Project and Production Management
Prof. Arun Kanda
Department of Mechanical Engineering
**Indian Institute of Technology, Delhi**

Lecture - 7
Project Representation

In today's lecture we are going to begin a discussion on the active phase of project planning and control. So far we were talking about the birth of the project and in the last lecture we talked about project selection. Once the project has been selected the next stage is trying to initiate work on that project and trying to implement that project. In today's lecture our focus is going to be on project representation that is talking about how the project is represented. You are all aware that the project network is a very convenient way of representing the project. We shall be discussing the project network and other means of project representation and we shall see what all goes into representing a project as a network.

What are the kinds of advantages of representing a project as a network and what are the prerequisites for representing a project as a network? The first thing that has to be done before a project is initiated is the formation of a project team because it is the project team which is ultimately going to be responsible for implementing the project and therefore this is the crucial first step in trying to initiate any project. Probably one of the most significant things that have to be done at this stage is the appointment of a project manager. We shall discuss in a later lecture the typical qualities that a project manager should possess. But the important thing to understand here is that the appointment of a right project manager is in fact a prerequisite for the success of any particular project. Then selection of the project team members. This particular selection has to be done judiciously primarily because the project members are the people who are responsible for the successful implementation of the project. The team members are generally chosen depending upon their expertise and the kind of expertise which is needed by the project. There has to be a proper match and appropriate set of team members has to be chosen. It's very important that there should be proper human qualities in the team so that the team can function effectively as a successful crew.

Once the team is formed generally what has to be done is there have to be briefings among the members as to what the objective of the project is. The team has to meet and everyone has to participate in that shared vision or the objective of the project. This would normally result in a broad consensus about the scope of work and the time frame in which the work is expected to be completed so that everyone is broadly prepared to undertake the work which is required in the project and then follows a detailed development of the work breakdown structure for the project and allocation of major responsibilities to either individuals or different agencies if the various parts of a project are subsequently sub contracted.

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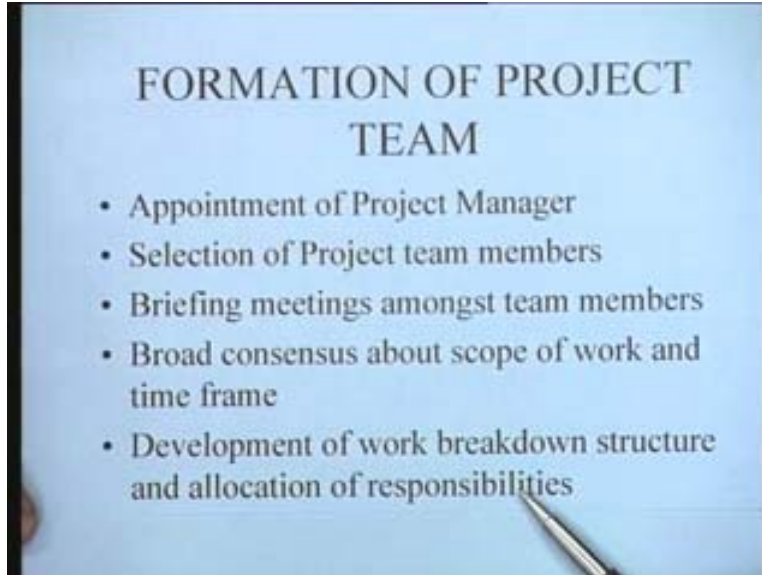
We shall now talk about some of the major ways in which the work breakdown structure and the allocation of responsibilities for a project is actually done. The work breakdown structure of a project is essentially a breakdown of the total project task into components to establish a number of things. For instance how will the work be performed? How will people be organized? How will the resources be allocated and how would the progress of the project be monitored? These are some very crucial questions which are in fact all linked together and are answered through the basic work breakdown structure of the project.

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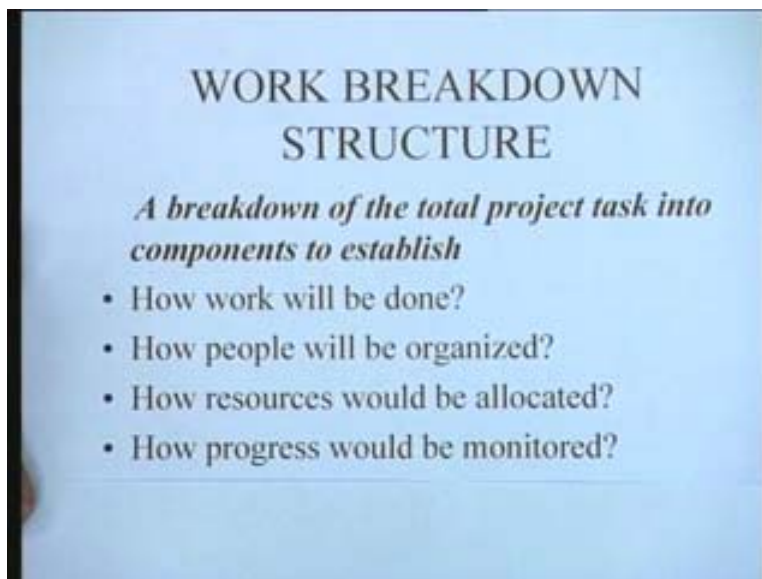
There could be various ways to breakdown a project into the work packages. One must remember that there are alternative ways to breakdown the work. You can imagine it is like cutting a cake. You can cut a cake this way or you can cut a cake this way and ultimately it's the pieces which are actually the activities or the jobs that have to be done as far as an individual project is concerned and the manner in which you cut the cake depends upon the purpose for which you are doing the whole exercise.

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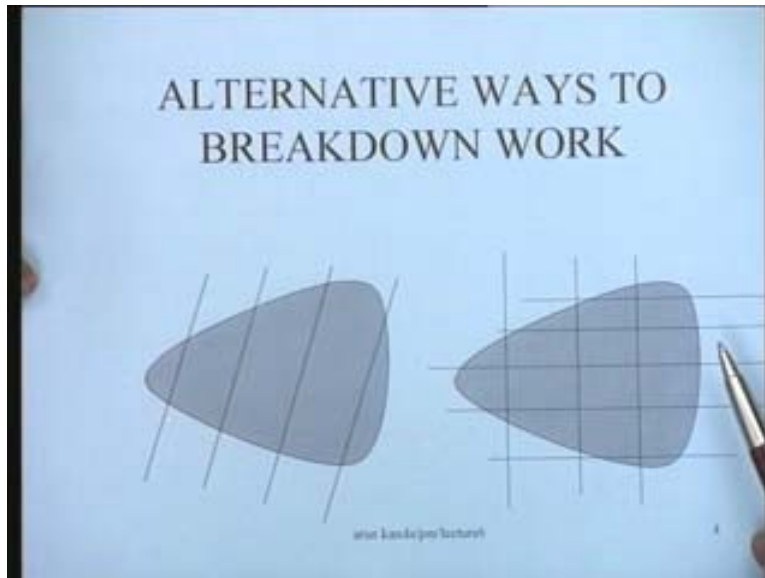
Here I will give you an example of a typical work breakdown structure. A work breakdown structure typically could be represented as a hierarchy where the total project is at the top and this project could be broken down into various systems; system I, system II and so on up to system N at the first level. Each of these systems could then be subsequently broken down into various sub systems depending upon the convenience and each sub system could be broken down into individual tasks. The task could be broken down into sub tasks and each of these sub tasks could be broken down into individual work packages.
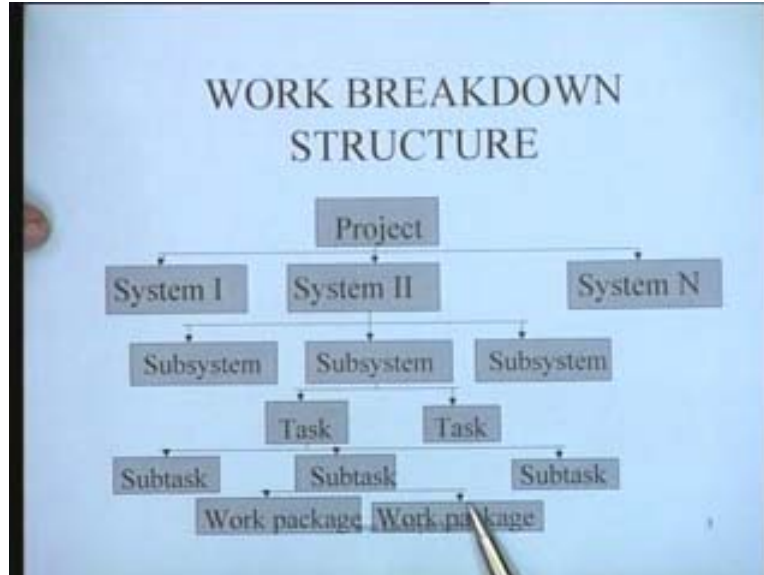
These work packages would be the manageable activities which you would have to monitor, control and keep track of when you are trying to implement the particular project. The various kinds of ways in which we can breakdown work are there could be a hardware orientation which would result ultimately in identification of the basic work packages. It is like trying to say that the car is made up of: the structure, the engine, the transmission and so on. These are like the individual end items or the hardware orientation and you are presenting the breakdown of a project as a hardware orientation. Another orientation could be an agency orientation which is based on the assignment of responsibility to different agencies. For instance if you are breaking down a project into a number of tasks which are first assigned to contractor one, all the tasks pertaining to contractor one could be in one bag. All the tasks pertaining to contractor two could be another bag so that you have then developed a work breakdown structure based on the agency which is going to be responsible for doing those tasks.

