Save 1000 Hours and Promote Cheaper Alternatives

By William J. Vitaliano, Systems Engineer
Harris Corporation

The use of parametric costing on a recent government proposal saved 1000 hours and helped promote the use of cheaper design alternatives. In the past, Harris had used the bottom-up and similar-to basis of estimate (BOE) approaches to determine program development costs. On a recent project, in response to the government's "cost as independent variable" (CAIV) initiative, the firm tried the parametric costing approach in conjunction with the BOE approach.

The firm used a commercial knowledge base consisting of extensive industry data to estimate the development and production cost of a new system. The knowledge bases saved research time and guesswork for the cost engineer and provided an opportunity to evaluate alternative approaches on a timelier basis. The development team concluded that the parametric costing approach provided a useful alternative to the bottoms-up and similar-to basis of estimate approach and could offer significant benefits in many future programs.

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Harris Corporation received an invitation to bid on a government project. A critical part of the proposal required developing an accurate development and production cost estimate. In the traditional process, such estimates were produced by breaking down the system into its individual components, both electrical and mechanical. The electrical hardware components, which typically constitute the bulk of the cost for Harris' projects, were analyzed down to the level of the individual printed circuit board (PCB).

At this point, cost engineers searched through previous programs to find similar boards that had been produced in the past. Once something was identified, the engineer created an estimate like, "The PCB used in the earlier project took 500 hours to design. The one in the current project will be a little easier. Let's estimate the cost at 425 hours." Because this process was used frequently, many government contractors including Harris have people dedicated to collecting and organizing costing data from previous projects.

Cost as Independent Variable (CAIV) initiative

The customer requested a different approach for the study. The motivation was not in saving time during the proposal process, but rather reducing life cycle costs through the CAIV initiative. This initiative involved a two-fold process. The first was a planning activity establishing and adjusting program cost objectives through the use of cost-performance analyses and tradeoffs. The second component executed the program in a way to meet or reduce stated cost objectives.

Early in the acquisition process, the high leverage of CAIV-inspired cost/performance/ schedule tradeoffs shape the requirements and proposed design objectives. Later, the overall cost objectives were allocated to specific cost and system elements. The bottoms-up and similar-to basis of estimate approach weren't conducive to CAIV methods because it took too long to compare alternate design approaches from a cost standpoint. Therefore, the customer suggested a parametric costing approach should be used on the project in support of the standard approach.

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Harris Corporation engineers examined several different types of software packages using the parametric costing approach. All of these packages provided estimating software and knowledge bases built on extensive real-world data and expertise. The engineers selected SEER-H™ and SEER-SEM™ from Galorath

Incorporated (www.galorath.com), El Segundo, California, because they believed its interface was more intuitive and easier to use. The software package reduced the learning curve by avoiding the use of less-than-obvious adjustments to more clearly present the estimating objective. It also based the price of individual PCBs on its number of components rather than its weight, an approach that usually provides more realistic results.

The program was sensitive to the difference between mechanical and electrical elements and between labor and materials costs. It provided databases compiled from thousands of real-world projects to help make accurate estimates. Finally, it had many tools for users to assess risks, make trade-offs, perform sensitivity analyses, and create technology forecasts.

Developing the parametric model

The proposal team started by developing the systems architecture, including defining the input, processing steps, and output. Throughout the process, the cost engineer worked closely with the project team to develop a good understanding of the system at a high level. This was an essential part of the costing process because it helped the cost engineer fully comprehend the requirements of the system to assist in making tradeoffs that might be required from a cost standpoint as the project moves along.

During this period, the cost engineer also began constructing the parametric model by entering high-level systems data into the software package. As the proposal matured, the electrical systems engineers and software engineers diagrammed the system to the individual PCB level and the cost engineer began adding more detail.

The cost engineer used the tools to describe each

component, identify its quantity, material composition, and design and manufacturing processes involved. At this level, the SEER-H model began predicting recurring and nonrecurring development and manufacturing costs by identifying
similar components from its database.

While SEER-H was primarily designed to model the development process, it included manufacturing cost estimation capabilities that were sufficient for low production programs. If higher quantities were produced, then it would make sense to also develop a design for manufacturing type model such as Galorath's SEER-DFM™.

Comparing alternatives from cost standpoints

The proposal development process involved a continuing series of changes and tradeoffs. The cost engineer stayed involved with the project and continually updated the model to reflect the latest thinking of the design team. Using the parametric approach provided near-real-time feedback to the team on the effect of choosing various options on the development and manufacturing costs.

Using the conventional costing methodology approach, the lengthy period of time required to develop new cost estimates meant a considerable effort might be put into design approaches that would later be ruled out from a cost standpoint.

The cost engineer included program management office and higher level costs as a common factor that was automatically allocated to various elements of the project. This saved them from making what would otherwise be time-consuming calculations. The model also speeded the development of productivity curves estimating the rate at which manufacturing costs could be reduced during the lifecycle of the project. Whenever the design was changed, these curves were automatically updated based on previously entered assumptions, eliminating more manual calculations.

Substantial time savings

The parametric cost approach saved much time on the project. The software database was more comprehensive than the existing project library and the software automatically selected appropriate historical projects, eliminating the time previously spent searching through the library. Also, the software removed the need for the cost engineer to create and maintain a complicated spreadsheet. However, there was still a need to capture, analyze, and organize cost history data to calibrate and, if needed, to validate the model.

Finally, the program automatically generated a wide range of reports including all of those needed on the project. The team also used the parametric results to do engineering and management reviews of the cost data resulting in additional time-savings. Harris engineers estimated approximately 1000 hours of cost engineering support were saved using SEER™ tools.

Harris engineers involved in the project believed the quality of information provided by the parametric approach was better than the conventional method. The capability of the program to quickly evaluate the cost of alternate approaches saved time during the proposal process by providing information guiding engineers towards a cost-effective approach sooner.

The primary reason that the government encouraged the use of the parametric costing approach was its ability to consider cost from the earliest possible stage of the design process. Furthermore, based on the experience of the project, it worked.

As the first use of the parametric model approach at Harris, the team used the conventional estimating approach at the end of the project as a comparison, and the results matched closely, within seven percent. The parametric approach was an effective alternative that should be considered for larger projects with a high magnitude of nonrecurring development and manufacturing expenses.

For more information contact :

Galorath Incorporated
100 North Sepluveda Boulvard, Suite1801
El Segundo, California 90245 USA
Telephone +1 310.414.3222 Fax: +1 310.414.3220

Galorath International Ltd.
Peel House
Upper South View
Farnham Surrey GU9 7JN UK
Telephone +44 (0) 1252 724518 Fax +44 (0) 1252 891997

www.galorath.com info@galorath.com

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