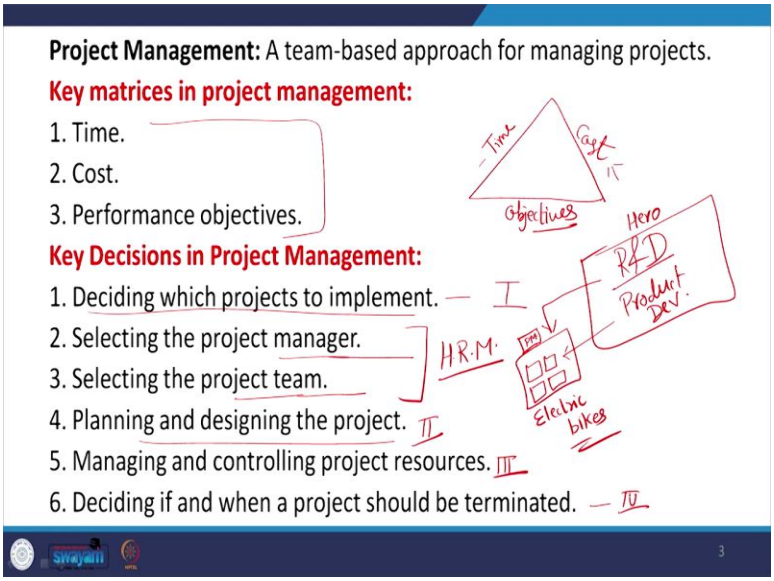

Now, one very important activity; one very important characteristic of project is that projects are unique activities. Each project is unique. If you are making five buildings, so each building is having the unique requirements. Because sun facing will different, because of highway connectivity will be different; because of water availability will be

different. For all these reasons, there will be some unique things in each of your housing projects.

So, each project is a unique activity. Or you can say it is a onetime activity. It is not repetitive. It is not repetitive. It is a onetime activity. Each project is unique and it is done only for a particular purpose. It is only for a particular objective. So, it is a very specific thing which is non-repetitive, but it is of a very significant heavy investment. Therefore, it requires your significant attention. And, you have to complete the project within a given timeframe.

And based on these characteristics of a project, we have a very interesting trilogy of project. And that trilogy is this time, cost, and performance objectives. So, you can have this trilogy as three sides of a triangle. One side of the triangle is saying about the time. The other side of the triangle is talking of the cost. And third side of the triangle is talking of objectives.

So, the meaning is that you have to accomplish some specific objectives within a limited timeframe and with a limited budget. It is a different matter that in many situations we overshoot time. We overshoot the cost. And that brings low productivity, low efficiency to the project. So, for a good project you have to develop a system in such a manner that you should be able to achieve your objectives in your originally planned timeframe and in the originally decided budget of that particular project.

The other important thing, which we need to discuss in project is the project lifecycle. The project lifecycle is another very important aspect and it tells you that there are four stages. Four, you can say phases in the life of a project. The life of the project is decided on the basis of efforts, how much efforts you are putting and this is the time. So, on X-axis we have time. On Y-axis, we have level of efforts.

Now, the first is the defining of the project. So, what project you want to do? Then the planning. So, now, the first starts increasing. The maximum efforts are during the execution stage. All of a sudden you see, there is a sharp increase in your level of efforts as you are moving from planning to execution because this right execution ensures the

actual success of the objectives of the project. And then finally, the delivery; when you are handing over that project to the customer.

So, these are the four important phases. And, the level of efforts is very important criteria on the basis of which these phases are divided. So, the maximum efforts are in the execution stage, which is being followed by planning and followed by delivery and the least is in the definition.

Now, what are the important decisions we take in project? And, these important decisions which we take in the project are, first is deciding which project to implement. This is your phase 1, definition. Selecting the project manager, selecting the project team, these are related to human resource management that who is your project manager, who are the members of your project team?

Because, many a times you identify, you have already running a company. Why I am talking about this? Like, you already have a company. For example, Hero. And, you want to start a new project of development of electric bikes. That is a new project, which you want to start.

So, out of your entire team of R&D or your product development team, you will take one person as project manager who will lead this new initiative of electric bikes. And, then some of the persons from them will be the team members. So, that is how organizations within their own setup create project teams as and when it is required.