There could be a function orientation. For instance if you talk about an organization like engineers India limited they handle a number of projects. They have a design department, procurement, construction and a commissioning department and they breakdown task into design component, the procurement component, the construction component and the commissioning component of a project. That is a function orientation. They have segregated the work according to the functions involved in the organization. One particular agency might be responsible for design or might be responsible for part of procurement and part of construction. Agencies could cut across the functions when you are talking about different projects.

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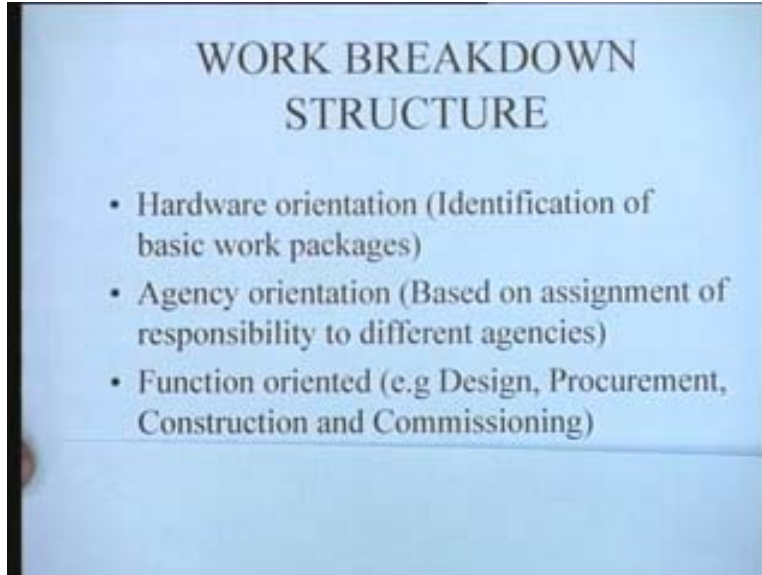
Depending upon the need you can develop different kinds of work breakdown structures and especially for large projects it's very important to develop a proper work breakdown structure because this is a statement of the quantum of work which is involved and who is going to do that work. This is in fact very important.

When you look at the work breakdown structure generally a work breakdown structure includes 6 to 7 levels. I explained to you the hierarchical structure. There could be 6 or 7 levels but more or less may be needed for a given situation. Then all paths on a work breakdown structure do not go down to the same level. This is not necessarily true. Work breakdown structure does not show sequencing of work. I think this is important to understand. Work breakdown structure is not showing you in what sequence you are going to carry out the work. It's only showing you the quantum of work involved in the entire project and a work breakdown structure should be developed before scheduling and resource allocation are done because this is going to be defining exactly what all has to be done.

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WORK BREAKDOWN STRUCTURE (Continued)

- Generally a WBS includes 6-7 levels. More or less may be needed for a situation.
- All paths on a WBS do not go down to the same level.
- WBS does not show sequencing of work.
- A WBS should be developed before scheduling and resource allocation are done.
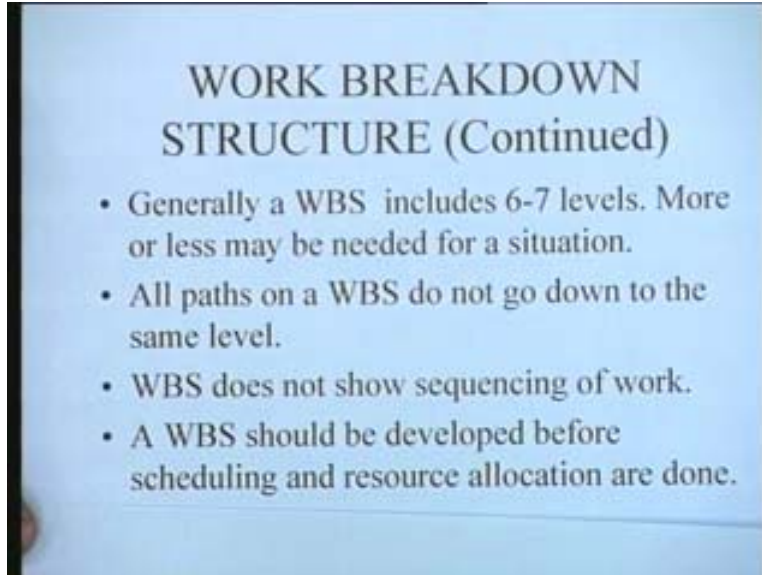
This is the work breakdown structure as far as the various properties are concerned. A few comments about how the work breakdown structures are to be developed. A work breakdown structure for a project should be developed by individuals knowledgeable about the work. This is important. This means that levels will be developed by different groups and the separate parts combined. This can happen. Different peoples can be experts in different areas. They would identify the quantum of work in individual areas and they would work individually and I can even put the whole work breakdown structure together and breakdown of a project only to a level sufficient to produce an estimate of the required accuracy. There is no point in breaking down work to the atomic level for instance; breakdown work only to the level which is sufficient to produce the estimate of the required accuracy.

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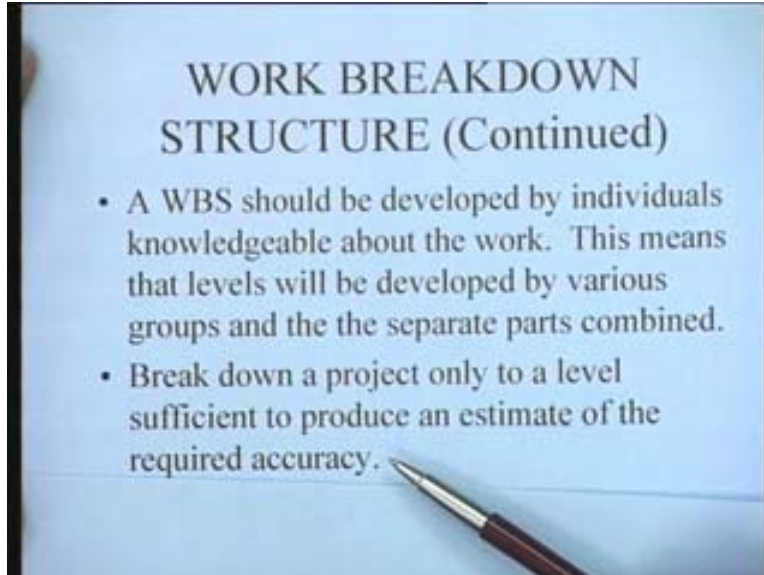
Let's take an example of developing a missile. Let's say this is a project. This is an end item orientation that we are talking. When you are talking about development of a missile which might be a project developed by ISRO it would have various components. The typical components could be development of the guidance control system, development of the rocket, development of the launching platform and development of the warhead. These are like individual parts which at the first level you identify. Each one of them could be then subsequently developed further.

