Learning Objectives

Upon completion of this unit, students should be able to:

1. Explain the importance of schedule modification.
2. Identify various tools used to compress project schedules.
3. Describe how to implement crash cost evaluation for trade off analysis.
4. Discuss how various factors can impact a project throughout a project's duration.
5. Explain the use of crashing during a project.
6. Indicate the importance of fast tracking and the part it plays during schedule adjustments.
7. Interpret the impact of critical chain concepts.
8. Discuss the importance of multitasking within reason.

Written Lecture

We have discussed in great detail the importance of scheduling, but that schedule is not a set schedule. It is important to understand that the original schedule is just a starting point for the project and that there needs to be flexibility and adjustments as needed due to budget changes, costs differences, deadlines, and resources. There are many reasons, causes, and effects to changing the schedule. To prepare for these changes, project teams need to be able to address these as the need arises.

Schedule Modification: Product Development Example

Schedule modifications can take place in different forms.

1. Crashing is adding additional resources to a project in order to reduce the time frame for project tasks.
2. Fast tracking takes place when rescheduling sequentially related tasks, allowing for the project to be accelerated.
3. Another option is to delay some activities to reallocate resource expenditures. This happens when the project delays major cash outflows by taking advantage of available float and moving a task to a future time.
4. Reduce scope is when the team eliminates actions from the overall project to help speed up the project process. The expectation is to reduce scope without compromising the overall product; it is important to keep this in mind throughout the project and be aware of what is acceptable to cut and what is not.

Crashing Project Schedules

The project needs to be assessed to determine if it pays off to add the resources verses the shortened time frame. The payoff needs to be determined before the resources are to be added. Some project tasks require minimum adjustments,
while others may require more extensive consideration. To do this effectively, the team needs to know what additional resources are needed and the cost. Then, they need to decide “What is the absolute shortest amount of time in which the activity could be accomplished?” (Brown & Hyer, 2010, p. 251). This is considered to be fully crashed time.

It is also important to know how to calculate the person-months, which is number of people times the months of work. In addition, the crash cost per month will need to be determined, which will reflect the cost of adding the resources per month, to see if the total cost is beneficial. Refer to page 253 of the textbook for the formula to calculate the incremental crash cost. Below is a breakdown of its parts:

- **Normal time** is the time requirements under normal conditions.
- **Crash time** is the least amount of time in which a task is able to be completed.
- Normal cost is the cost of completing the task at its normal time.
- Crash cost is the cost of completing the task at its fully crashed time.

It is important to remember that crashing can be a benefit if the cost tradeoff is worth the time saving measure.

There are several cost accumulations that can occur over the time of a project’s duration such as salary and benefits of the projects team, salary and benefits for support teams, rent and utilities of the work space, equipment, incentives, late penalties, and possible lost profits if the project is delayed. These all need to be taken into consideration when determining the value of the project’s critical path and the value of crashing the project. Not doing so could cause a bigger loss if the team acts without full knowledge of the situation.

There is a procedure to follow when deciding to continue with the crashing process. Exhibit 8.7 is an example of the steps necessary to follow through with the crashing procedure. Exhibit 8.8 shows the crash cost calculations of the garage remodel discussed in the chapter—it highlights the importance of these numbers. Exhibits 8.9, 8.10, and 8.11 show how the previous chapter’s scheduling procedures come into play when we adjust the schedules. Exhibits 8.12 through 8.15 are great examples of these adjustments. Once these scheduling adjustments are explained, the project manager must evaluate and assess the options and determine which will best suit the project.

**Fast Tracking**

Fast tracking is scheduling two or more activities at the same time. It can work on its own or with other methods. Refer to Exhibit 8.16 for a visual reference. It can be useful for reducing project time; however, it is important to have a plan and an organized structure. Without planning and organization, it could result in increased cost, lack of productivity, and lost time.

**Modifying Schedules to Accommodate Resource Constraints**

Resources are also valuable to both crashing and fast tracking. When a schedule is first complete, usually the resources are overloaded; this means the schedule plans for an excess of resources, or overallocation. Underallocation is the uneven scheduling of resources. Exhibit 8.17 shows how the schedules are modified. Resource allocation concerns time and the resource availability. The project manager needs to know which of the two will be priority for the project.
Project managers will redistribute resources and float within the original time constraints. This is called *time-constraint resource smoothing*. This also follows a pattern by scheduling critical path activities and then scheduling noncritical activities. This can be difficult with large, in-depth projects. This is a time when software designed to schedule and implement the adjustments is useful. Refer to Exhibit 8.20 for more detail.

Critical chain concepts are the constraints that have the potential to slow down the project, or the actual "things" that do slow down or stop the project. It is important to be able to not only identify the constraint, but also know what the most productive way of dealing with it is. There are three main concepts in dealing with this:

1. The first concept is to give it priority. This means the product manager needs to be certain that the staff is optimal and that they have the resources, such as materials, to keep the task on its path.
2. The second concept is to have buffers prepared and ready to implement as needed. There are *feeding buffers* that float and are scheduled to meet noncritical activities with the critical chain. There are *resource buffers* that act as protection for the critical chain activities by using information and communication. Lastly, *project buffers* are time frames set up between the anticipation of actual completion and the date it is due to the customer.
3. The third concept is being aware of multitasking overload. Use good judgment when planning and assigning tasks so that maximum productivity can be accomplished. Also, be aware of the amount of multitasking so the focus remains on the overall goal.

The project leader or team leader helps the project team handle uncertainties and adjustments with greater ease by taking care to analyze, investigate, and monitor project schedules. This allows the project to keep track of the tools and concepts that are being considered and implemented to address, accommodate, and make adjustments as needed to the project schedule.

**Reference**