So, in various institutions also; in various organizations also, depending upon the need; like, when general elections took place. So, any political party, they create their specific team for the requirements of general election planning. So, that is basically kind of a project management activity. And for that, you need to select one person who is the in-charge of the campaign. And, then there are various members in his team, so that they can do different kinds of activities. So, that is the project manager and project team.

Then planning and designing the project, that how the project will be delivered? So, that is the phase 2 of the project. That is the planning part of the project. Then managing and controlling the project resources. That is the third phase, which requires the maximum

resources, which requires the maximum effort from the point of view of use of your human resource that to manage and control the project resources.

And finally, deciding if and when a project should be terminated. That when a project should be handed over to your customers? When a project should be handed over to the users? So, that is the final stage in the project management.

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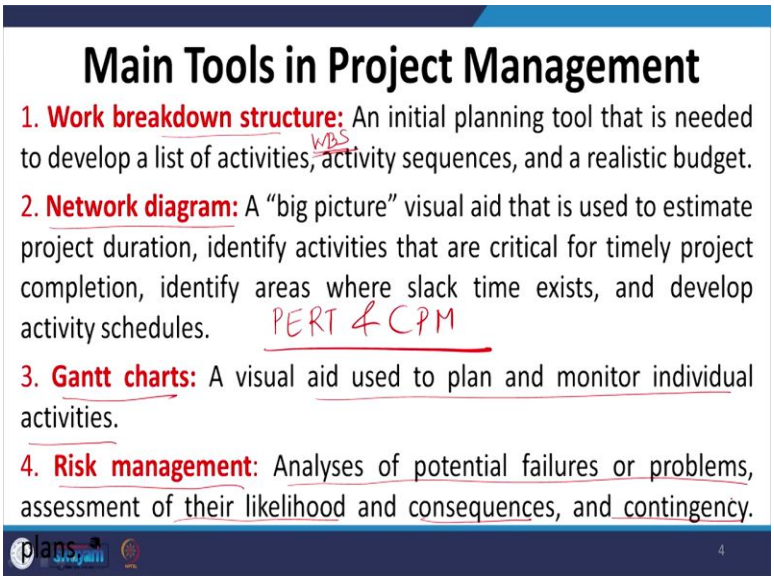

Now, to achieve a project management, to do this activity, there are some important tools available. One of them is work breakdown structure, which we call as WBS also. There are different types of software which are available for project management. And Microsoft Project is one of them. Primavera is very popular software for project management activities. But, all those softwares can only work when you have a proper work breakdown structure. Without proper WBS, these software cannot give you the good results.

So, the first important thing is dividing your entire objective; dividing your bigger objective into smaller activities and smaller activities as micro activities as you can. So, your ability of dividing the bigger role into smaller and smaller as micro-mini you can go, that much planning you can do, that much good execution you can do when you are going with that detailed planning with you.

If you are not able to identify various activities, so at the time of execution you need to take a lot of ad hoc decisions. And, those ad hoc decisions will cost you extra resources. So, that will put down the efficiency of your organization. So, developing a good WBS is a very very important task.

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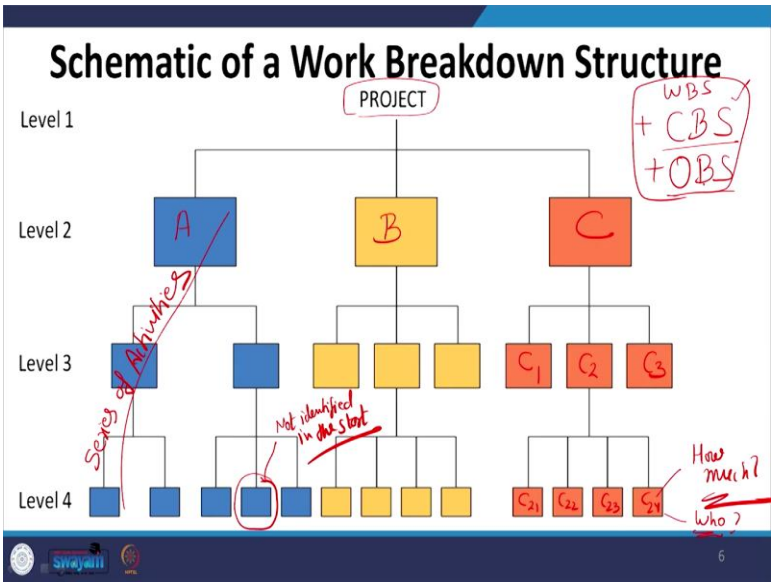

We will see that in WBS, we have this type of diagram where this is the major objective of the project. So, this will be translated into various tasks- that what are the different activities you will be performing. And then, the sub activities and sub activities will further be divided into micro activities. So, all these are the activities, series of activities. So, all these lines are representing different series of activities, which you have to perform to accomplish the objective.