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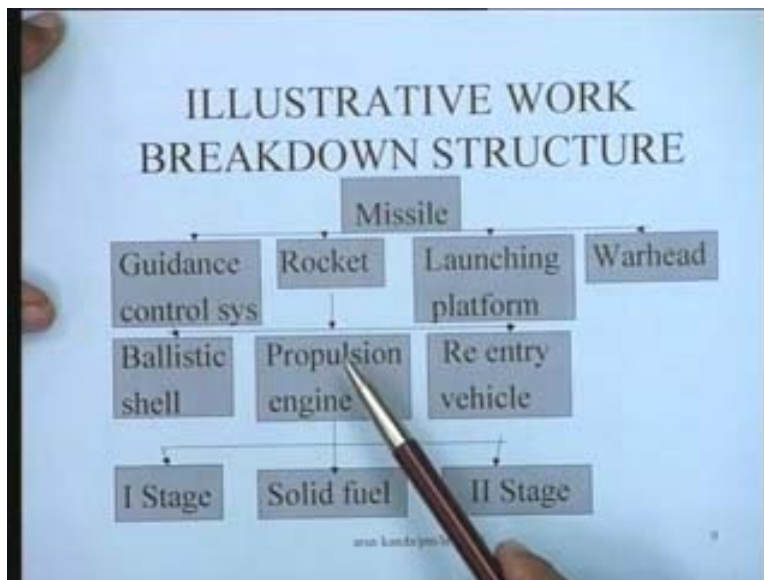
For instance we have developed the rocket in this particular example. The rocket would have a propulsion engine. It would have a re-entry vehicle and it would have a ballistic shell. You are talking about the development of all these at the second level. Then similarly let's look at the development of the propulsion engine. The propulsion engine you would talk about whether it would have a first stage, second stage and solid fuel and so you would talk about development of these individual components. Similar kind of an exercise could be done for each of these various tasks that you have identified in the work breakdown structure and in fact once this is done you could document this and this would then be known whether you have done this task, what are the components of this task and everything would be available and you would in fact be doing these various tasks by assigning them to appropriate agencies or individuals as the case may be.

Let us now talk about some means of project representation. We have already identified the various tasks which are involved in a project. Let's talk about how we can represent projects. The simplest way of representing a project could be to give the project a name and description - develop a rocket. This is one way of representing a project. But this kind of representation does not give us any detail and is therefore of no use for planning the implementation of that particular project. It can be useful only for calling the project, just as a name is useful for calling a file in a computer program. The other way of representing a project could be to represent it as a list of jobs that constitute the project. This is very much like a shopping list that your mother would have given you on many occasions and you make a list and you are supposed to go to the bazaar and buy all those things. That's a shopping list. A project is very similar. Project is a list of jobs which have to be done. So you can represent it as the list. But what is the major disadvantage of using a list of this kind? It does not show in anyway the dependence between various jobs or what are the precedence relations between various jobs. It's just a list and it just gives you information on which project which are the various jobs that have to be done. It's not complete nor does it tell you when which activity is to be done in the list.

So another way of representing a project is to represent it as Gantt chart or a bar chart showing when activities take place. This is a very convenient way of representing a project because it would show all the activities and it would show when which activity is to be done but the difficulty with this particular formulation is that it does not tell you which activity is dependent on which other activity. Which activity can be slided to and fro without affecting the other activities. This kind of information is not available in this kind of representation. It might be a useful display device but it's not a useful planning device. Then we come to the familiar project network showing activities, their dependence and their relation to the whole. That's the advantage.

The project network will show you the all the jobs which are involved. What are their dependencies? That is when can which job be done? For instance in the construction of a house after the plans are complete the first activity probably would be digging up foundations. Unless the foundations are dug up you cannot start your civil work. So this is a dependency of that kind. These dependencies would be shown in the project network and their relation to the whole. That means you would show the entire network and each activity would have its place in the network. It would show when it is required to be done

at what stage in the project and conveniently we have two types of representations for a typical project.

One is the activity on arc representation, the A-O-A representation. The other is the activity on node representation the A-O-N representation. Both are networks; that is both are directed graphs. They have nodes and arcs but the interpretations are different. The interpretation in the A-O-A network is that the arrows or the arcs represent the jobs or the activities whereas in this representation it is the nodes or the circles or the junctions or the vertices which represent the jobs or the activities. You can say one is a kind of a dual of the other. We can make a statement of that kind but essentially they look the same and they are project networks.

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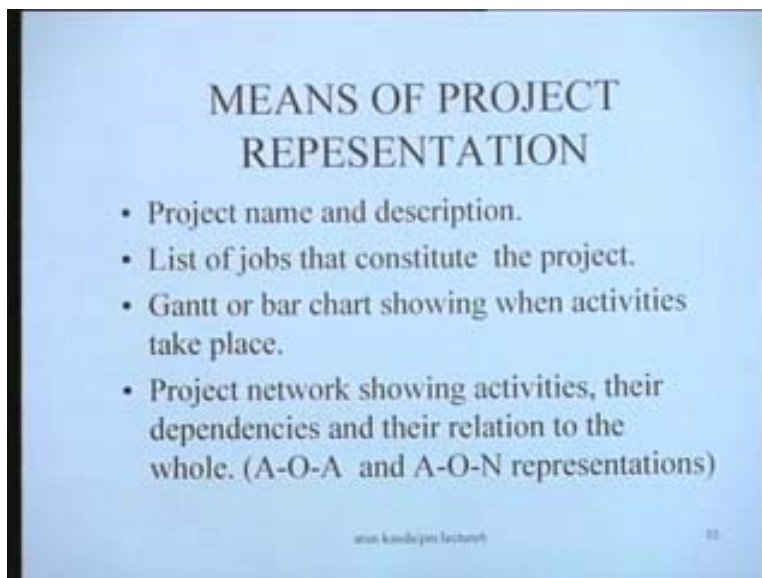
Since we are going to be dealing with the project network in a much greater detail we must understand why we use project networks. Let's answer this question of why use project networks? What are the advantages of using project networks? One of the reasons is that a project network is a very convenient way to show activities and precedence in relation to the whole project. That's one of the advantages. It is the basis of project planning. That's the important thing. What does it do? You can identify the responsibilities for various activities on the network. Activity this, this, this is the responsibility of so and so group or such and such contractor and so on. You can define the sub contracting units on the network. Which activities are the responsibility of which contractor? You can identify the role of different players on the project. Then you can use the network for basic scheduling and establishment of work. That means you can find out when which activity is to be done. That is basic scheduling and establishment of the work time tables.

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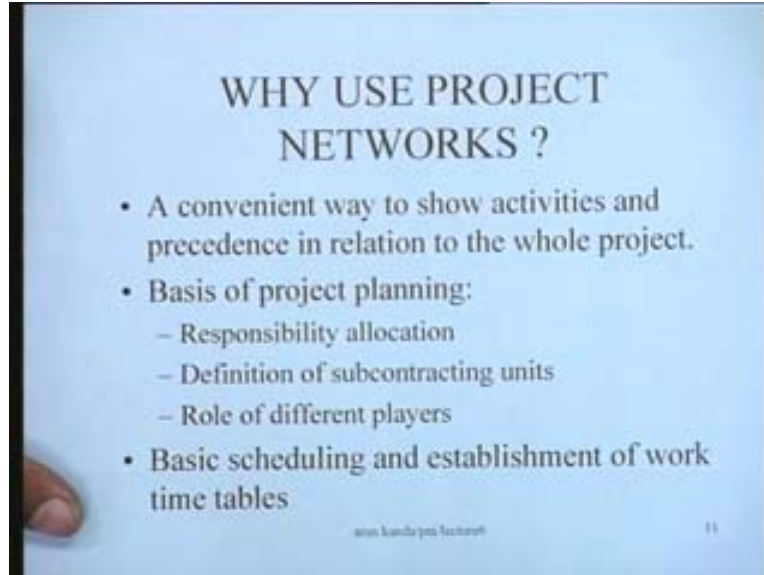
You know when what activity is going to be done. What is the earliest and the latest start and finish of various activities keeping in view the project has to be finished at a certain time or whatever is the minimum time. These kinds of computations can be done very conveniently with the project networks.

Another reason why project networks are useful is that they help us in determining the critical path which is a very effective device for selective management control. A project might consist of 500 activities but the so called critical path in a project might consist of only 20 activities. The critical path is important because it is the path which governs the duration of the project. Out of the 500 activities we have identified only 20 activities which are responsible or which controls the duration of the project and management can focus its attention more closely on those activities. So you are using the principle of selective management control. That's what management wants.

