# CONSTRUCTION AND PROJECT MANAGEMENT

## Lecture 7

### Updating

Why at all should we update a project? A project is planned in paper, but everything does not go as per the plan as certain unforeseen circumstances crop up. So, we have to keep updating the project on a routine basis based on the status of the project. Updating is done to control the project. In project management, the major works are planning, scheduling, controlling and monitoring a project. This controlling and monitoring aspect of a project comes into picture only after continuously updating the network.

Controlling is necessary for every activity that is planned. Control involves comparing the actual achievement with the original plan at regular intervals and taking necessary corrective action to bring things back to schedule. For example, if a particular activity, x, was assumed to be completed in 20 days, on the 12th day today x minus some amount of work is pending. But, if you want to complete that work in 20 days as per schedule, the pending work should also be done within the remaining 8 days period. The reason for the delay, be it manpower shortage or material shortage, should be ascertained and this can be done by updating the project. When micro level projects are updated, you get to know the micro details of the project and planning can be done accordingly to ensure that the project duration is achieved as desired.

During implementation, it must be seen if the activities are as per schedule or ahead of schedule or behind schedule. In the case of those behind schedule and ahead of schedule, it should be matched with the schedule. The reasons for some activities lagging behind need to be studied and the activities must be provided with adequate support like resources, manpower, material, money, etc, to bring it back on schedule. Based on the progress of work and the revised durations of unfinished activities, the network diagram has to be redrawn and this process is known as updating. So, you have a project network done already and now it is being updated.

### Requirements for updating a project:

For updating a project network, the first and foremost thing needed is the base network, on which the whole project duration was arrived upon. Day 1 you might have come up with a schedule with preliminary inputs from the client or superiors and this particular schedule would have undergone a lot of revisions with each incoming detail and you must have arrived at a master schedule. For example, a project schedule has December 2015 as the completion date and as a planning engineer/planning manager you are being asked now in September 2015 to update the scheduling, which was done in, say, June 2013. The schedule was updated few times earlier and the master schedule will be called as the R0 schedule or the initial schedule. This R0 schedule

forms the baseline of your schedule as a new schedule will be formed based on it only. Then comes your original network calculation chart that is in the master schedule which will have a few considerations like days needed to do a particular activity with so much material and manpower.

Stage at which updating is to be done - If you are in September 2015 now, your project should be handed over in 3 - 4 months and hence, finishing works must have started as per the master schedule. But, the structural works are over and finishing works and external works are yet to start. This is the execution position of the project. There may be ‘n’ number of reasons for the delay in the schedule, but you need to track the project by comparing the old schedule, the original R0 schedule and the present acting schedule.

I need to understand new information and knowledge which will affect the duration of the activities to be performed. For instance, flooring activity is getting delayed as imported Italian marbles will take another 4 weeks to reach India. These 4 weeks cannot be crashed as that is the lead time vendors are asking for. As I cannot start the marble laying work for 4 weeks, instead I could possibly go ahead with fixing door frames, painting exterior areas, etc and we have to ascertain if the activities have any dependencies like cost, time, material or equipment to calculate the actual duration of the activity and thus achieve a new project completion date or maintain the same R0 schedule.

**Steps in Updating Process:**

There are various steps involved in the updating process. Firstly, data are required in the updating process. You have to describe the present status of the project, recording the activities that have happened till date.

Summarize - you need to summarize the activities that are completed, those that are in progress, those yet to be started and their inter dependencies and note it down.

Place - you need to place where your project stands now, like, for instance, the structure is complete and finishing work has to be started and what are the inter dependencies associated with it.

Perform- Perform is nothing but starting the updating process. Updating process is a continuous process that has to be done on a regular basis. There is a cycle of updating that is as follows:

First, you plan and reschedule the work based on the progress of work and the project’s present status. Subsequently, you issue directions to the team working in the site, before executing the project. Suppose you know that Italian marble will take 4 weeks to be delivered, you can give instructions to fix the door shutters and take care that the work does not disturb or damage the other work.

Then you record and assess the process. When you give out instructions, know the sequence of the work changes. As per the initial work schedule, flooring was to be done first, followed by door frame and shutter fixing. Now, as flooring work is getting delayed, you are asking your people to move door frame fixing to the initial stage, and then flooring. Your work sequence gets changed and the preceding and succeeding activities get interchanged. This needs to be recorded and the progress of work assessed. Since I have changed the sequence of work, does it affect the other works and does it have any dependency that needs to be studied. That progress should also be reported. After noting down the progress, compare with the old master schedule. There will not be necessarily one master schedule. Schedules are subject to revisions and there might be R1 or even a R2 schedule. So, the last schedule needs to be compared. Considering the earlier example, where December 2015 is the handing over date as per the master schedule and the date is revised to April 2016 as finishing works are yet to be taken up, the new schedule R1 supersedes the master schedule and R1 will be the latest schedule with which I need to compare the latest developments at site. After that, I again re-plan and reschedule depending upon the progress of work. This process is a continuous one, a cyclic process, and only when this process is completed, your project will be completed too. You need to keep on updating until and unless your project is completed so that you clearly understand the inter dependencies of each activity and the duration it's taking and where any activity requires attention.

