Project Management – Transitioning from Critical Path to Critical Chain

JUNE 6, 201

So what is Critical Chain?

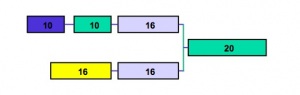
Is it just a re-branding of Critical Path?   No.

Critical Path is defined as the longest chain of activities in a project.  This, by definition, ignores any resource limitations.  It assumes that there are no resource issues within the project.

Critical Path was created in the 1950′s by the US Navy while developing the Polaris missile system – I assure you, when you’re the US Navy at the height of the cold-war, you can make the assumption that you have infinite resources.  Unfortunately, that is not true for most projects today.

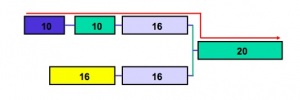
Critical Chain, however, is the longest chain of dependent events – considering both activity and resource dependencies.

For example, let’s look at the following simple project as an example:

[](http://alexrogoventures.files.wordpress.com/2011/06/ex-project-pic.jpg)

If you look at the project above, the lines represent activity dependencies, the colors represent resource types and the numbers represent durations.  So, we have everything we need to call this a project network.

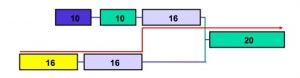
Under traditional critical path scheduling, what would the planned lead-time be for this project?  Well, first, we must identify the critical path.  So, in looking at the network above, what is the longest chain of activities in the project?

[](http://alexrogoventures.files.wordpress.com/2011/06/cp-pic.jpg)

As you can see from the red arrow above, the critical path goes from the first blue task (duration 10) through the top path and ends with the last green task (duration 20).  This is the longest chain of activities in this project.  So, from a traditional critical path standpoint, the lead-time (committed time) of this project should be 56 days (assuming the durations are in days).  So, in many conventional environments, the commitment will be a 56 day project lead time.

Now, the question, of course, is how realistic is the above schedule?  If we only have one “grey” resource, is the above schedule actually feasible?  In reality, the “grey” resource will likely have to multi-task (switch back and forth) between the two tasks requiring it – this will cause both tasks to take considerably longer.  In any case, given one “grey” resource, it is not possible to execute both tasks in parallel as modeled.

The critical chain approach to scheduling the above project takes into consideration ALL dependencies – activity as well as resource.  In order to identify the true longest chain of events (in order to determine a realistic lead-time), one must first deconflct any resource contention within the network (i.e. a situation where more than one task is shown happening at the same time utilizing the same resource but for which there is not sufficient resources capacity to execute concurrently.  In our example above, the critical chain approach would generate a project network (schedule) as follows:

[](http://alexrogoventures.files.wordpress.com/2011/06/cc-pic.jpg)

What is the difference between the critical chain schedule and the critical path schedule?  The critical chain schedule allows for the fact that the two “grey” tasks “duration 16″ cannot possibly occur in parallel given we have only one grey resource.  As such, prior to determining the true schedule (lead-time) of this project, the resource conflicts had to be de-conflicted.  Once the resource contention was handled, the critical chain could be identified.  The critical chain goes as follows:

Yellow 16 – Grey 16 (activity dependency)

Grey 16  - Grey 16 (resource dependency)

Grey 16 – Green 20 (activity dependency).

As you can see, a critical chain can jump from path to path depending upon the nature of the project network.  Now, in this particular case the critical chain schedule has a lead-time of 68 versus the critical path schedule of 56.

Two things about that:

1.  Assuming those duration times above were valid – the 68 day lead-time is at least feasible versus the un-feasible 56 day commitment; and

2.  As we’ll begin to go into in our next session, the duration times used in a critical chain environment tend to be significantly shorter than what is used in conventional planning – typically allowing significantly shorter (yet feasible) project lead-times.