It's very much like ABC analysis in materials control. You identify A class items and if you control those A class items you can control 90% of the cost; something similar happens. It's very useful principle in project management. You can do deterministic versus probabilistic activity times. You can talk about resource planning for projects. You can talk about project crashing with time cost tradeoffs. You can talk about resource aggregation. You can talk about resource levelling. You can talk about limited resource allocation. All these are basically resource planning exercises which you can do on the project and this exercise is facilitated by using the network.

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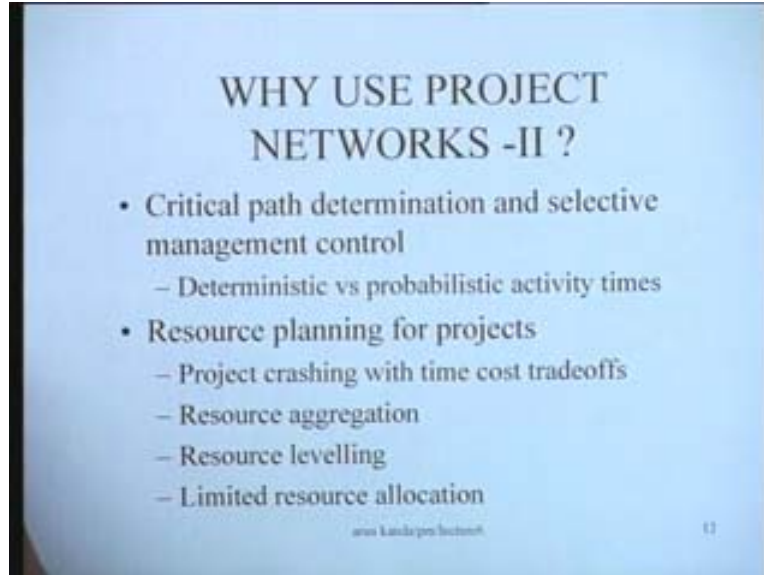
Another reason why project networks are useful is in the stage of project implementation which is very important. You can implement projects conveniently because you have a time table for implementation. So you know what is to be done and when using networks? You can monitor and report progress more conveniently by using networks that such and such activities have been done, such are half done such are not yet started. So you will know exactly where you are and so monitoring and reporting progress is easy. Updation of schedules and resources is very easy with project networks. This updation is very important because as you go along certain jobs don't take the amount of time which you had anticipated earlier. You might be spending more time or less time than what you had anticipated. You got to update your schedules and this updation is very simple on networks. Co-ordination of work with different agencies; on the same project network you can show some activities in red, some activities in green showing which is the responsibility of home and the project network thus is a common vehicle for planning, communicating and implementing the project right from inception. In that sense the project network is really very, very useful.

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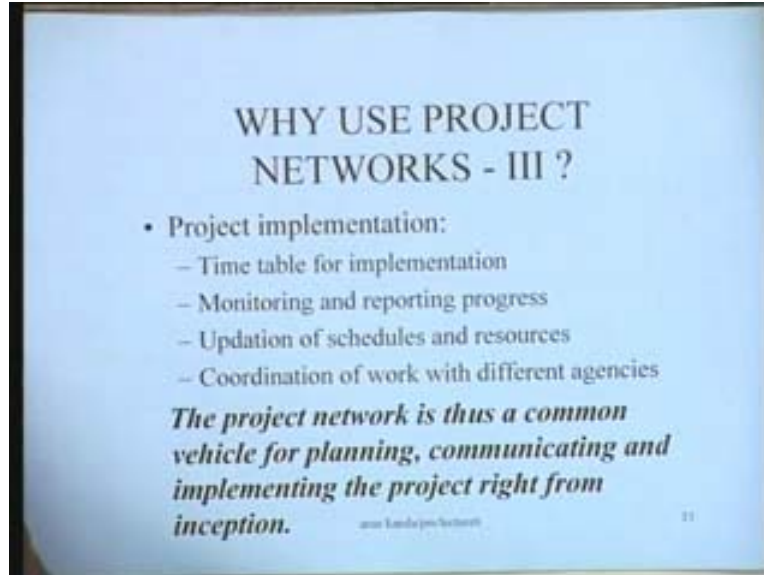
Let us now take an example of how a project network would be developed? What would be the nature of the activities involved? As I said the project team has been formed and let's say that we are the team and we are trying to talk about a project and as an example let's take a project of organizing a one day seminar on project management. Suppose you want to organize a one day seminar on project management. What we would do as a group is to identify the list of jobs which we have got to do. That's the first thing that we would do. One activity could be to decide date, budget and venue for the seminar. This is one of the activities which is important.

Another activity could be to identify speakers and the participants. That is the people who are going to participate and the people who are going to speak in the seminar. We need a decision on that. This is like thinking loud; identifying the speakers and the participants. Activity three is to contact and finalize speakers. We might have identified 10 speakers but when we contact them only 5 really concur and give their consent to participate in the seminar. This particular activity is contacting and finalizing speakers for this particular job. Let's say that we print a seminar brochure. We want to print a brochure for the seminar which would identify, which would give the details of the speakers, the time, the schedule, the venue and everything and we would like to circulate it to various people. We would like to mail these brochures to tentative participants and may be we will prescribe a certain registration fee for this because we are going to recover the costs of the organizing seminar from the participant's registration fee. We would like to estimate the number of participants. This estimation could be based upon the brochures which we have mailed and the responses that we get from that.
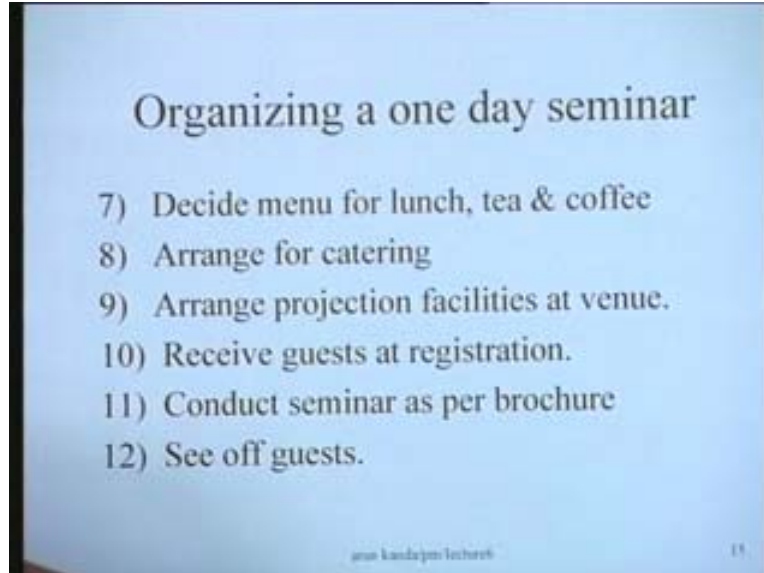
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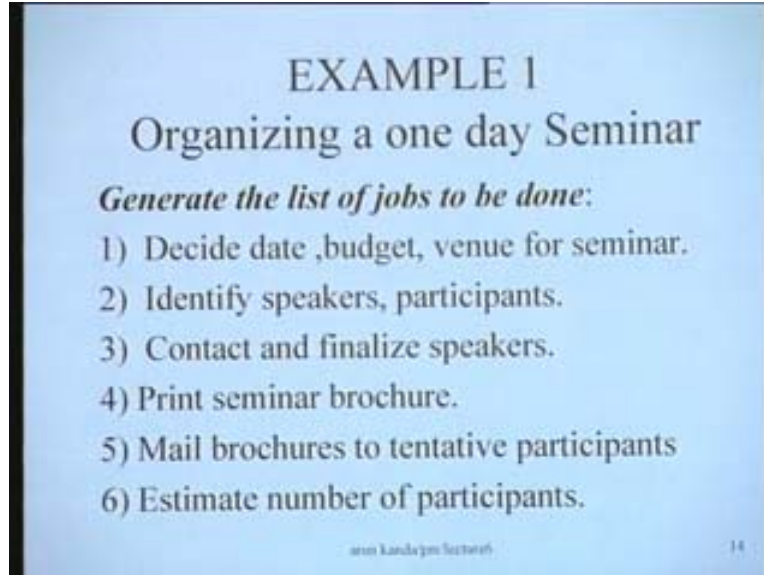
The seventh activity for the one day seminar could be to decide the menu for the lunch, the tea and the coffee breaks whatever you want to give. You want to give biscuits with the tea during the 15 minute break that you have in the morning and the afternoon. What would you like to give them for lunch? These decisions are governed by the budget and also by who are coming and your preferences. Activity eight is arrange for catering. Probably we are going to ask some caterer who is familiar with the institute to come and organize these lunches and teas and the coffee. Because it's a one day seminar there's no dinner.
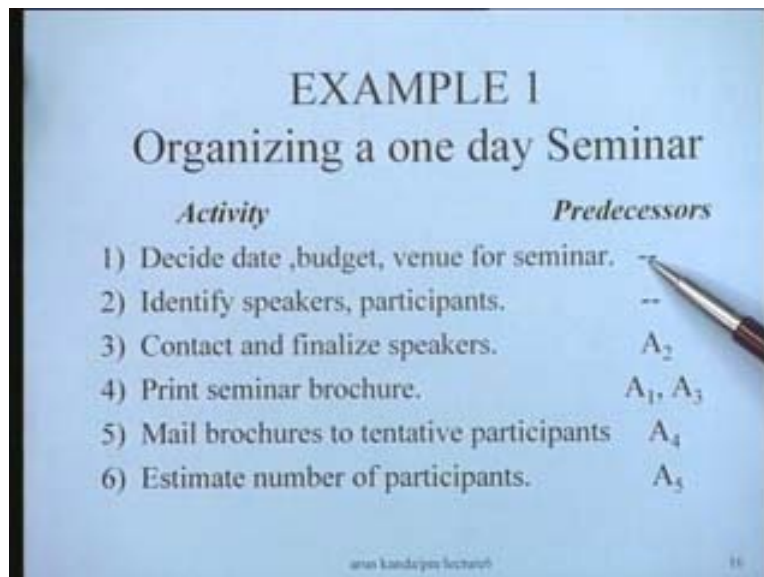
Then activity nine is to arrange projection facilities at venue. If the seminar is going to be arranged in the seminar hall or in the convocation hall of the institute, then you will have to make sure that all the projection facilities like OHP or slide projector or a computer with that kind of screen for projection is available. That's the activity nine. Activity ten would be basically receiving guests at registration. Guests would be coming on the day of the registration. You got to receive them. Activity eleven is to conduct seminar as per brochure schedule and the final activity would be to see the guests off. We are not including in this project subsequent activities like clean up or settling the accounts which could also have been included but it's just a question of defining the scope of your project. We are talking about these 12 activities which are a part of organizing the one day seminar.

