Applied Software Project Management

Estimation

What is estimation?

- The project manager must set expectations about the time required to complete the software among the stakeholders, the team, and the organization's management.

- If those expectations are not realistic from the beginning of the project, the stakeholders will not trust the team or the project manager.

Elements of a Sound Estimate

- To generate a sound estimate, a project manager must have:
  - A work breakdown structure (WBS), or a list of tasks which, if completed, will produce the final product
  - An effort estimate for each task
  - A list of assumptions which were necessary for making the estimate
  - Consensus among the project team that the estimate is accurate

Assumptions Make Estimates More Accurate

- Team members make *assumptions* about the work to be done in order to deal with incomplete information
  - Any time an estimate must be based on a decision that has not yet been made, team members can assume the answer for the sake of the estimate
  - Assumptions must be written down so that if they prove to be incorrect and cause the estimate to be inaccurate, everyone understands what happened
  - Assumptions bring the team together very early on in the project so they can make progress on important decisions that will affect development

Wideband Delphi

- *Wideband Delphi* is a process that a team can use to generate an estimate
  - The project manager chooses an estimation team, and gains consensus among that team on the results
  - Wideband Delphi is a *repeatable* estimation process because it consists of a straightforward set of steps that can be performed the same way each time

The Wideband Delphi Process

- Step 1: Choose the team
  - The project manager selects the estimation team and a moderator. The team should consist of 3 to 7 project team members.
    - The moderator should be familiar with the Delphi process, but should not have a stake in the outcome of the session if possible.
    - If possible, the project manager should not be the moderator because he should ideally be part of the estimation team.

The Wideband Delphi Process

- Step 2: Kickoff Meeting
  - The project manager must make sure that each team member understands the Delphi process, has read the vision and scope document and any other documentation, and is familiar with the project background and needs.
  - The team brainstorms and writes down assumptions.
  - The team generates a WBS with 10-20 tasks.
  - The team agrees on a unit of estimation.

The Wideband Delphi Process

- Step 3: Individual Preparation
    - Each team member independently generates a set of preparation results.
    - For each task, the team member writes down an estimate for the effort required to complete the task, and any additional assumptions he needed to make in order to generate the estimate.
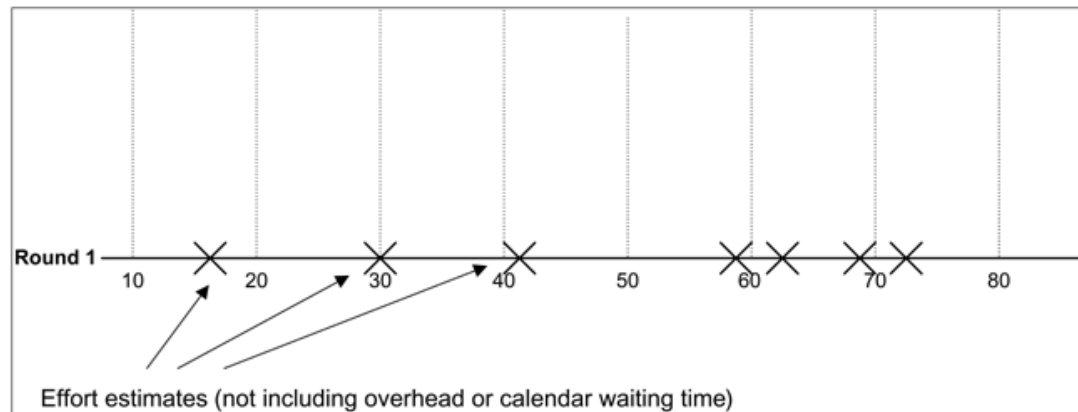
The Wideband Delphi Process

