

## PARAMETRIC ESTIMATING



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Many state transportation agencies find it a challenge to accurately estimate future projects that have a long-range time horizon. Managing budgets with three, five, and even ten-year event horizons introduces many unknowns and uncertainties about project designs, prices, and engineering challenges. Developing a cost estimate that is truly representative of the final engineer's estimate, and ultimately the awarded project cost, may seem unreasonable. Yet creating more accurate estimates is not only a mandate of the FHWA, but an absolute necessity in a time of increasing budgetary restrictions. Agencies need the tools to accurately estimate, budget, and utilize all available capital resources to provide the public with the best possible transportation infrastructure.

### Background

The Iowa Department of Transportation needed to find a way to improve road and bridge estimating accuracy due to common overestimations on long-range project plans, thereby tying up large amounts of budgetary capital that could have been applied to additional projects. HDR, Inc., a consulting firm engaged by Iowa DOT to help solve this problem, conducted an extensive search of companies with various estimating technologies but were unable to find an off-the-shelf solution that would help Iowa DOT develop more accurate long-range cost estimates. Knowing that ExeVision excelled at transportation-specific project development solutions, HDR approached ExeVision to discuss a development partnership, working with the Iowa DOT to provide a Parametric Estimating Solution that would be precisely targeted for solving the long-range estimating challenge.

### A Breakthrough Solution

HDR and ExeVision have introduced *iPD Parametric Estimates™*, a breakthrough estimating technology that helps estimators develop more accurate long-range cost estimates. *iPD Parametric Estimates* uses a sophisticated combination of Parametric Estimating, Percentage of Project, and Composite Item Groupings to produce cost estimates starting with only the smallest amount of knowledge about a project design. Then, as the designers are able to refine their early designs, the cost estimates can likewise be refined and developed with increasing precision. Recognizing that long-range designs develop at different rates for different parts of the project, *Parametric Estimates* allows cost estimates to include all types of estimate items (Parametric, Percentage of Project, Composite Item, and Bid Items), allowing the estimator to take advantage of all of the detailed knowledge available.



Parametric Trend Analysis for Item Lookup

## Parametric Estimating

Parametric Estimating is a technique used to develop probable capital costs for a future project when very little information about the given project's scope is known. Through analysis of past projects that are similar in size, scope, and/or complexity, statistical models are developed to help generate reasonable price predictions based on a small number of parameters—sometimes even just one. The models are based on statistical analysis of historical cost records to determine key drivers of cost, and to identify those factors that are most likely to affect the cost outcome of any given project. iPD Parametric Estimates provides users access to this statistical analysis through an intuitive user interface and aids them in developing more accurate future cost estimates when compared to traditional average unit bid estimating strategies.

## The Process

A Parametric Item (e.g. bridge, roadway, etc.), may be added to an estimate when few specific details are known about the future project. For example, if a bridge is included on a 5-year plan but little is known about the composition of the deck, materials for the substructure or superstructure, approaches, piers, landscaping, etc., a fairly accurate estimate is still possible with the square footage of the deck as the only known variable. Additional supporting project categories (e.g. roadway approaches, landscaping, signage, etc.) are also identified and included as Percentage of Project categories and their item prices and category totals are automatically calculated based on the historical project data analysis, as a percentage of the total project cost.

iPD Parametric Estimates also supports Composite Grouping, a convenient way of adding categories of grouped items to an estimate that represent a specific component of the construction project, like left turn lanes or guardrail installations. By choosing a component group, the parametric estimating engine analyzes the items that make up that component group based on the parameters established for the project and work type, and makes adjustments to item pricing based on dynamically calculated regression equations.

These estimating items can be used with various levels of detail. As more knowledge is available about the project, the estimator can add more detail to Parametric items or Percent of Project items to improve estimation output confidence intervals at any project subcomponent level. For example, the engineer may want to estimate the cost of the piers of a bridge rather than the cost for the entire substructure, or the cost of paving shoulders rather than the entire paving cost, etc. The estimate works at the level of detail most appropriate to the level of knowledge available, which will be different for each broad category of the overall project. The sum of the Parametric items, the Percentage of Project groups, and the Composite Item groups, form the complete project estimate.

## From Long-Range to Engineer's Estimate

In estimating and budgeting, high-level Parametric Estimates are the starting point in a process that begins with long-range project estimating and concludes with an Engineer's Estimate used by most agencies as part of creating a contract package for bidding and letting. And ExeVision's parametric estimating technology can be added to ExeVision's *integrated Project Development* (iPDWeb) normal estimation process so there is no hand off from long-range parametric estimating to Engineer's Estimates on current projects—they are natural outputs from one continuous process flow.

Each of the three estimating areas (Parametric, Percentage of Project, and Composite Grouping), can be expanded to ever increasing levels of detail until reaching the actual bid item level. Because of the way parametric items are created and managed, the mathematical relationships between parametric and actual bid items are maintained throughout the process. As time passes and more information is available to the estimator, specific items can be added or deleted as needed. Additionally, while automatically calculated parametric prices should generally be used for accuracy, the estimator can override these values at any time during the process by simply selecting a check box.

## About ExeVision

ExeVision, Inc., is the developer of the iPDWeb solution, a comprehensive, project development system fully integrating all functional aspects of road and bridge construction from estimate creation and electronic bidding, through final contractor payment. ExeVision is also the creator of the iCXWeb application, designed to assist contractors in the creation and submission of bids and facilitate seamless bid communication between contractors and the agency. These two solutions provide substantial time and cost savings for state transportation agencies. ExeVision, headquartered in Utah, has been developing and deploying mission critical applications for over 20 years.

## About HDR

HDR's expertise spans more than a century and 10,000 employees in more than 225 locations around the world. Their engineering, architecture, environmental and construction services bring an impressive breadth of knowledge to every project. Finding innovative solutions has defined HDR's past and drives their future. They take a disciplined approach to cost estimating, which is one of the most important factors to meeting your budget goals and completing construction projects without surprises.

*For more information or a demonstration:*

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