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Organizing a one day seminar

7) Decide menu for lunch, tea & coffee
8) Arrange for catering
9) Arrange projection facilities at venue.
10) Receive guests at registration.
11) Conduct seminar as per brochure
12) See off guests.

How do we develop a project network for this? Step one was identifying the activities and this list of activities would be generated by the team or the experts by keeping into consideration what the whole project is all about. In order to develop the project network what would have to be done is that we would have to identify the predecessors for each of the activities. Let us try to look through the activities once again and identify the predecessors. The first activity of deciding date, budget and venue for seminar has no predecessors. It can begin right away.

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EXAMPLE 1
Organizing a one day Seminar

Activity	Predecessors
1) Decide date ,budget, venue for seminar.	--
2) Identify speakers, participants.	--
3) Contact and finalize speakers.	A_2
4) Print seminar brochure.	A_1, A_3
5) Mail brochures to tentative participants	A_4
6) Estimate number of participants.	A_5

Similarly identifying speakers and participants can begin right away. But contact and finalize speakers can be done only after the second activity is complete. That is after we have identified the speakers and the participants. So the predecessor for A_3 is A_2. The third activity is this. Print seminar brochure; for printing the seminar brochure you must have decided what the date and the budget is. So A_1 is a prerequisite and then which speakers are going to speak; you would probably like to print those. So that also must be specified there. So A_1 and A_3 are both predecessors for activity 4, A_4. For mailing brochures to tentative participants you can mail the brochures only when the brochure is ready after they are printed. So A_4 is a necessary prerequisite for this particular activity. Estimating the number of participants you can do only after the brochures have been mailed and hopefully you have obtained some responses. So A_5 is a predecessor for activity A_6. Activity A_7 is deciding menu for lunch, coffee and tea.

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This can be done only after you have estimated the number of people. So we have put A_6 as a predecessor for this particular activity. Arrange for catering; you have put both the things A_1 that is you know when it is to be done and what is the venue and also the menu for the lunch, tea and coffee. So A_1 and A_7 are shown here. For arranging projection facilities at site we have put A_6 as a predecessor because it's only after deciding on the number of people that you would decide the venue. In receive guests at registration we have said that guests should be arriving for registration only when you are ready. When you are ready means your catering arrangements are done. So A_8 and your projection facilities are ready. Both the things should be ready before you can receive the guests for registration.

You conduct the seminar as per brochure. Conducting the seminar means that your catering is done, your projection facilities are done and at the same time your guests are available. These are the three things which are required for the seminar to be performed. We conduct the seminar as per these things. You see of guests after the seminar is over.

So A11 is a prerequisite for seeing off guests. This process of identifying the predecessors is trying to identify the kind of technological precedence's which are necessary for conducting those activities.

Assuming that we use an A-O-A representation the project network looks something like this. These are the 12 activities for the project.

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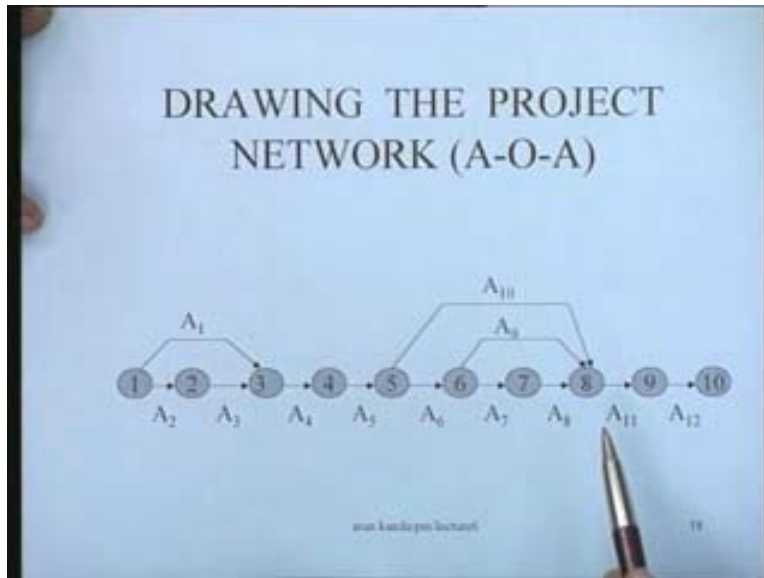
What we find is that this particular project network has 10 nodes as shown in this particular project here and you find that these are activities A_2 and A_3 and A_1 is more or less in parallel with both A_2 and A_3 the way it is shown here. A_4 has A_3 and A_1 as predecessors. It goes on and then similarly what you find here is that as far as A_{11} is concerned, which is conducting the seminar, A_8, A_9 and A_{10} are predecessors. We have in fact a representation of the project as a network. In this particular case it is an A-O-A network because the interpretation we have given to the arcs is the arcs are representing the individual jobs. The jobs get completed in this particular sequence. That's what it is.

We can also develop an A-O-N network for this particular project, the A-O-N network with the activities on node. A-O-N network for this same project shows a diagram something like this. Here again you find for instance that A_{11} is an activity which is shown on the node. A_8, A_9 and A_{10} are three predecessors for this activity and we have these arcs showing this kind of precedence relationship as far as activity A_{11} is concerned here. Both these projects have nodes and arcs. The only thing is that we have given a different interpretation to the arcs and the nodes in this particular structure; the way we have defined this particular network here.

