The 20 Laws of Project Success

Note: This white paper is from the upcoming book by Clint Padgett and Tom Clark **The Power of Project Success – Achieving Advantage Through Superior Project Performance.**

Law #9

"I don't know what effect this will have on our completion date"

Statement of Law

Project schedules should be network-based, and the critical path must always be known.

Case

OmniEnergy Enterprises (OEE) has signed an agreement to purchase Green Mountain Power Company. The closing date for the transaction has been set. Charlene Jackson, OEE's Senior Attorney, is the project manager for the execution of the purchase. Charlene is meeting with Tony Castilla, OEE's Executive Vice President concerning the status of the project.

Tony Castilla:

> *Charlene, I really like the way you are managing this acquisition as a project. This bar chart schedule you have created is clear and shows exactly where we are headed.*

Charlene Jackson:

> *Thanks. I produced the bar chart schedule with the Project Pilot software on our network. It's pretty easy. All you have to do is enter the start and completion dates for each activity, and it creates the bar chart. It has lots of formatting options.*

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Tony Castilla:

So how are we doing so far?

Charlene Jackson:

Pretty well overall. However, I just learned that we are going to be six days late finishing the due diligence on Green Mountain's ownership interest in that nuclear power plant in France.

Tony Castilla:

Is that going to delay the closing date?

Charlene Jackson:

I'm not sure yet. I know it will delay some of the remaining activities, but not all of them. I'll just have to think through the sequencing requirements among the activities again, adjust the activity start and finish dates, and figure out the impact of this delay on the closing date.

Tony Castilla:

Doesn't the software tool tell you the critical path for your project?

Charlene Jackson:

I think it can, but to be candid, I don't know how to do that. Heck, I'm not sure I even know what "critical path" means.

Questions

1. If Charlene is using a reasonably good project management software tool, why can't it determine automatically the impact of a delay in one activity on the completion date of the project?
2. What is the meaning of the term "critical path"?
3. Why should project managers always know the location of the critical path in their project?

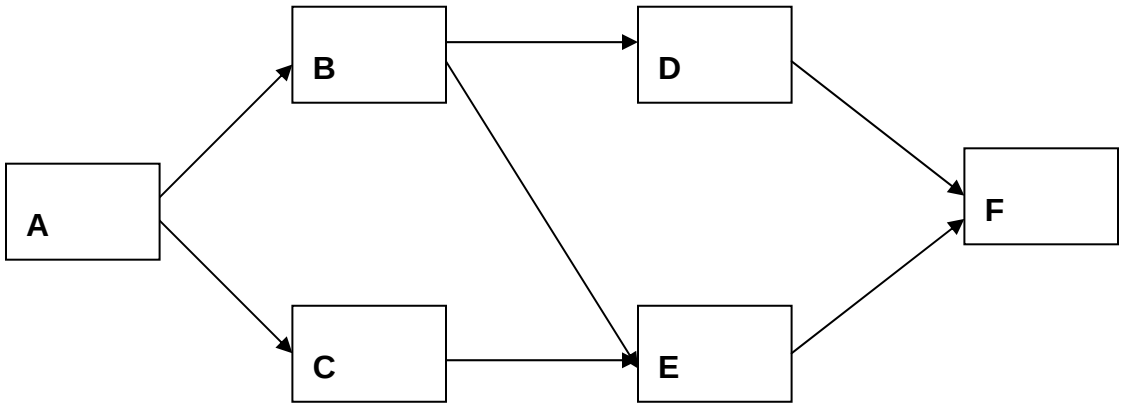
Discussion

Charlene is using one of the most common approaches to creating and publishing a project schedule. She entered each activity name (and hopefully the name of the team member responsible for managing the activity – see Law #8) into her project management software tool. Then she entered the start and finish dates for each activity, so that the tool was able to display/print the schedule in the form of a bar chart (or "Gantt chart"). In order to enter those dates, Charlene had to think through the sequencing requirements among the activities. However, she did not capture the sequencing requirements explicitly in her project database. So whenever there is a change to the schedule (such as the addition or deletion of an activity or an activity finishing earlier or later than its scheduled finish date), Charlene must re-analyze

the sequencing relationships among the activities to determine the overall impact of the change. Plus, she has to manually change all the activity start and finish dates that are affected. Such changes occur so frequently and the schedule revision process is so laborious, that the revisions often are not made, and the schedule eventually loses its credibility and usefulness. Another, less obvious problem with this approach is that it does not provide for the automatic identification of the critical path of the project, an important concept that is explained later in this chapter.

