



WHITE PAPER

Understanding the Benefits of Cost-Based Estimation

Jeff Hisem + Nate Binder
Infotech
May 2022

Copyright © 2022, Info Tech, Inc., DBA Infotech. All rights reserved. This document or parts thereof may not be reproduced in any form without written permission of Info Tech, Inc. Produced in the United States of America.

An Introduction

Welcome to our exploration of the benefits of cost-based estimation. Throughout this whitepaper, we'll examine the cost-based estimation methodology, its associated benefits, how reliable estimates can be used with greater confidence when evaluating bids and how good bid analyses of projects bring us full circle to more informed estimating in the future. If you are an agency that is seeking to understand why your estimates don't line up with the bids you receive, or why your current estimation method may not be consistently reliable, this whitepaper is for you.

The Basics of Cost-Based Estimation Methodology

A good cost-based estimate reflects the ability of the estimator to understand how a project is being built and associate those costs of construction.

Cost-based estimation is one of many estimating methods used to assess the projected cost of work items in a construction project. What sets the cost-based estimation methodology apart is the depth of analysis of those work items. Rather than looking at the in-place cost for an item like asphalt concrete, cost-based estimation seeks to understand that cost by identifying all the elements that contribute to the cost of the work item, such as materials, labor, etc.

The Five Key Elements of a Cost-Based Estimate

| ELEMENT | SOURCE |
|--|---|
| Materials The cost of the item materials. | Material Suppliers |
| Labor The cost of the workforce needed to place the work item | Federal Wage Rates Union Contracts |
| Equipment The cost of the specialized equipment needed to place the work item. | Equipment Suppliers Equipment rental rates |
| Production The rate at which the item can be constructed (ex. tons/day) | Production guidelines from Means (and others) Information from Project Construction Engrs.. |
| Profit The estimated profit margin of the contractor. | Varies from item to item |

Gathering the above referenced resource data for cost based estimating can be daunting to begin with, but building this data becomes very valuable once it is in place. It doesn't have to take place all at once. The agency should consider identifying the items of work in projects which constitute the largest cost, and concentrate on building cost sheets for those items first. The "80/20 Rule" (80% of the project cost is generally in 20% of the items of work) is a good guideline to determine which items to cost estimate first.

Comparing Estimation Methodologies

| | COST-BASED ESTIMATION | BID-BASED ESTIMATION | AD HOC ESTIMATION |
|--------------------|---|--|--|
| Description | An estimation based on an analysis for all of the cost factors that go into an item of work. | An estimation based on an analysis of historical prices for a particular item of work . | An estimation based on the estimator's own industry experience and cost assessment. This could include price quotes from other sources |
| Pros | Assessing cost factors can produce a more accurate estimate and a deeper understanding of the construction process. | Using historical data can create consistency across estimates | Can be completed quickly for less involved items of work. |
| Cons | Requires a deeper understanding of the construction process. Takes time and effort to initially set up cost sheets and supporting data. | Historical data itself may be skewed by inaccurate pricing, unbalanced bidding, and complementary bids. does not provide the full picture. | Limited analysis could result in inaccuracies, not suited for complex work items. |

The Benefits of Cost-Based Estimation

At the core of it all, it is of utmost importance that the agency is awarding contracts at the most reasonable cost. To ensure this happens, the final engineer's estimate should be used as a benchmark of that reasonable expectation of cost. The estimate in and of itself is not the end of the process, but merely an all-important step in reaching the agency's goal. Using the estimate to validate the bid completes the process.

In order to assure bids are reasonable, the estimate should 1) reflect a good understanding of how the project is going to be built and 2) associate a reasonable cost to it. Cost-based estimating methods can illustrate how well the estimator understands the proposed work. This method examines all of the attributes of the work item and their cost to build an in-place cost. Most other methods do not dive as deeply to define those attributes that come together to build the cost.

We've discussed what goes into cost-based estimation and how it compares to some other popular estimation methodologies. Now let's dive even deeper into the "Why?" of it all – how is cost-based estimation going to help your organization?

