Project Planning & Control
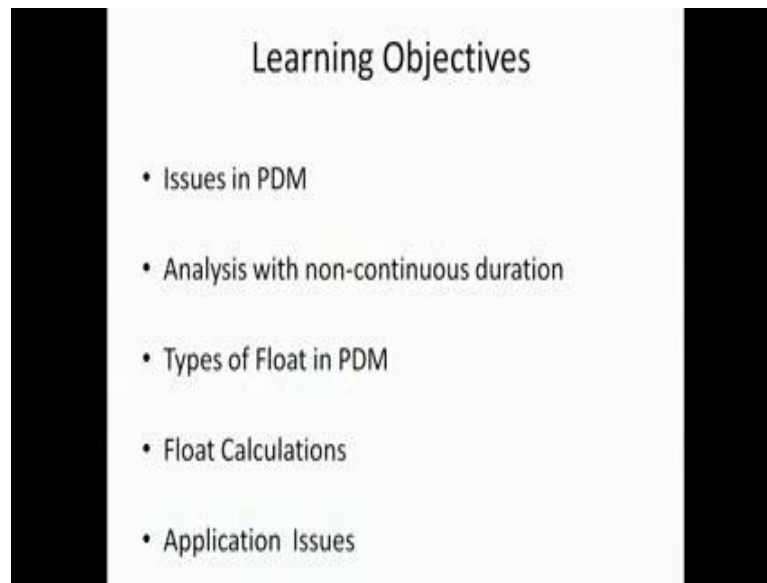
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Lecture - 43

**Issues in PDM, Negative Lags, Problem #2 Solution**

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Welcome to this second lecture on precedence diagramming method. And in this session we are going to cover the following topics, we are going to in a discuss a few of the issues with precedence diagramming method, will talk about analysis with non continuous duration, and you will see that from our earlier lecture where we have it try to keep the duration continuous there will be a difference in this approach when we use it and its probably more realistic. We will also discuss floats in the precedence diagramming method, this is I mean in many, many books, the floats are shown as very similar to AON and AOA, but we will see that there are some other kinds of floats can defined to the PDM. Will talk about calculations the floats and then briefly will discuss application issues.

Most of the lecture will be on the concepts of PDM, I think when we get to applications is a lot to discuss, but the frame work of this course does not allow us the time for that, but you will certain get some flavors of it, which you can probably read and get to the details later.
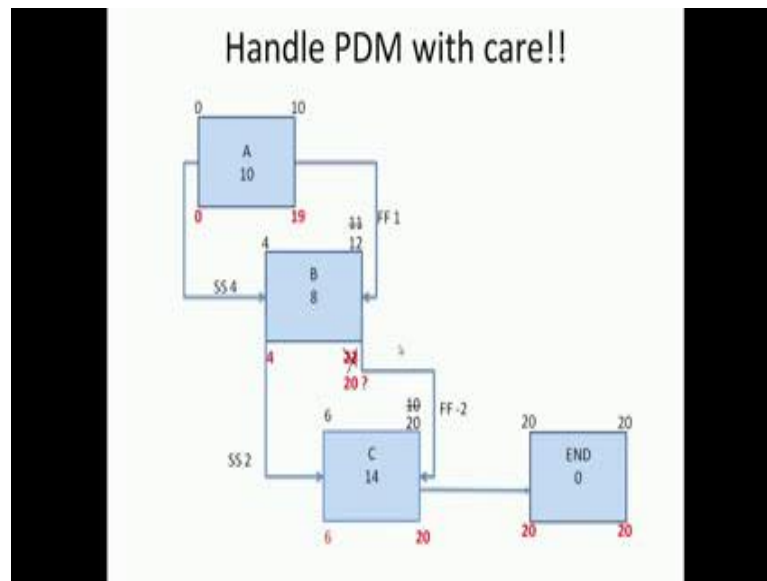
Now, one thing which we have to do is to be able to understand why we have to handle PDM with care. So, let me take this example we are seeing some of some examples like this before. So, basically I have 3 activities ABC and I have a end which is which is there and I have defined will different relationships. So, you can see A to B this is start start relationship and a finish finish relationship, with 4 with lag of 4 and lag of 1, and bc again this is start start finish relationship, but you will see the finish finish relationship has a negative 2. So, it is kind of a lag. So, this is something which we want to see how the analysis behaves when we put a negative value in the lag.

