

COST ESTIMATING

Project underestimation of resources and costs is one of the most common contributors to project failure. As such, project managers should be knowledgeable of and consider the various industry techniques and tools in the definition and execution of project cost estimation. As defined by the *Project Management Body of Knowledge (PMBOK)*, cost estimation is the iterative process of developing an approximation of the monetary resources needed to complete project activities. Project teams should estimate costs for all resources that will be charged to the project. This includes but is not limited to:

- Labor
- Materials
- Equipment
- Services
- Software
- Hardware
- Facilities
- Contingency Costs

The following list includes common tools and techniques used in project cost estimation:

- **Expert Judgment** – use of knowledge gained from past project management experience. Expert judgment, in conjunction with objective estimation techniques, provides valuable information about the organizational environment and information from prior comparable projects.
- **Analogous Estimating** – use of the metrics from a previous, similar project as the basis of estimation for the current project. Analogous estimating takes the actual cost of previous, similar projects as a baseline and then adjusts for known differences (such as size, complexity, scope, duration, etc.).
- **Parametric Estimating** – use of a statistical relationship between historical data and other variables (for example, lines of code in software development) to calculate an estimate for activity parameters, such as scope, cost, budget, and duration. Used correctly, this technique can produce high levels of accuracy.
- **Bottom-Up Estimating** – estimating all individual work packages/activities with the greatest level of detail, summarizing higher-level estimates with the combination of the individual estimates. The accuracy of bottom-up estimating is optimized when individual work packages/activities are defined in detail.
- **Three-Point Estimates** – use of three estimates to determine a range for an activity's cost: the best-case estimate, the most likely estimate, and the worst-case estimate.
- **Reserve Analysis** – determination of contingency reserves to account for cost uncertainty.
- **Project Management Estimating Software** – use of project management cost estimating software applications, computerized spreadsheets, simulation, and statistical tools. Such tools can allow for rapid consideration of multiple cost estimate alternatives.
- **Vendor Bid Analysis** – determination of what the project should cost based on a review of vendor bids/proposals. This technique may be used in conjunction with other cost estimation techniques to ensure that cost estimates are comprehensive.

Whereas the execution of appropriate cost estimation techniques certainly contributes to the accuracy of cost estimates, other project management knowledge areas also play an important role in cost estimation accuracy. For example:

- **Quality Management** – If team members do not agree clearly upon deliverable quality criteria early in the project, they may take longer to meet expectations, unnecessarily resulting in a schedule delay and corresponding cost overruns.
- **Communications Management** – If team members do not clearly understand their roles and responsibilities on the project, project work may take longer to complete, thus delaying the schedule and increasing costs.
- **Scope Management** – If requirements are ambiguous, team members may deliver products that do not meet expectations, resulting in unnecessary rework, schedule delays, and corresponding cost overruns.
- **Human Resource Management** – If team personnel do not possess the required skills or experience to perform project work, it may take them longer to complete the work, causing schedule delays and cost overruns.
- **Risk Management** – If team members do not proactively conduct risk management, cost-impacting issues that could have been prevented may emerge.
- **Procurement Management** – If procurements do not include terms and conditions that proactively mitigate State risk (such as fixed-price contracts and deliverable acceptance criteria), the project may experience increased costs later in the project due to changing project and market conditions.
- **Time Management** – If team members do not accurately estimate the time to perform activities, the project may experience schedule delays and cost overruns.

Thus, the execution of all *PMBOK* project management best practices impacts the accuracy of cost estimates. For more information regarding cost estimation, see *PMBOK*, fourth edition, section 7.1.