Now, if you are not able to identify this particular activity. Since, this activity is not identified in the start; therefore, you will not allocate any resource for this particular activity in the beginning. But, when you are going for the execution, this activity will come in front of you and then you have to do something to complete this activity.

And that is what I said, that we need to make ad hoc decisions to fulfill the requirement of this activity. And, those ad hoc decisions will obviously cost you more; will take your more resources. So, your foresightedness, your experience in those projects that helps

you in making a good WBS. And, with WBS, we make two more types of diagrams. One is CBS and another is OBS. These two additional diagrams are also made with work breakdown structure.

CBS stands for cost breakdown structure. Because, all these are the activities, A, B, C. Then, A1, A2, A11, A12 etcetera, etcetera. So, like this way we can give more names C1, C2, C3. Now, these are the part of C2. So, these are C21, C22, C23, C24. So, C24 will cost how much? So, accordingly, not only C24 but all activities which are being shown in this diagram, these activities will consume some resource. So, you have to make proper allocation of resources for these activities. That is the cost breakdown structure.

The second issue is, who will perform these activities? You have C24, C23, C22, C21 these activities and so on various other activities in this diagram. Who will perform these activities? So, you have to identify a suitable person who is skillful in those activities and that is organization breakdown structure, OBS.

So, CBS is for the cost or the budgeting part of our project. And, organization breakdown structure is basically that how many members are required for this project? What type of skills should be there? And then obviously, developing a chart of manpower requirement is our OBS. So, we need to have WBS plus CBS plus OBS. These three types of structures are important for developing a good project.

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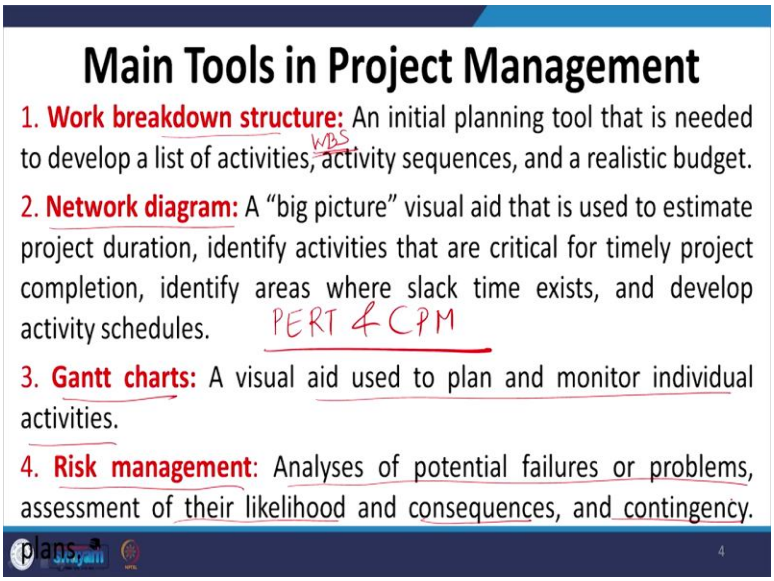

Then, another important type of tool is the network diagram. So, network diagram is basically used when we are in the execution stage of product, the third stage of the project. The maximum efforts are required in the third stage. So, you need to have very good monitoring of your project process, very good execution of project process. So, that you have actually the right, you can say, return on your efforts.

So, the network diagram that which activity should follow which activity, that is being done in this particular diagram. And we will see with the help of two very popular tools PERT and CPM that how we can develop a good network diagram for our purpose. And how we can use that network diagram to effectively control and monitor the progress of our project.