So, basically we are going to we are giving it basically a lead. So, if I am going to start with 0, as we have done earlier you will find that it goes from you know. So, I will start the early start for A is a 0, I go with the duration here and get a early finish of 10. And then now A leads on to B, because as a start start relationship with a lag of 4, if A starts at 4 - B would be base, A starts at 0 - B would start at 4, the early chart the earliest B can start is at 4 and now B has a duration of 8. So, one of the options is for B 2 the early finish could be 12 or if I come with the other relationship, there is a finish finish relationship from A. A early early finish is at 10, and if I use the finish finish relationship and come it should finish by 11. So, when I take between 11 and to 12, 12 is more constraining. So, I keep 12 as the early finish, and then move on to the next activity which is C. So, here again you have start start relationship of 2 between B and C. So, the 4 when I come down to C using the lag of 2 C the early start of C becomes 6, and going through the duration of C 14 the early finish of C becomes 20. Now using the finish

finish relationship, remember we ever at 12 we have, now we come with a finish finish of minus 2. So, it goes to 10 and based on this we should be able to take take the next step which is to look at how does this then go on to the end. Now we have a basic finish chart relationship at the end, and we see that this is gone on to this is gone on to 20, because we are taking the 20 from the early finish of A.

So, as we as goes to 20 and end is a is kind of dummy activity, so we end with 20 and this to care with the forward pass. Now as we get to the backward pass will see become back 20 20 that is ok, and then we come take the 20 back here and then with the with the late start of C we get 20 minus 14 in which is 6, that is also fine. So, this is the late finish of C and the late start of c. Now when we go to B, remember there is a lead negative lag, so we when we going here we actually land up with 22. So, as 20 goes to the finish of we will land of the 22, but do realize that we cannot do 22, because the project duration itself is 20. So, how do we handle this situation?

So, one probably commonsense way of going about the saying or this should not exceed project duration. So, I go ahead and put 20 as a project duration the maximum, it can be is a project duration, and continued down with the analysis. So, if I go when back here 6 minus the 2 here goes to 4 and 4 minus 4 0, and I proceed this way now I am able to get an inconsistency here. So, this kind of issues have been discussed quite of bit in PDM literature.

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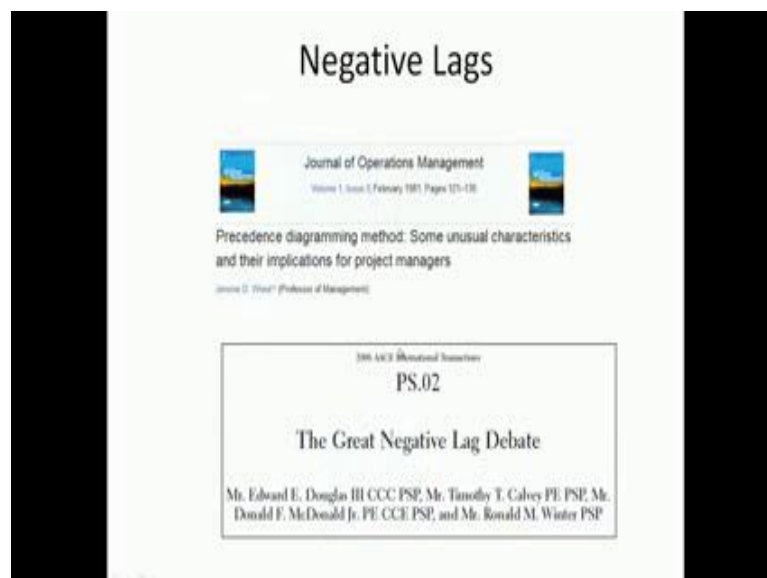
And this while business of negative lags has quite a lot of attention, and this is lot of

