ARC 226 Construction Scheduling

Chapter 5 Introduction to CPM Scheduling

General

- CPM
  - Critical Path Method
- Advantages over bar charts or other methods
- Disadvantages

Development and Features

- Developed in the mid '50's
  - U.S. Navy missile project
  - DuPont/Rand joint venture to manage plant construction
  - Not exclusively a construction related method
- Shows the relationships between activities
  - Uses a flowchart or network diagram
- PERT- Project Evaluation and Review Technique
  - Gave the most likely time a weighted average

Network Diagrams

- Activity on arrow (AOA)
  - Used by the Navy
  - Not currently used much
- Activity on node (AON)
  - More common method
  - Easier to develop and understand
    - This is what the text will discuss
- Refer figure 5.1 for an example

Construction Logic

- Arrows represent relationships of logic
  - Arrow from one activity to the next, predecessor, successor
  - SS- # of days from the start of one activity to the start of the subsequent
  - FF- # of days from the finish of one activity to the finish of the subsequent activity
    - No FF or SS # means that the 2nd activity can start only after the first activity is finished
- The network key
  - ES, EF, LS, LF, Dur,
  - Float- "slack" for an activity
    - Amount of time the activity can be delayed and not delay the project as a whole

Critical Activities

- Figure 5.1- items with the bold arrow
  - Items with no float
    - ES and LS days are the same
    - If these activities are delayed, the project will be delayed
- If an activity is delayed, which subsequent activities need to be accelerated?
  - The schedule helps to concentrate resources in the right area
- 80/20 rule- 80% of your results will come from 20% of your tasks
  - Use the schedule to locate the 20% tasks and manage them carefully

CPM and Change Orders and Delays

- CPM helps to identify if a CO will or will not affect the completion date
  - The logic and calculations determine the effects of a proposed change or delay
  - The manager knows where to focus in order to get back on schedule
- Shows if a CO will use all available float

Setting Management Priorities

- Managers can prioritize their activities more accurately
  - Several activities requiring the same equipment, which activity will get the equipment first
    - Generally based on the amount of float for the activities
  - Helps to show material requirements
    - Focus on the critical activities
    - Include procurement activities in the schedule
  - Helps to manage the cash flows of the project

Simple or Complex Projects

- Initially CPM was used only on larger projects
  - Now applicable to any sized project
    - Software has become easier to use
- CPM is applicable to any type of project with multiple activities that follow one another

Easy to Follow Visually

- Gives a vision of the whole project from beginning to end
- Forces more detailed thinking than other methods
  - Relationships among activities must be considered
- If there are changes, it is easy to see how the rest of the project will be changed

Allows Analysis of Different Construction Methods

- CPM allows a manager to easily analyze different scenarios or sequencing for a project
  - Must be computer generated
  - Updating the schedule becomes more manageable
    - Effects of different crew sizes, additional equipment, overtime, etc.
- Are prospective changes worth the effort?
  - Can be answered with CPM

Documentation

- Documentation may be the most important task of the PM
- CPM helps with documentation and also can prove who is responsible for delays
  - CPM allows for analysis of who is responsible for delays
- A schedule may be a contractual requirement for some projects

CPM and Teamwork

- Everyone who looks at the logic diagram sees the same project goal
  - Each player can see his or her importance in the whole process
  - Facilitates input from subs
- Better time management allows for a better finished product
- Every team member knows exactly what to do and when to do it

Why is CPM not More Common?

- Often viewed as too difficult to learn
- Early on, the computer based aspect was a hindrance
  - Data was out of date by the time it was generated
  - Computer systems were not as user friendly as they are now
- Viewed as extra paperwork
  - Some managers can not see the benefits
  - Keep the updated schedule simple

CPM Disadvantages

- Can be complex
- Requires training and then usually applied use
- Requires input from all parties to generate a valid schedule
- Steep learning curve, but substantial benefits for learning

Review

- CPM can
  - Show construction logic
  - Identify critical activities
  - Determine the effects of change orders and delays
  - Allow management to set efficient priorities
  - Allow analysis of different sequencing
- Must be a team effort
  - The entire management team must learn and understand the basics
  - The schedule should be developed by everyone affected