A better understanding of how projects are built

Cost-based estimating requires a better understanding of actual construction work. The more you know about a project, the more reliable your estimate of cost is going to be. This method of estimating is the natural course for someone who understands a project thoroughly and holistically. That said, pursuing this estimation methodology will instill the estimator with new knowledge through the course of the process, and in turn, that knowledge will feed a more accurate estimate. As you gain understanding about the project process, you can avoid missing things in a contractor's bid that will increase the cost of the project to the agency down the line.

A better chance at estimation reliability

Cost based estimates are generally more reliable because attributes of a work item are specifically defined. As a result, estimators have a better understanding of the project. They will be able to better determine the true cost of an item. That estimate will stand up to bid prices and be more easily defended when contractors' bids are analyzed.

A better understanding of specific contractor pricing

Cost-based estimating by the agency is performed much like contractors as they are putting their bids together. This can lead to opportunities to have conversations with contractors about their own estimating practices. There are two time frames when it is reasonable to discuss costs with a contractor. The first occurs before a project is let to bid; the second is the analysis stage between bid opening and award. The former will be discussed now; the latter in a different section of this paper.

Consistency will lead to reliable Estimates

A consistent approach to all methods of estimating, including cost-based, leads to more reliable analysis of bids when projects are let. One of the challenges of the agency estimator is that they are preparing an estimate of cost for a project that is being bid by many different types of contractors, all with different business plans, different equipment, different personnel and different talents, etc. Because of this their bids are going to be different. And they should be. But it is still the job of the agency to assure they are getting the best value for the money they spend.

Informing Estimates through Contractor Discussions

In some cases it is reasonable to discuss cost estimating methods with contractors. Contractors are usually willing to talk about items of work that seem to have widespread differences between their bid and the agency estimate. These discussions can be very helpful to better define the specific work and to address assumptions that were not correct. In cases like this contractors may be willing to help the agency understand those work items better by talking about their work in general. What kind of crews do they put together? Is there any new equipment or new construction methods that have changed their approach to an item? Answers to these questions can ultimately reveal specifics about contractor pricing. This can give you a deeper understanding of specific contractor skill sets and how that might be reflected in their bids when it comes time for analysis

These discussions need to be somewhat one-sided. The idea is to glean information about how the contractor is putting his bid together. Meetings with them should not focus on specific items within a project but more about generically how cost sheets are put together. Sometimes if the agency reaches out separately to more than one contractor about certain items of work, they can get a more cohesive picture of the item and the pricing. The agency should not talk to more than one contractor at a time and under no circumstances discuss what other contractors have shared with you. Talking to contractors helps estimators understand their thought process when they put their bids together. In turn, this helps the estimator also understand how they are building their project and their specific expertise as they build that project.

The Importance of Using the Estimate to Evaluate bids

One of the most important parts of estimating is what you do with the estimate after it's completed.

The Official Estimate establishes a benchmark for the agency as a reasonable price for work to be performed. It's important to treat it as such once the bids are opened. A few things to consider:

Always compare the bid to the estimate, not the other way around.

The estimate is the agency's determination of reasonable costs. The analysis of the bids should be done on the item level. The reasons for that gap between bid and estimate are variable, but you must acknowledge that gap as a point of emphasis for your analysis before diving into discrepancies. As an experienced cost-based estimator, you'll find it increasingly easier to identify these discrepancies during the bid analysis stage and bring your concerns to the contractor. Much of estimating is not really about the total project cost, it's about the individual items of work and understanding how unit prices can be manipulated to take advantage of the estimate.

Identification of Unbalanced Bids

Unbalanced bidding occurs when the bid price for an item of work does not represent the true cost of performing the work. The price can be too high or too low depending on what they are attempting to accomplish with the “incorrect” price. Many times the unbalanced item results in other items of work also having their prices changed. There are many reasons for unbalanced bids; and unless it just happens to be an error in bidding, the unbalancing is intentional and performed to gain an advantage over other bidders and/or to maximize profits.

Identifying and exploring discrepancies is essential.

If the estimate is performed consistently and there are price discrepancies with the bid items, an analysis should be performed to determine why those discrepancies exist. If a cost-based estimate was performed on the item in question, it is much easier to analyze why the discrepancy exists.