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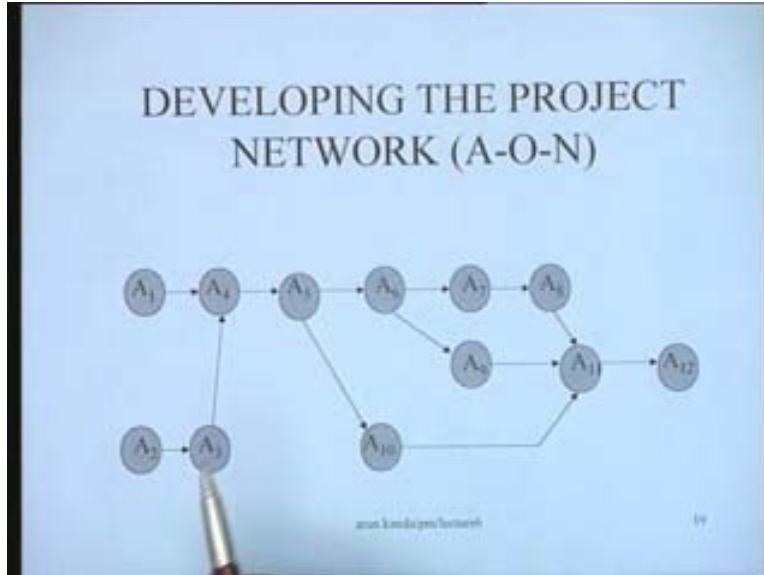
This was an example where we had been able to develop the network quite conveniently. Let's look at some other examples and see for instance what could be the possibilities? Let's take this example. It's a small project of only five jobs; a, b, c, d and e and a, b, c these jobs have no predecessors. Job d has a and b as predecessors and job e has b and c as predecessors and let us try to develop the activity on arc network for this particular problem. What you find here is that a b and c have no predecessors. They can start in this particular manner, the way it is starting. But what is happening to activity d? Activity d requires a and b. So what you can do is you can imagine that there is a dummy here which goes from 2 to 3 in this particular manner and similarly for activity e what you have is you need a dummy which goes from b and you can have a dummy which will go from here in this manner.

We have seen that representing this particular project required the use of these two dummies. We can call this as dummy number 1 and dummy number 2. Both these dummies were necessary for us to develop the project network. These dummies are called logical dummies and here is an instance. Example 2 is an instance of a situation where dummies are necessary to represent the correct precedence logic in this case. Both dummies D_1 and D_2 came in here and they were necessary. We could not represent the project network without resorting to these particular dummies.

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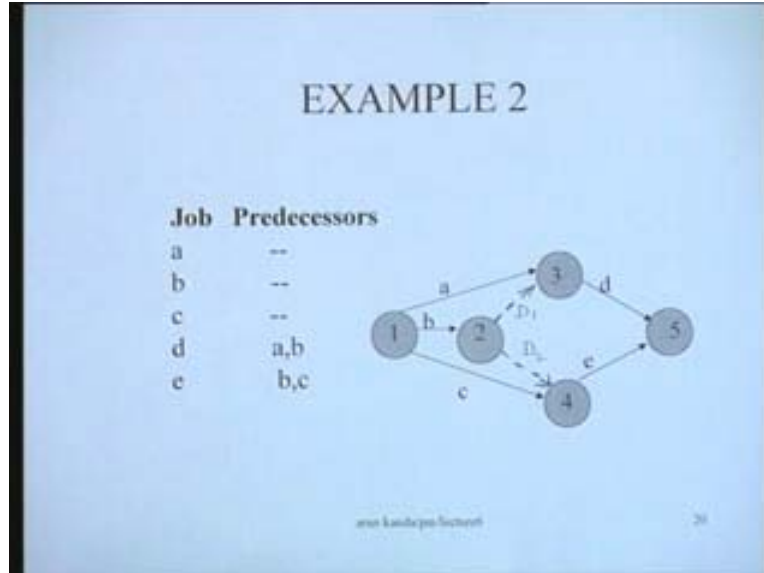
I give you another example which is a little more complicated than this one. Let's look at this particular example 3. We have three jobs a, b and c which have no predecessor relationships. D requires a and b. What we can do is to represent this correct relationship we can take a dummy and show it like this. This is a dummy which is necessary to represent the precedence requirements of job d. It requires a and b. e requires a and c. This is job e. It requires both a and c. I can take another dummy and I can try to represent this through another dummy like this. This now represents ab, ac as far as e. This one, as well as this one are now taken care of.

How about job f? The predecessor relationship specifies that a b and c should all be predecessors for this particular job. How do we take care of that? What you can do is this node represents the completion of a and b. If I represent a dummy in this fashion, this particular dummy shows that jobs a and b must both be completed for this particular activity to start and this node represents a and c. If I take another dummy like this, this shows that a and c both must be completed. This particular node now represents the completion of all; a, b and c to be completed before this particular job is done. I could have taken another dummy here from 2 to 5 and put it this way but that is not really necessary. It could have been done. There would have been nothing wrong in that but it was not really needed. In this example what you find is that D_1, D_2, D_3 and D_4 namely 4 dummies have to be used to represent this relationship properly and these are all logical dummies.

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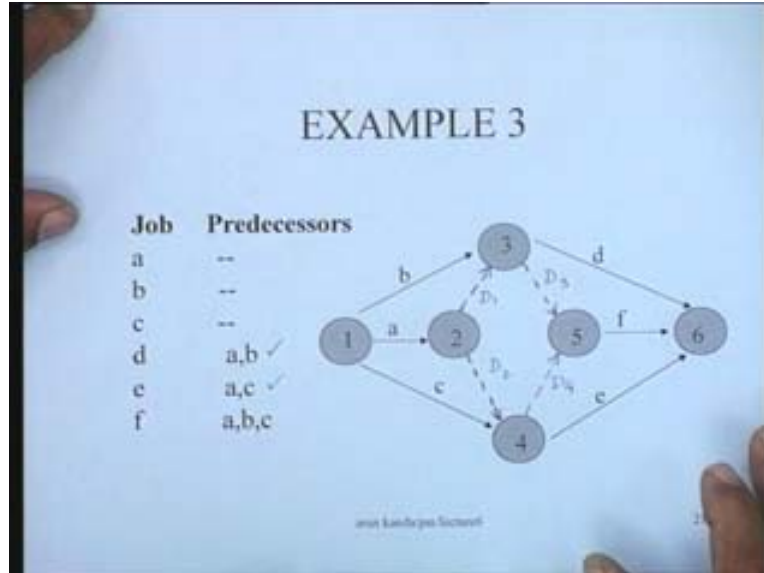
They are logical dummies in the sense that they are necessary to represent the correct logic. Dummies could be used for other purposes also. Here let's take an example. Look at this example 4. In this particular example job a have no predecessors. Jobs b, c and d are actually jobs which have the same predecessor and the same successor set. So these are actually jobs being done in parallel, b c and d. I could have joined b like this and d like this but then what would have happened is that the activities would have been referred to by the same node numbers and many computer programs try to identify activities by referring to the node numbers. You don't want to have 3 sons called by the same name because then when you call them you don't know whom you are calling. This kind of problem would emerge.

What can be done is that I can introduce 2 dummies here. This dummy and this dummy and let's call this dummy as D_1 and let's call this dummy as D_2. These two dummies are not logical dummies, mind you. They are dummies introduced for uniqueness of activity representation. These are dummies because this job is in parallel and this job is in parallel with this job. But by giving this nomenclature I can say 2 3, 2 5, 2 4 are now three different activities which are in parallel and these are dummies which are zero time and zero resources. This is an example of a dummy which is used for uniqueness of activity representation.