Another very important tool for the project management is Gantt chart. Gantt we have already discussed his name during the development of initial scientific management. Along with FW Taylor, the name of Gantt is also very important. And he basically developed a visual aid, which is used to plan and monitor individual activities. Each individual activity can further be divided into various sub-activities.

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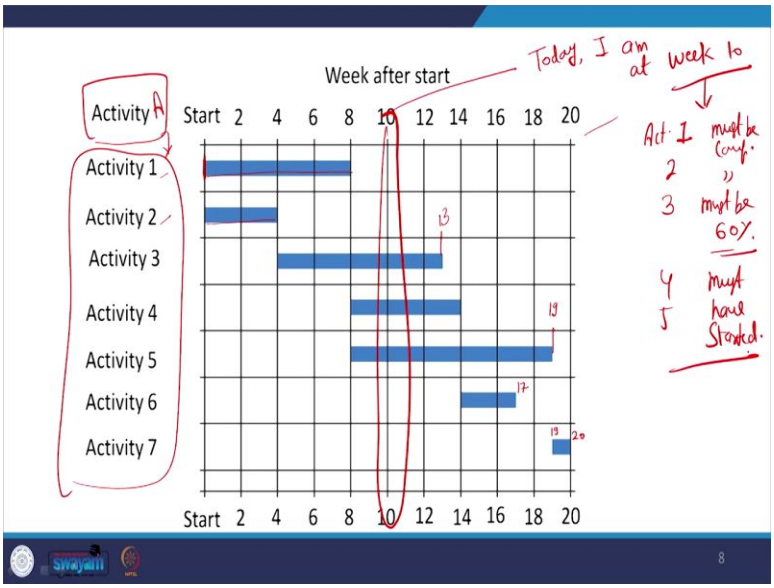

So, we have a kind of chart which helps us in monitoring the performance of these activities. Like any activity A. For an example, take activity A. Now, activity A is divided into various sub-activities 1, 2, 3, 4, 5, 6, 7. So, these are the sub-activities of activity A. Now, sub-activity 1 and sub-activity 2 can start in the first week.

But activity 1 is taking eighth week and activity 2 is taking fourth week. Then, activity 3 will start in the fourth week and will be completed by thirteenth week. Activity 4 will start in the eighth week and will be completed by fourteenth week. Activity 5 will start in the eighth week and will be completed by nineteenth week. Activity 6 will start in the fourteenth week and will be completed in the seventeenth week. And, activity 7 will start in the nineteenth week and will be completed by twentieth week. So, that finally your A will complete in 20 weeks time.

Now, if I am in week 10 today, if I am in week 10 today. So, I at week 10 today, I am at week 10. So, what I want to see that at week 10 activity 1 must be completed. Activity 2 must be completed. Activity 3 must be 60 percent around completed. Activity 4 and 5 must have started.

So, if these things are there; if I am monitoring the performance on week 10, it means my system is going right on the track. But, if I see on week 10 that activity 1 is still not

completed, it requires some more time to complete. Maybe 1 week or 2 week, I do not know. But it requires some more time to complete.

Then I can understand that my entire project is under some kind of delay. So, you can see from this visual aid very clearly that which activity must be completed by this time. And when I check, when I use this aid, I can monitor the performance that how much delay is already being built into my project. So, that is another very useful tool for the project management.

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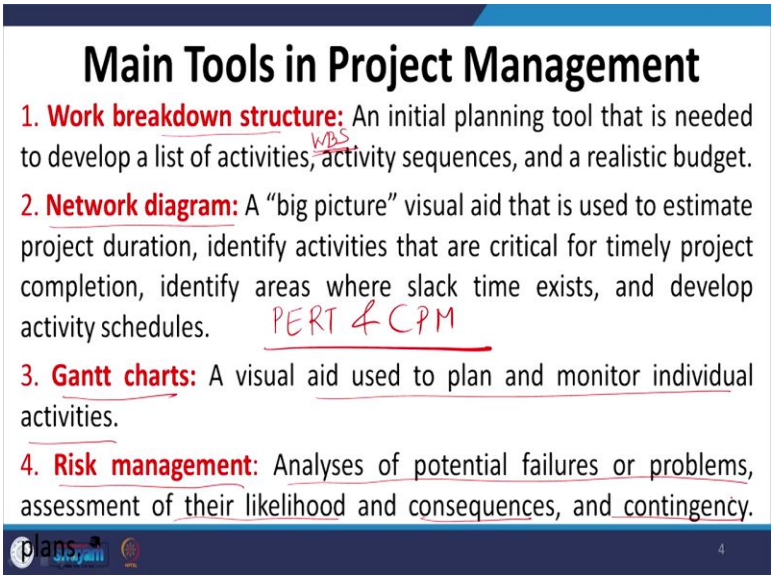