publications on this. So, you can see the first publication from journal operations researching precedence diagramming method some unusual characteristics and their implications high light these issues or the another publication here from AC, this is called the great negative lag debate. So, here the paper actually talks about how some practitioners actually like to use the negative lag, and are able to handled it properly. So, there is, so certainly the software that is available allows you to use to negative lag, but in basic analysis and for starting, it is really recommended that you do not use negative lags at all. And in fact, the question of you know how much of PDM should be used as a starting planning engineer is also, there is a lot of discussion going on that.
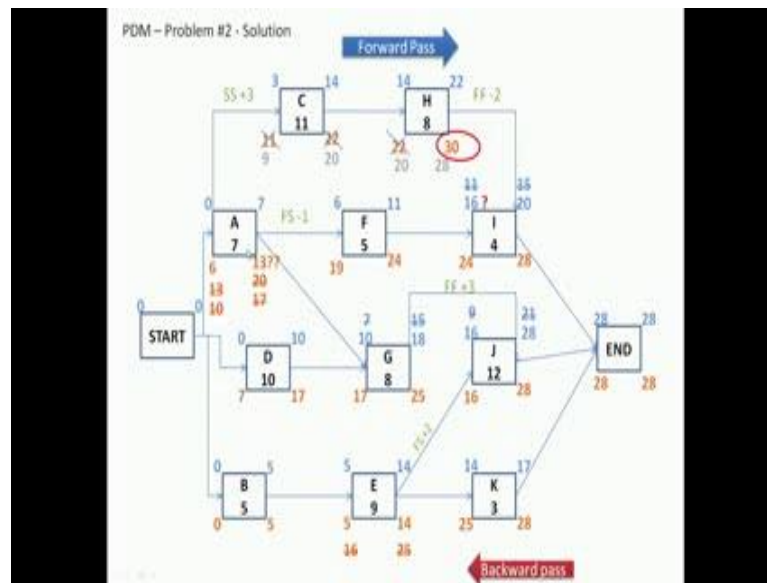
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Now, remember we had start have given this problem in the end of the last lecture, and if you notice there are 2 relationships here with negative lags, and if you had actually solved this, you know you would have we can actually tried to go through the processing of solving it, and see what the issue which come a par.

So, here we see this is the network and I have shown the different relationships. So, we have all the activities, we have the start start relationship here, the finish start, we have finish finish relationships here, finish start with plus 2, here is the finish finish with a negative lag and the finish start with the negative lag. So, as we do the forward pass on this, we get this is fairly standard, we would go with this, we would go to 0 to 7, then A goes from 0 to 7, B from 0 to 5. And then we go from C, because this because of the plus 3 the lag in plus 3 it goes to 3 is early start of C becomes 3 to 14, and d 0 to 10, I am going to go through this and I will stop where there are interesting issues that are happening.

So, here again we had 7, because it is a negative lag, it is early statistics and then plus duration gives 11. Here we have 2 options, we have the option from 10 and from 7 and we apply the early start which is the maximum early finish of predicates are rule, and we get 10, 8 and then we go to 18 here. And we go on with 14 22, and now we look here when we come here we have an issue that crops on. You know when we come from this direction we have a 11 and 4, we could get 15, we come from the other direction we go to 22, and it is a negative lag we go to 20 and we go back here 16. So, if I want to do this activity continuously I can I mean should I go from 16 to 20, because this is what is constraining me as per the late, as per the early finish rule from here from this relationship now.

So, this is an area which requires attention, and then as we go of through and this is assuming that I want to do it in 4 continuous days, how do I go about doing it. If I go in

to the next relationships. So, I have between 18 and 15, I have a plus 3. So, one option is to come with 18 and 21, the other option is to go for 16, and 12 28 and obviously the 26 and 28 is what is controlling this activity. Similarly we come out here 14 17. So, all my forward pass durations have been calculated and I get 28 as a project duration, and now I start the backward pass. So, as we go with the backward pass again my late finish my late start, late finish late start, late finish late start I go back. So, here I have you know this is early relationships or its 28 minus 3, that is coming to 25, and then back here. Here I have 2 options, that is one is 14, that is kind from 16 and 2 that will be 14 or 25, I go with the minimum here and so on as I go back most of these are fairly standard accept here now.

Again we are facing this problem where because I have a negative lag the late finish of H is a exceeding the project duration or 28. So, this is going to cause problem. So, if I go down this path, it is not going to take give me or proper value. So, I am going to actually again make, I mean say that is cannot exceed project duration, and take this path take this as 28 and use that as the limit and then go down ways on 28, 20, and then you know 28 minus 8 being 20 and then go down other backward pass.

Now as we come to A, again A has you have you have start start relationship with C, you have a finish start relationship with F, and you have finish start relationship with G, as you get values from here you will see that again the start away, you know is different from the finish of A: the finish of a might be controlled. So, if I start A on 6 and finish when should I finish A, I can finish A on 13, if I am do it is continuously. If I start a for example, on 13 it will delay the, it the late start away it will delay the late start of C which is not acceptable. So, I have to start on away for 6, and I have to finish by 13 better real do it really need to finish by 13, if I finish later than 13 what happens? Really you can see that none of these activities get affected. So, why am I constraining myself. So, this is the question that we need to see…