Keep on updating – A project should be updated at regular intervals for monitoring and control purpose. It could be done on a monthly basis, bi-monthly basis, quarterly basis or even bi-weekly basis depending upon the project stage.

Change in project process – If, as in this example, the door frame fixing and flooring activities have been interchanged, there is a change in process and hence we need to update the project because this change would definitely have a duration implication. In the case of any design change or a major duration difference in completing an activity, the project has to be updated.

**Resource Management**

Resource management corresponds to time, manpower, material and money. Manpower and material are nothing, but your resources. We have already seen about time, i.e. crashing of an activity, critical activity, project determination and cost. Now, we will see about optimum cost and to what all areas I should do crashing to get optimum cost.

Resource management uses two techniques -- resource loading and resource leveling. Resource loading refers to the amount of individual resources an existing schedule requires during specific time periods, say 7 painters are required to complete external painting in 10 days time for a G + 4 storey building. A histogram, a vertical bar chart, is very helpful in determining staffing needs or identifying staffing problems. In the above mentioned example of 7 painters, details like how am I going to divide them in 10 days and what all days which painters should work at which place, needs to be plotted in a histogram. A resource histogram can also show when work is being over

allocated to a certain person or group. Over allocation means more resources than area available are assigned to perform work at a given time.

Resource loading has two variances -- allocation and aggregation. Allocation is nothing but allotting resources required to carry out an activity after finding out the number of resources required. So, if the nth activity requires 7 number of people, for nth activity I put 7 numbers, this is resource allocation. More than one type of resource may be necessary for a specific activity. For example, to carry out a repair work, I require 20 welders, 10 fitters, 15 labourers and 15 unskilled labourers. What kind of resources are to be employed is important because each resource comes with a cost and the duration of work, place of work, and whether it is going to be in shift all these should be planned when networking.

From the practical point of view, resource allocation does not have to follow a constant pattern. Some activities may initially require fewer resources, but may require more of the same resources during the later stages of the project, and vice versa. At this stage, the impact of any resource allocation decisions is not known and we cannot yet answer if allocating more number of resources for any particular activity will increase or decrease the duration of the project or if only for critical path activities, more resources would decrease the project duration or increase the cost, etc.

**Resource Aggregation:**

If the same resource allocation is plotted in a bar chart over a period of time, detailing the activities and respective resource allocation, it is called resource aggregation. Resource aggregation is simply the summation on a period by period basis of the resources required to complete all the activities based on the resource allocation carried out in the previous stage. The results are usually shown graphically as a histogram. Such aggregation may be done on an hourly, daily or weekly basis, depending on the time unit used to allocate resources. When you plot a bar chart, you don't have an early start and early finish time. The networking is like a confined network, where the inter dependencies are not identified, but if we do the same thing in CMP or PERT you can have an early start and early finish time. What if I start an activity on an early start time, but when we planned it, it was on a normal time? In that case, the resource will be required on the early date itself. You can see in this graph resource requirement at the early start. If we consider all activities to start early, the dark bold line will be the amount of resource I will be requiring over a period of time. If it is going to be late start, the dotted line is how it is going to be. On a critical path if I am going to consider all the activities, this is how it is going to be. However, when a network is used for planning, the resource aggregation procedure is not so simple or straightforward. As the network is not drawn to a time scale, there is no direct link between the network and the demand for resources, i.e. this aggregation or resource loading has a drawback. When we plot it against a time scale, we are not exactly getting to know the adequate number of resources, so we go in for resource leveling.

**RESOURCE LEVELING:**

Resource leveling is adopted when the demand is more and supply is less and this is how the situation mostly is. There is no an ideal situation where the supply and demand is matching or the supply is more and the demand is less. So, you need to try and match the supply and demand. Resource leveling is the process that ensures resource demand does not exceed resource availability and this type of management is what generally people follow.

There are two ways by which resource leveling can be done -- time limited resource considerations and resource limited resource considerations. Time limited is when you have fixed to complete the project at a particular time and how much ever resource you want you can put in. In this case, emphasis will be on completing the project within the specified time. This time will usually be determined by network analysis. Adjustments in the timing of any activity and the resource required at a given time must be undertaken within the float available. Obviously, there can be no adjustment of the activities which are on the critical path. So, critical path activity will be crashed.

In resource limited, resource is limited and time is not a constraint. With the given resources, you work on the project. This will definitely increase the project duration and the cost.

**RESOURCE SMOOTHING:**

Resource smoothing is a part of resource leveling. If there are 10 labourers on day 1, 7 on day 2 and 10 on day 3, resource leveling will try to match the demand daily with supply, but resource smoothing tries to maintain minimum work every day. It is not that you give 2 days work for some 5 people and rest them the other days, but you try to accommodate the resources on an everyday basis so that the payment you make to the resources is not wasted. In itself, resource smoothing is a process that, notwithstanding any constraints imposed during the leveling process, attempts to determine a resource requirement that is smooth and where peaks and troughs are eliminated. There is no peak requirement of labour or very low requirement of labour, everything is maintained at a medium level. For example, even if 7 units of a given resource are available at any time, utilizing 5 of these units each week is preferable to 4 one week, 7 the next, 2 the next and so on, so that your cost doesn't go up or your manpower do not run away. Resource smoothing is done only after resource leveling is done.