Then another tool for project management is the risk management. Because project is onetime activity, you do not have the prior experience and it is very unique in its way. So, project is also full of a lot of risk. And many a times we are not able to foresee those risks. A good project manager is one who is able to foresee the risk and also create some kind of mechanism for the risk management. So, risk management is a very important aspect of project management.

Now, what we do in this risk management? It analyzes of potential failures or problems, assessment of their likelihood and the consequences and contingency plans of labor. That if some kind of failure is there, what is the possibility of happening that failure? Let us say, I want to start some international business. Now, the international business is very

much affected by exchange rate, currency exchange rate. Now, if I see that India versus dollar; rupees versus dollar.

So, if the dollar is becoming stronger, how it is going to affect my project? Or, if rupee is going to become stronger, how it is going to affect my project? And then I also try to see what is the chance whether the dollar is going to become stronger or rupee is going to become stronger?

So, I decide on the basis of that what type of measures I should take and whether I have any plan B also available with me or not. So, all these things are some of the important tools in the project management. Work breakdown structure we discussed. We discussed about the Gantt charts.

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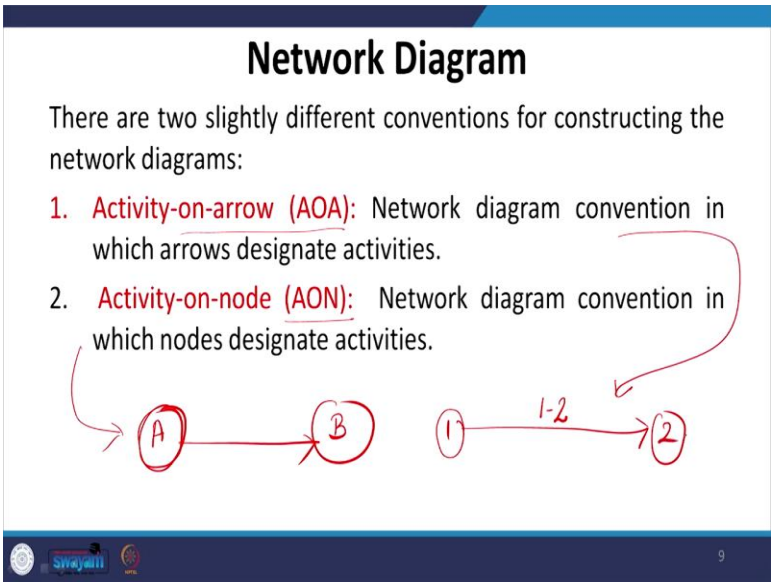

Then the third important thing we want to discuss that is the network diagram, the diagram about which we use for controlling the project. Now, there are two very popular conventions which are used for making the network diagrams. One is AOA and another AON. AOA and AON are activity on arrow and activity on node.

For example, this is one case and this is another case. If I am saying that this is node A, this is node B. And here something is happening from node A to node B. So, here this node is representing the activity. In the second case, this node is representing the activity.

And here I am saying this activity is 1 to 2. So, this is representing the activity on arrow. So, these are the two conventions are there, which we follow in network diagram.

But network diagrams are developed on the basis of precedence diagram or the precedence relationships, that what type of precedence relationships we have. So, we will like to see the precedence relationship. But before that, we have some important terminologies which are used in developing a network diagram.