Understanding risk and the reasons for discrepancies

It is important to remember that a discrepancy doesn't inherently mean there is something wrong with the bid. Discrepancies between the bid and the estimate can occur for a variety of reasons:

- + The contractor may be taking on more risk (or less) in another work item
- + There may have been a simple math or observational error in the estimate
- + The contractor and the agency have a different understanding of costs for a work item
- + The contractor has included an unreasonable profit margin or unbalanced their bid
- + A recent innovation or contracting method has affected the contractor's costs

Additionally, contractors have an exceptional understanding of how to mitigate risk in their bid, because taking on risk is their greatest opportunity for profit. As you analyze your bids, keep the contractor's own risk assessment in mind, as items that appear too high or too low may just be reflecting the contractor's confidence in their specific capabilities.

Starting the conversation with your contractors

All of the above information is critical when comparing the bid to the estimate. Sometimes it is difficult to determine why discrepancies exist between the bid and estimate. This is the second time the agency may consider talking to the contractor. Here are a few ways to involve your contractors in your estimation and estimate analysis process:

Offer discrepancy resolution

Many agencies offer contractors the opportunity to clarify discrepancies in their bid. Discrepancy resolution sessions can help align many of the differences between bid and estimate. Many times, these discrepancies are legitimate and can help the estimator understand the specifics of the project. It may be a case where the project site was misrepresented in the plans, or an innovative construction method is used, or materials were more expensive than normal, etc.

Speak to the process

Even more than before, these conversations should be fairly one-sided, with the contractor taking the lead on bringing up the items of work they think the state may be having problems with. A vast majority of the time, the contractor will indicate the problem areas without the agency saying a word. If they don't bring it up, just ask them to talk a little about item number "x", and let them explain how they are going to do the work. Allow them to explain to you why these items might be priced differently than one might expect.

Good Bid Analysis can lead to better Estimates down the road

As an agency goes about the business of analyzing and validating contractors bids for the purpose of award, a final benefit can be realized through the identification and resolution of price discrepancies. For those items that were cost-base estimated, the estimator may find valuable information from the contractor to gain better future knowledge to improve their cost sheets, and resource data about that item.

All of the items discussed above point to the idea of an agency being as well-informed as possible about the construction process for their program. Utilizing cost-based estimating methods, yet another valuable tool in the agency arsenal the agency will be better prepared to be a watchdog of limited resources in the face of increasing demands for the funds to maintain a safe efficient highway system.

Elevating Estimation with Data Analytics

Estimators must understand that they are also analysts.

It would be poor practice to put together a detailed cost-based estimate and then walk away from it. Estimators who want to improve their process have to do the work of comparing the bids to the estimate and verifying any differences they find. Of course, this is easier said than done.

An agency with a team of 7-8 estimators may sell anywhere from 5-50 projects in a single day. That means it's on someone to analyze, not just the cost of those projects, but the cost of the hundreds, even thousands of work items in every single project.

Consulting & Analysis

If your organization wants to pursue cost-based estimation but isn't sure where to start from an analysis aspect, Infotech can help. Our rich history of transportation data analysis dates back to 1977, when we first worked with the Florida Attorney General on a highway construction price-fixing case. In the decades that followed, we developed and refined an array of data services that leverage expertise and technology to produce actionable insights.

↓ The following services may assist in your cost-based estimation efforts:

Cost Index Service

Infotech's Cost Index Service helps organizations with their estimation, budgeting, and financial planning by analyzing historical cost and contract data in their construction management system. Organizations use the comprehensive Cost Index Report to identify major cost drivers in common construction types, estimate construction costs in their market, and adjust estimates and budgets to be accurate to market conditions.

The Cost Index Report informs:

- + Cost-based, and long-term estimates
- + Agency budgets
- + Collusion detection support

Market Analysis Service

This high-level analysis examines a specific contract work type to help an organization understand the level of competition in that area. This service helps determine if in-depth analysis is warranted and gain further understanding of the market analysis process.

Organizations that undergo market analysis benefit in the following areas:

- + Gaining a deeper knowledge of market drivers and conditions
- + Understanding if there is potential collusive activity in your state
- + Training employees in the fundamentals of market analysis



If you're interested in further conversation about your organization's data and how it impacts your estimation process, feel free to contact us at dataservices@infotechinc.com.