- Step 4: Estimation Session
  - During the estimation session, the team comes to a consensus on the effort required for each task in the WBS.
  - Each team member fills out an estimation form which contains his estimates.
  - The rest of the estimation session is divided into rounds during which each estimation team member revises her estimates based on a group discussion. Individual numbers are not dicsussed.
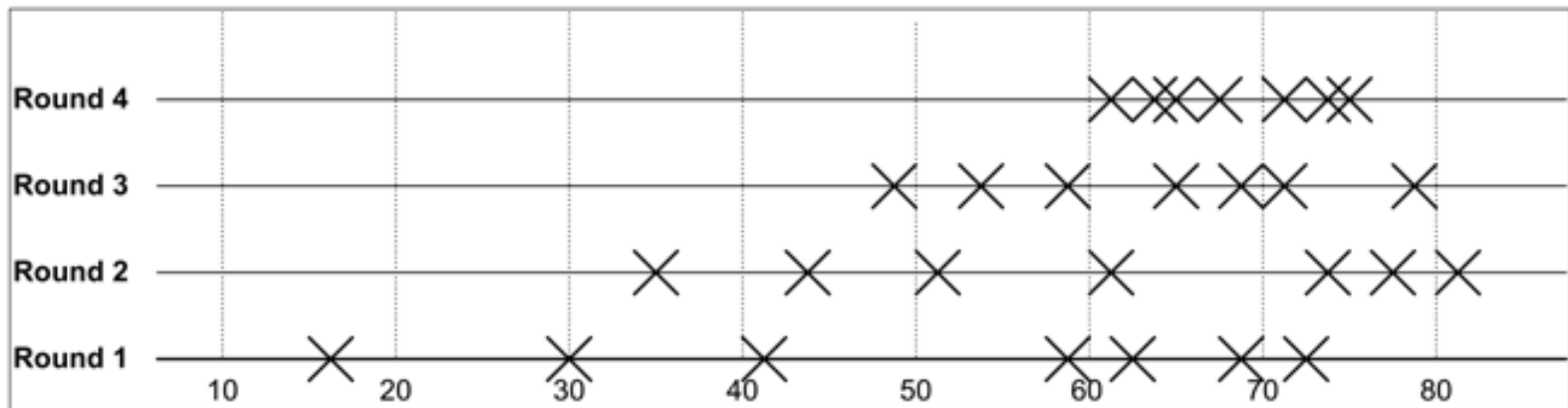
The Wideband Delphi Process

- Step 4: Estimation Session (continued)
  - The moderator collects the estimation forms and plots the sum of the effort from each form on a line:

Effort estimates (not including overhead or calendar waiting time)

The Wideband Delphi Process

- Step 4: Estimation Session (continued)
  - The team resolves any issues or disagreements that are brought up.
    - Individual estimate times are not discussed. These disagreements are usually about the tasks themselves. Disagreements are often resolved by adding assumptions.
  - The estimators all revise their individual estimates. The moderator updates the plot with the new total:

The Wideband Delphi Process

- Step 4: Estimation Session (continued):
  - The moderator leads the team through several rounds of estimates to gain consensus on the estimates. The estimation session continues until the estimates converge or the team is unwilling to revise estimates.

- Step 5: Assemble Tasks
  - The project manager works with the team to collect the estimates from the team members at the end of the meeting and compiles the final task list, estimates and assumptions.

- Step 6: Review Results
  - The project manager reviews the final task list with the estimation team.

Other Estimation Techniques

- PROBE, or Proxy Based Estimating
  - PROBE is based on the idea that if an engineer is building a component similar to one he built previously, then it will take about the same effort as it did in the past.
  - Individual engineers use a database to maintain a history of the effort they have put into their past projects.
  - A formula based on linear regression is used to calculate the estimate for each task from this history.
- COCOMO II
  - In Constructive Cost Model, or COCOMO, projects are summarized using a set of variables that must be provided as input for a model that is based on the results of a large number of projects across the industry.
  - The output of the model is a set of size and effort estimates that can be developed into a project schedule.

Other Estimation Techniques

- The Planning Game
  - The Planning Game is the software project planning method from Extreme Programming (XP), a lightweight development methodology developed by Kent Beck in the 1990s at Chrysler.
  - It is a full planning process that combines estimation with identifying the scope of the project and the tasks required to complete the software.
  - The Planning Game is highly iterative. The scope is established by having Development and Business work together to interactively write "user stories" written on index cards to describe the scope. Each story is given an estimate of 1, 2 or 3 weeks. This process is repeated continuously throughout the project.