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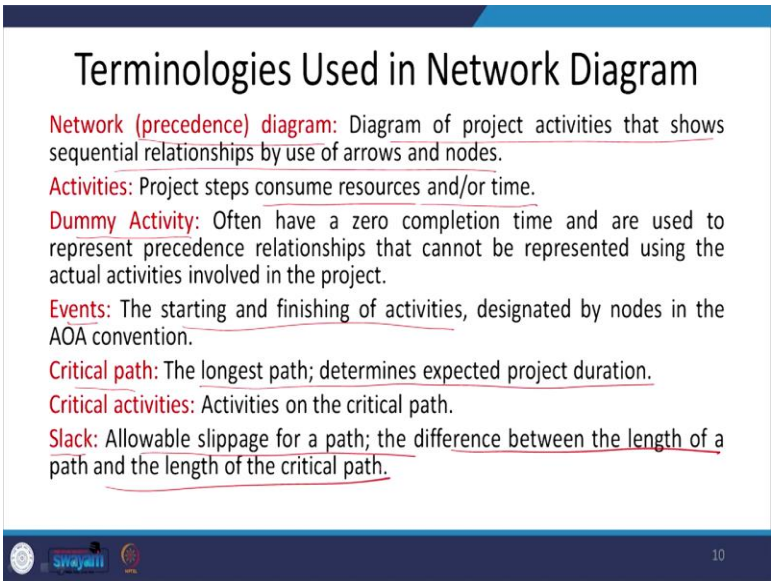

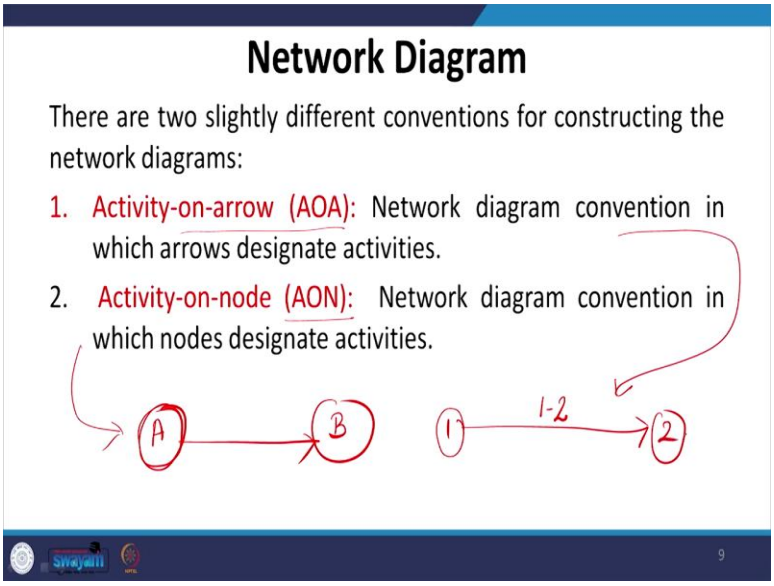

So, in the network or the precedence diagram as we understand the diagram of project activities that shows sequential relationships by use of arrows and nodes. So, two examples we just discussed AOA and AON. These are the ways in which we can represent our network diagrams.

Activities are those things which consume resources and resources, particularly time and money. These are the two types of resources we normally talk. But in some of the precedence diagrams, we have to use dummy activities. And the dummy activities are those activities, which are to show the directional effect, the precedence effects.

But these activities do not consume any resource. So, they do not take any time. They do not take any money. But, they are only the binding for the direction of movement of activities. So, these are dummy activities. We will see in our numerical problems that how dummy activities are required for just ensuring the right direction of project.

Then events, the starting and finishing of an activity is known as event, activity 1 to 2, like in this example. So, the 1 to 2 this is activity the arrow. And 1and 2 are events. 1 is the starting of activity and 2 is ending of the activity. Then, critical path, this is very, very important; the longest path that determines the expected project duration.

So, there may be multiple paths for completing the project. But out of those multiple paths, the path which is taking the longest time, the highest time is known as critical path. And all those activities which are coming on the critical path are known as critical activities.

And then another important term is slack, that is allowable slippage for a path; the difference between the length of a path and the length of the critical path. So, all activities, we will see with the help of example, may not fall on the critical path.

All those activities which are on critical path, they have to be performed right at the time of their start. But, those activities, which are not at the critical path, they are on some other alternative paths.

So, you may delay the start of those activities by some time that will come with the mathematical calculation. But you can delay the start of those activities by some time. So, that some time by which you can delay the start of those activities is known as slack.

So, we need to know what are the slacks available for different activities so that we can do a better resource planning that is the purpose of determining the slack, because if you have limited resources, you can postpone the happening of that slack activity. Whenever, you have enough resources or you have reserved resources, in that case, you can use them for doing that activity at a later date.

