Technical Approach: Production Cost Analysis

Herren Associates has been performing Production Cost Analysis on sole-source System Integrator production proposals since 1989. During this time, our consultants have developed an analytical framework to evaluate the material costs, labor hours, and other direct costs of the Combat Systems onboard Navy surface combatants. Herren Associates’ consultants use their Industrial Engineering backgrounds and Cost Analysis skills to provide a fair and reasonable evaluation of production proposals for our clients including PEO IWS, PEO SHIPS, and SPAWAR.

When a client submits a Request for Proposal (RFP) or Request for Quote (RFQ) from a sole-source supplier or System Integrator (SI), there is no competition for the work; therefore, no incentive for the supplier or SI to propose the best-value solution. In addition, most of these sole-source contracts are Firm Fixed Price, meaning the supplier or SI will increase profit if they propose more costs or hours than needed to perform the work. Herren Associates’ consultants use a variety of data points, from numerous sources, to determine the areas of the proposal where costs or hours might be overstated. Our approach uses the following four steps:

1. Proposal Evaluation Kick-off Meeting
2. Fact-finding Questions/Factory Tour
3. Independent Cost Estimate
   a. Material Analysis
   b. Labor Analysis
   c. Other Direct Costs
   d. Rates and Factors
4. Comparative Analysis and What-if Scenarios

Step 1: Hold a Proposal Evaluation Kick-off Meeting

To begin the evaluation process, an initial planning meeting with the Proposal Evaluation Team and Technical POCs is held. This meeting allows our consultants to gain an aggregate technical understanding of the system/architecture by reviewing the technical requirements of the RFP, the required quantities, the type of material, and the level of program maturity. These factors, along with the type of contract (e.g., CPFF, CPIF, or FFP), directly affect the approach that will be used to develop the “should-cost” recommendation. During this Kickoff Meeting, an evaluation strategy is developed that details the division of responsibilities, whether or not a site visit will be scheduled, and the evaluation due date.

Step 2: Compile Fact-Finding Questions and/or Schedule a Factory Tour

The next step in the process is for Herren Associates’ consultants to review the basis of estimates (BOEs) for each WBS element provided in the proposal and document any fact-finding questions related to inconsistencies or unclear estimating methods in the proposal. Questions tend to arise in the following areas:

- Readability and format of data
- Format of work breakdown structure (WBS)
- Inclusion of a consolidated bill of materials (CBOM)
- Inclusion of purchase order (PO) history
- Inclusion of any actual/historical labor hours
- Method of analysis on the basis of estimates (BOEs)
- Inclusion of enough information about “similar-to” programs

Herren Associates’ consultants typically visit the factory floor and meet directly with the SI cost estimators to provide a holistic assessment and evaluation of the costs and cost drivers.

Step 3: Perform an Independent Cost Estimate (ICE) or Independent Cost Assessment (ICA)

After fact-finding and a site visit, an independent cost estimate (ICE) or independent cost assessment (ICA) of the proposal is performed including an evaluation of the material, labor, other direct costs, and rates/factors.
Analysis of Production Material Costs
To develop the material “should-cost,” Herren Associates performs an analysis of the proposed material costs. This analysis starts with the consolidated bill of material (CBOM), sorted based on extended cost. Following the Pareto Principle and focusing on the top 20% of the parts, 80% of the material costs are evaluated. Each part that is included in the top 20% is evaluated using a Bid-to-Buy analysis, Price/Quantity parametric analysis, Cost Estimating Relationship (CER), and/or Make/Buy analysis. To account for variability, probabilistic distributions are used in place of point estimates, where applicable, for these parts. Parametric relationships and historic cost data ranges are used to develop expected cost distributions, if sufficient data exists. In the absence of such data, triangular distributions will be developed from Subject Matter Expert (SME) estimates, identifying the minimum, most likely (or point estimate), and maximum value. These distributions are then assessed through Monte Carlo simulation in order to predict a risk-adjusted cost estimate. The next factor to consider when evaluating material costs is the effect of inflation on the price of goods. The Producer Price Index (PPI) is used to estimate inflation based on the type of material and the year when the material will be procured. This is especially important when considering multi-year procurements.

Analysis of Labor Hours
Labor hours fall into three major categories: discrete, touch, and support labor hours. The type of analysis performed on these hours depends on the category and nature of the work. To develop the labor hour estimates, Herren Associates evaluates the period of performance (PoP) and historical actual hours for discrete hours, learning curves (e.g., Wright and Crawford models) and technical SME inputs for touch hours, and regression analysis and CERs for support hours. Additionally, if there is a production break or loss of learning, the Anderlohr Method and Retrograde Method will be used, respectively. These analyses use historical actual data, when available, along with SME inputs and parametric modeling to calculate the number of hours that should be included for the effort. The recommended hours by labor code are multiplied by the associated labor rate to reach the labor “should-cost” estimate.

Analysis of Other Direct Costs
Other direct costs (ODCs) are defined as costs not identified elsewhere in the proposal as direct labor, direct material, or indirect costs. In general ODCs are licensing and other IT fees, special tooling and test equipment, freight, and travel. Herren Associates’ analysis of ODCs is supported with vendor quotes, historical costs, or commercial prices.

Evaluate Applicable Rates and Factors
The rates and factors applied to each cost element vary by SI. For most SIs, the rates such as the direct labor rate, fringe, overhead, and G&A are verified by the Defense Contract Audit Agency (DCAA), located onsite at the contractor’s facility. Profit or fee is negotiable and is therefore evaluated by Herren Associates’ consultants for reasonableness using the Weighted Guidelines Method. These Weighted Guidelines take into consideration the degree of risk (technical and management/cost control), contract type, working capital investments, contract facilities capital cost of money (FCCM), and cost efficiency.
Step 4: Perform a Comparative Analysis

Herren Associates’ cost models incorporate elements that can be adjusted based on factors of uncertainty, risk, and variation, changing the resulting cost estimate. As part of performing the ICEs, a series of “what-if” scenarios are performed to achieve optimal outcomes as a function of cost, schedule, quantity, or technical requirements. The addition of Crystal Ball simulation allows our consultants to simulate different outcomes using 1,000 or more trials, leading to a dependable and realistic range for possible contract values.

To complement the ICE or ICA, market and industry analysis is conducted to provide broader context to the cost data and to validate any ongoing assumptions made in terms of the behavior of identified material or labor cost drivers. Events such as a strike in the production plant or a period of economic downturn could cause historical data and parametric relationships to have to be adjusted in order to accurately reflect future costs. Also, new developments in terms of service and technology offerings will be examined to identify any areas where new testing equipment, updated processes, or commercial technology insertion may decrease costs.

A proposal from an SI eventually results in a contract between the Government and the SI after some negotiation on price and scope. Using cost analysis techniques such as learning curves, inflation factors, and bid-to-buy ratios, Herren Associates provides an invaluable service to the Government. Since 2003, our consultants have recommended almost $690 million in savings for the Government, a 16.2% reduction on the proposals we have evaluated.