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EXAMPLE 4

DUMMIES FOR UNIQUENESS OF
ACTIVITY REPRESENTATION
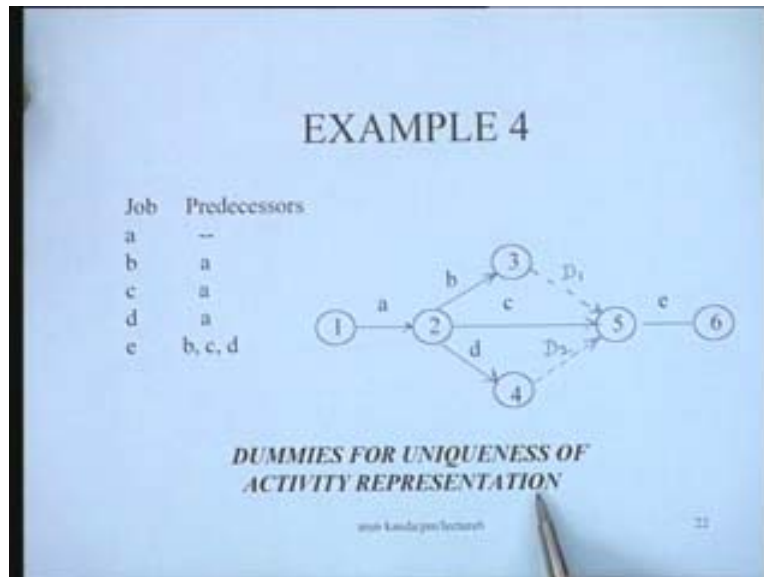
Mind you this use of dummies for uniqueness of activity representation would be required only in A-O-A networks. It would not be necessary in A-O-N networks. Why? Because each activity would have a separate circle to itself there is no need of a separate representation in a situation of this kind.

Let's look at the third major use of dummies. Here is a network and let us suppose that this is a network which is some arbitrary network where jobs have some directions and you have this kind of a situation. Let's say that there is an arc from here to here as well. There are three sources here. Let's forget about this node for the time being. What you notice is that there are three sources because arcs are emanating from these sources. Similarly this is a sink. Let's forget about this arc for the time being. Then this is a sink and this is also a sink. It has 3 sources and 2 sinks in general. Many computer programs require that you should have a single source and a single sink in a project network. This is very simple.

What can be done is I can add a master source S and connect the master source by dummies to these individual sources. So there were 3 sources. Let's call these sources as s_1, s_2 and s_3. All I can do is I can add a master source and connect the master source by dummies to these sources. I can do a similar thing here and connect these 2 dummies. This is let us say one dummy and other dummy and connect it to a master terminal T. These 3 dummies and these 2 dummies, these 5 dummies actually what are they doing? They are dummies for the creation of a single source and sink. They are neither logical dummies nor are they dummies meant for uniqueness of activity representation. They are being used. This kind of a representation would be necessary for both A-O-A and A-O-N because if you take the example that we did for the project seminar development the A-O-N network had two sources. You could always convert it into a single source by making use of these types of dummies.

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So dummies perform these three functions. Let us summarize the role of dummies in project networks. Dummies could perform either function I or function II or function III. The first function is correct representation of precedence logic. This was the example of logical dummies and we can see the logical dummies are needed for A-O-A networks but they are not needed for A-O-N networks. That's another interesting thing a comparison of both these networks here. The second type of dummies which is uniqueness of activity representation is required in A-O-A networks but it is not required in A-O-N networks and the third use is creation of a single source or single sink.

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These dummies are used here also and here also. This is a very harmless, innocuous kind of a use of dummies. The major advantage is if you forget about this use, dummies are not really required no logical dummies are required in A-O-N networks. But they are required in A-O-A networks. This is one of the major advantages of A-O-N networks vis-à-vis A-O-A networks that you do not require any logical dummies. Because introducing logical dummies is quite a nuisance and even till date the problem of finding out or solving the minimum dummy task problem that is what is the minimum number of dummies required to represent a precedence statement in general this problem is not yet solved till date and this problem is known to be an NP hard problem. That means a difficult problem in the literature. This is how dummies are used.

Apart from dummies the project network has to have certain properties and the important thing that the project network has to have is that the network must be consistent. What do we mean by a consistent and an inconsistent network? Suppose we have a project network of this nature and suppose we specify some direction of arcs. This project network is an inconsistent network. Why is it inconsistent? It is inconsistent because it has a loop which is formed in this direction. A closed loop in a project network is a logical inconsistency.

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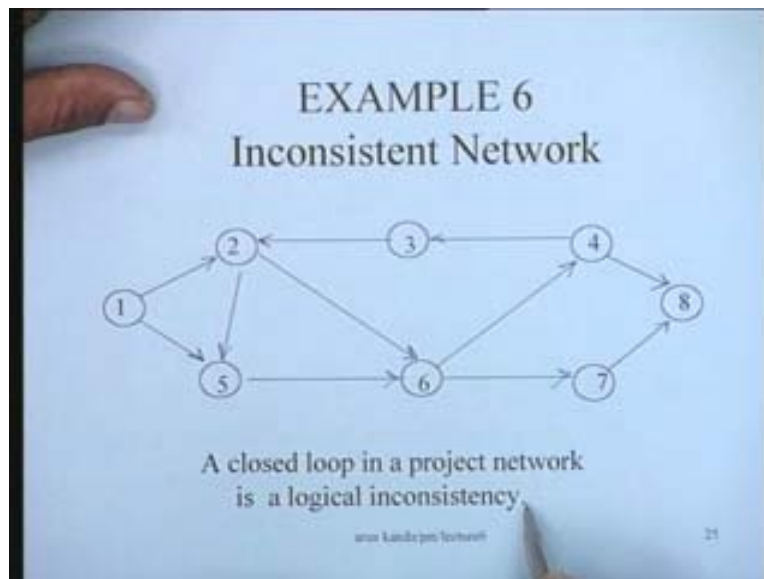
Why is it a logical inconsistency? We don't know where to begin but the important thing is that this job requires this job to be completed. This job requires this job to be completed. This job requires this job to be completed and this job requires this job to be completed. Ultimately what it implies is that in order to do a job that job itself should be completed which is a logical inconsistency. We have to guard against inconsistencies in project networks. In projects which have large number of arcs we must ensure that there are no cycles or loops of this kind and we have to sort of guard against those.

We will now talk about the concept of redundancy. If we have these jobs and these precedence relationships the way they are if we specify for instance that a has no predecessors. b has predecessor a. This is the direction of the arrow. c has no predecessors. d has predecessors a, b and c. We say this as a, b and c and e has predecessor d and f has predecessor d. This would be the kind of network that would be developed from this information. But in this information what do you see? We have specified a as a predecessor for d. It need not be done because a is automatically a predecessor of b and b is a predecessor of d. That means what? That means we could actually be deleting this arc altogether and we could in fact be deleting a from the predecessor set without in any case changing the network structure. So this is an example of a redundancy.

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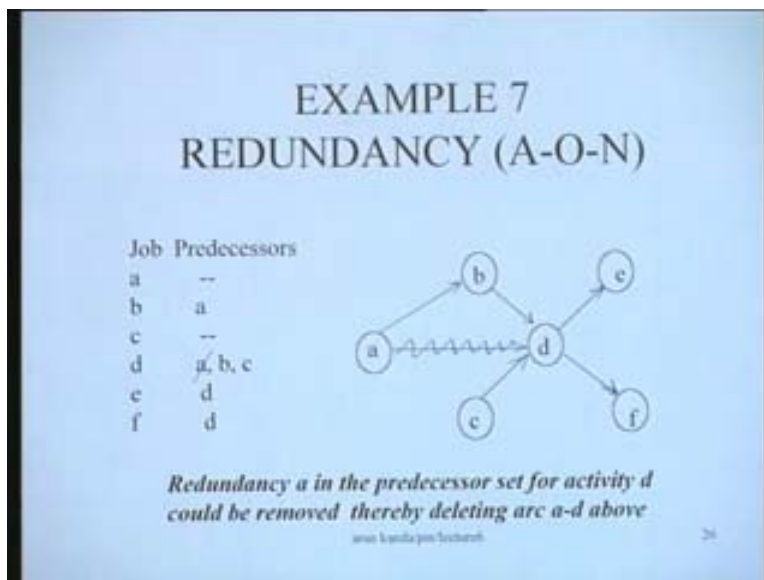
The important thing to bear in mind here is that we have prerequisites for a valid project network. It is a necessary thing that the project should not have any cycles. This is a necessary requirement. But it's a desirable requirement that the project should have the minimum number of dummies and no redundancies.