A far superior approach is to explicitly capture the sequencing relationships among the activities in the form of a project network diagram. Once developed and entered into the project management software, the network diagram allows the tool to automatically update the schedule when changes occur and to automatically identify the critical path.

In a project network diagram (illustrated below), each activity is represented by a box (or "node"). The arrows represent "precedence relationships" among the activities. Each arrow connects a "predecessor" activity to a "successor" activity. Before any activity can start, all of its predecessor activities must be finished. For example, Activity E cannot begin until both B and C are finished. [Note: The precedence relationships shown here are called "finish-to-start" relationships, because they connect the finish of the predecessor to the start of the successor. Other more complex types of precedence relationships exist, such as "start-to-start with a lag." But we strongly recommend using only finish-to-start relationships, even if that restriction requires breaking the activities into greater detail.]



The process of developing the network diagram involves a mental simulation of the project and is best performed by the team working together. (See Law #6 for ways to make the process as efficient as possible.) The process is powerful in terms of helping the team to identify activities that had been overlooked and to foresee/prevent problems.

Once the precedence relationships and the activity duration estimates (which will be discussed in the next two chapters) have been entered into the project management tool, the tool is able to perform several types of scheduling calculations. The "forward pass" calculations involve working through the network from start to finish calculating the earliest possible start and finish times for each activity. The calculation results for the example network are shown in the table below. The computer would give the results in actual calendar dates (rather than workday #s), and it would take into consideration non-working days as defined by the user.

ACTIVITY	Earliest Possible Start Time (Beginning of Workday #)	Earliest Possible Finish Time (End of Workday #)
A	1	8
B	9	13
C	9	11
D	14	20
E	14	23
F	24	25

Now if you needed to add an activity to the plan, you could simply insert that activity into the network by defining its predecessor(s) and successor(s). The software would immediately revise the calculations for the entire project. Similarly, if you need to change the estimated duration of an activity, or if an activity gets ahead of or behind schedule, the computer can quickly tell you the impact of the change on every activity in the project. Such changes typically occur frequently, and they come in bunches, as you execute a large project. The key to handling these changes quickly and easily is having a network-based schedule.

The other huge advantage of a network-based schedule is that it allows you to easily determine the critical path of the project. The critical path is the longest connected sequence of activities through the project in terms of total duration. In our example, there are only three paths, which are:

- A-B-D-F with a total duration of 22 working days
- A-B-E-F with a total duration of 25 working days
- A-C-E-F with a total duration of 23 working days

So A-B-E-F is the critical path. Since the critical path has the longest duration, it drives the duration of the project, which in this case is 25 working days. It is entirely possible, in fact it is not unusual, that a project could have more than one critical path; that is, more than one path with the same longest duration. Note that without a network diagram, it would not even be obvious how many paths the project has, much less which one is the critical path.

Why should a project manager always know the location(s) of the critical path(s) in their project? This information is important for two reasons. One of the reasons is planning oriented, and the other is control oriented. Actually, the two reasons are mirror images of each other, and they have to do with focusing attention on what really matters from a project duration perspective. Here are the reasons:

1. To compress the duration of the project, you must compress the durations of *all* critical paths.
2. Any schedule slippage along *any* critical path will delay project completion.

The critical path is a dynamic concept. The critical path(s) can change, both as you plan the project and as you execute/control the project. For example, you may compress the duration of the critical path so much that it is no longer the longest path, and some other path becomes critical. Or some non-critical path may fall so far behind schedule, that it becomes the longest path from the present to the end of the project. Again, a network-based schedule is the key to keeping track of the critical path.

Key Takeaways

1. Develop a network diagram as the structural framework of your project schedule.
2. Involve the project team, working cross functionally, in the development of the network diagram.
3. Use only finish-to-start precedence relationships, even if you have to break some activities down in greater detail.
4. Always know - and ensure that the team knows – the location(s) of the critical path(s) from the present to the end of your project.