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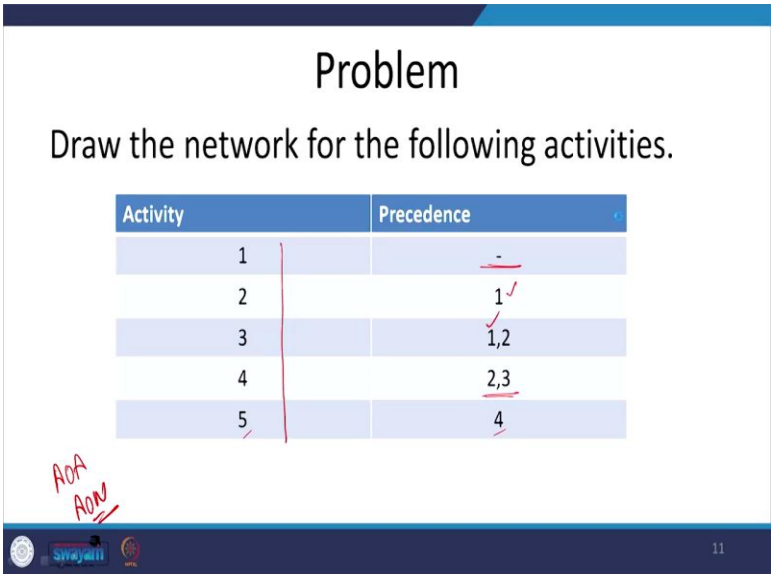

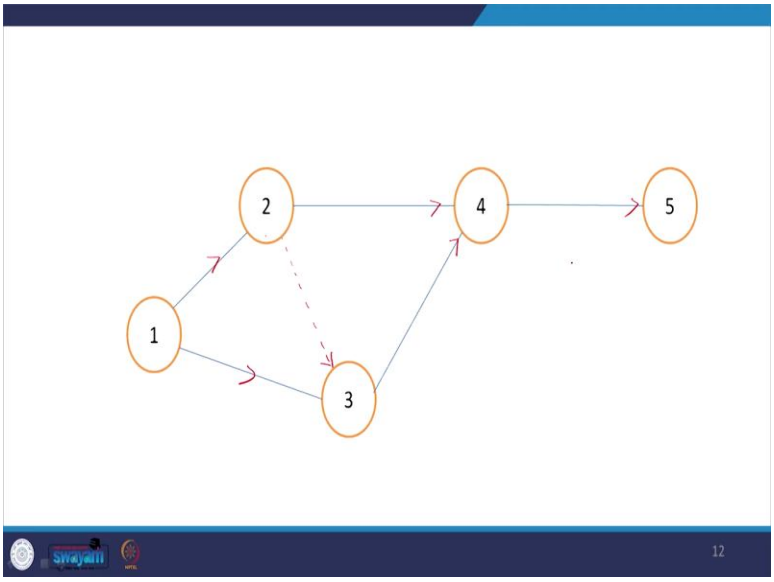

Now, with this very simple small example, we will try to understand that how to draw the network for the various activities. Now, in this particular case, we have just five activities and these are the precedence given to us. There is no precedence for A. This is 1; 1, 2; 2, 3 and 4.

Now, let us see, if I use any convention; I can use AOA or AON. So, in this case if you see these diagram. Now, the activity 1, if you see has no precedence. Activity 1 has no precedence but activity 2 and 3; 2 and 3 has precedence as both 1. So, from 2 and 3 you have the precedence of 1.

But your activity 3 has a precedence of 1 and 2. So, 1 is directly before 3. But, 2 is also required to be completed before 3 starts. So, you have to add one diagram; one arrow here also. Then, for 4 you have 2 and 3. For 4 you have seen that 2 and 3, both are required to start activity 4. And then for 5, activity 4 is the precedence.

So, activity 5 can only happen when 4 has been completed. So, this is the precedence diagram. This is the precedence diagram for this given question: that how 1, 2, 3, 4, 5 are divided or presented in the form of a sequence that is to be followed in developing this project.

So, now the next issue is to know the various other important calculations related to this particular precedence diagram. And with this, we come to end of this session. Thank you very much.