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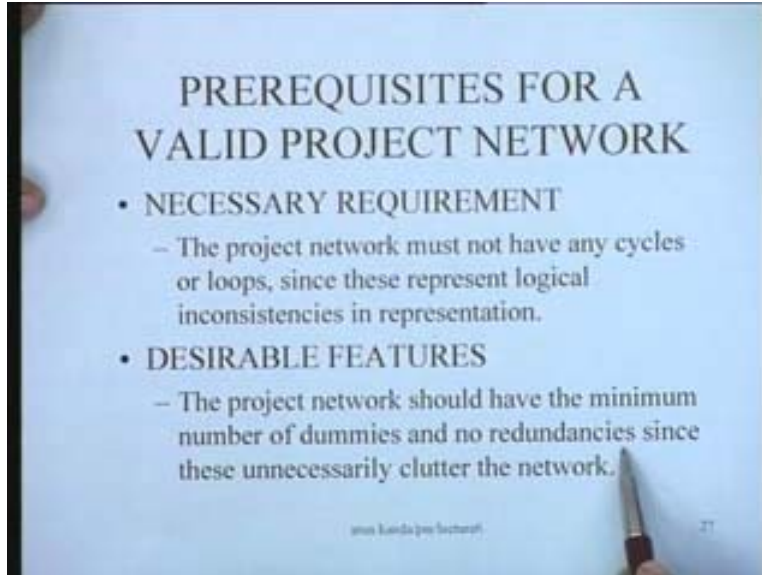
This is necessary and this is desirable in that sense. In our next lecture we will be talking about these preliminary manipulations which talk about checking inconsistencies in project networks.

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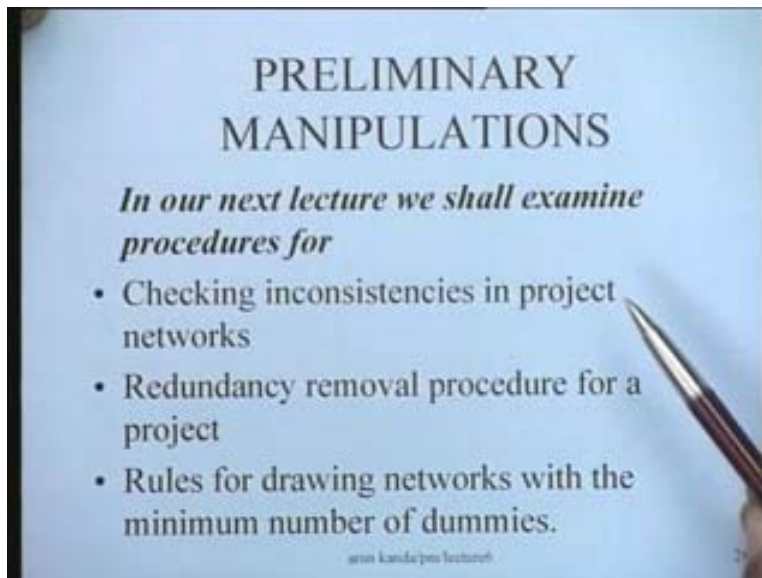
Redundancy removal procedure for a project and rules for drawing networks with the minimum number of dummies. We will talk about these in the next class and in this particular lecture let us see what we have tried to achieve. We have seen that project initiation is done in a project by forming a project team with a leader. This is an important prerequisite for project planning. Then the project team with assistance from

experts defines the project scope and develops the work breakdown structure. That's the objective of the developing team. The work breakdown structure could have an end item orientation, a functional orientation or a responsibility orientation depending upon what exactly you want to achieve.

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SUMMARY

- Project initiation is done by forming a project team with a leader.
- The project team with assistance from experts defines the project scope and develops the work breakdown structure.
- WBS could have an end item orientation, a functional orientation or a responsibility orientation.
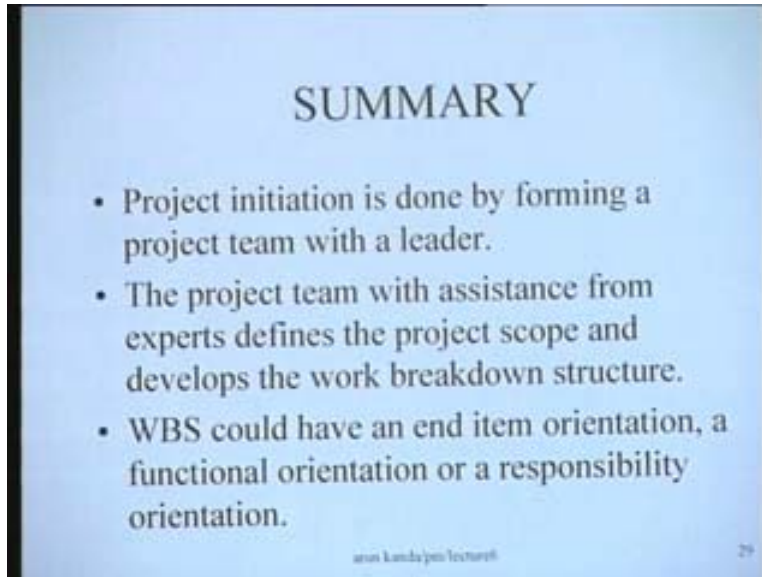
The work breakdown structure ultimately defines for us the work packages at lower levels and the activities in the project. There are various means of project representation. They could be lists, bar charts and networks. These have been discussed. The role of the project network in the entire project life cycle has been highlighted. It's an important tool for planning communicating and implementing projects.

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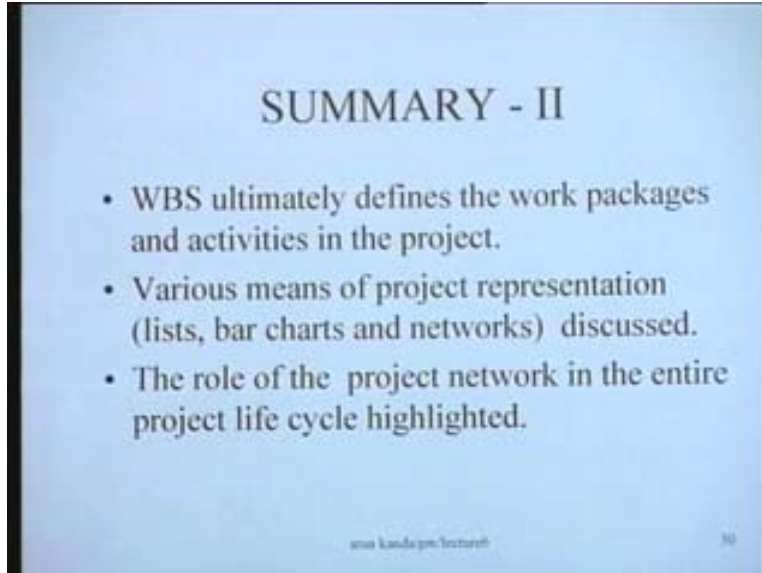
An example of organizing a one day seminar was developed as a project network in both A-O-A and A-O-N modes. The role of dummies in both A-O-A and A-O-N networks was highlighted through illustrative examples and the notions of inconsistency and redundancy in project networks was introduced.

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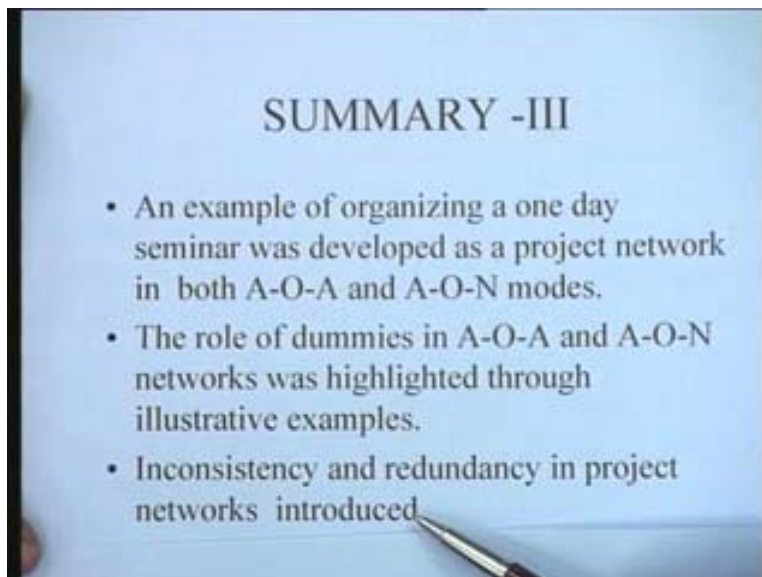
Detailed algorithms for dealing with these procedures will be taken up in the next class. Thank you!