

***PRICE***<sup>®</sup>

***ICEAA 2019***

---

# The Beginning of the End of Traditional Analogous 'Bottom-up' Estimating

Presented by:  
Chris Price

Estimate with Confidence™

Presented at the 2019 ICEAA Professional Development & Training Workshop - [www.iceaonline.com](http://www.iceaonline.com)

© 2019 PRICE Systems, LLC. All Rights Reserved

# Predictive Power for Bid & Proposal

- Key Points of today's Presentation
- Traditional Bidding Challenges
- WTH is Parametric Bidding?
- Parametric Bidding Benefits & Challenges
- What's it take to get there
- The Methodology
  - Six Foundational Elements
  - Six Implementation Phases
  - The foundation Predictive Power
  - Harnessing your history
- Summary
- SLAP?



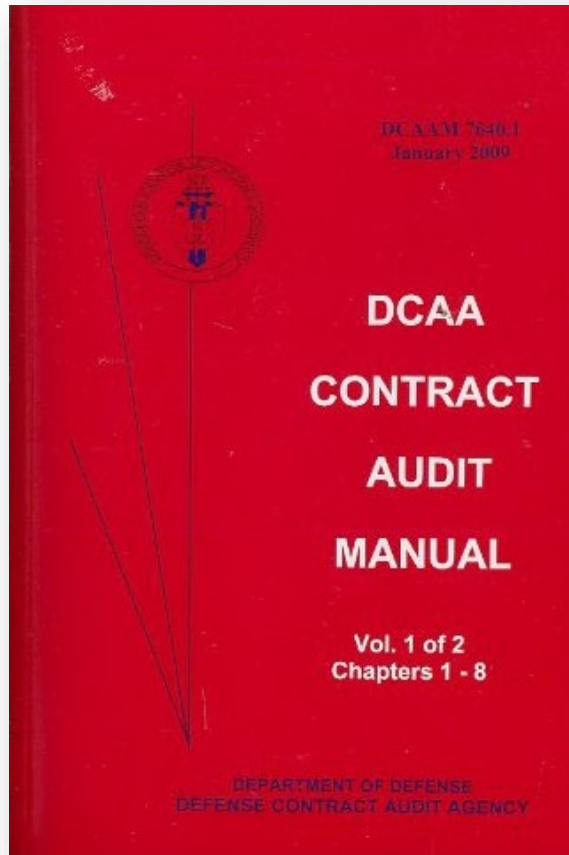
# Key Points

- The conventional Analogous ‘Bottom-up’ BOE estimating approach is time consuming and expensive
- Parametric Bidding promises to revolutionize the Bid and Proposal Process
- A well-constructed Parametric Bidding approach saves time and money, and promises to produce better, more consistent, accurate and repeatable estimates
- It is critical to base your effort on a proven implementation process that fully considers People, Process, Technology and Data.

# Challenges with traditional estimating

- **Cost estimation takes entirely too long and is expensive**
  - Usually ties-up valuable Engineering resources for weeks at a time
  - Results in volumes of data that take too long to review
  - Frequently not repeatable
  - Generally leads to more questions and rework
- **Project costing yields inconsistent results**
- **Knowledge is in the minds of a few; not a corporate asset.**
- **Failure to harness past performance to inform future estimates**
- **Disconnect between costing, pricing and scheduling**
- **No consistent “food label” to support executive decisions**
- **Spreadsheet quicksand – much time wasted and little governance**
- **Management confidence is not high or is waning.**

# B&P – Parametric Bidding Defined



## 9-1002.1 Definition of Parametric Cost Estimating

Parametric cost estimating ("parametrics") has been defined as a technique employing one or more cost estimating relationships (CERs) to estimate costs associated with the development, manufacture, or modification of an end item. CERs are a quantifiable correlation between certain system costs and other system variables, either of a cost or technical nature. CERs are said to represent the use of one or more independent variables to predict or estimate a dependent variable (cost).

## DCAA Contract Audit Manual

### Chapter 9 – Audit of Cost Estimates and Price Proposals (Dec 2017)

# Why Parametric Bidding?

- Parametric Bidding solves all of the issues mentioned previously:
  - Fast and Efficient: Automated process that requires much less resources
  - Repeatable results, based directly on historical data
  - Saves significant labor resources and lots of money

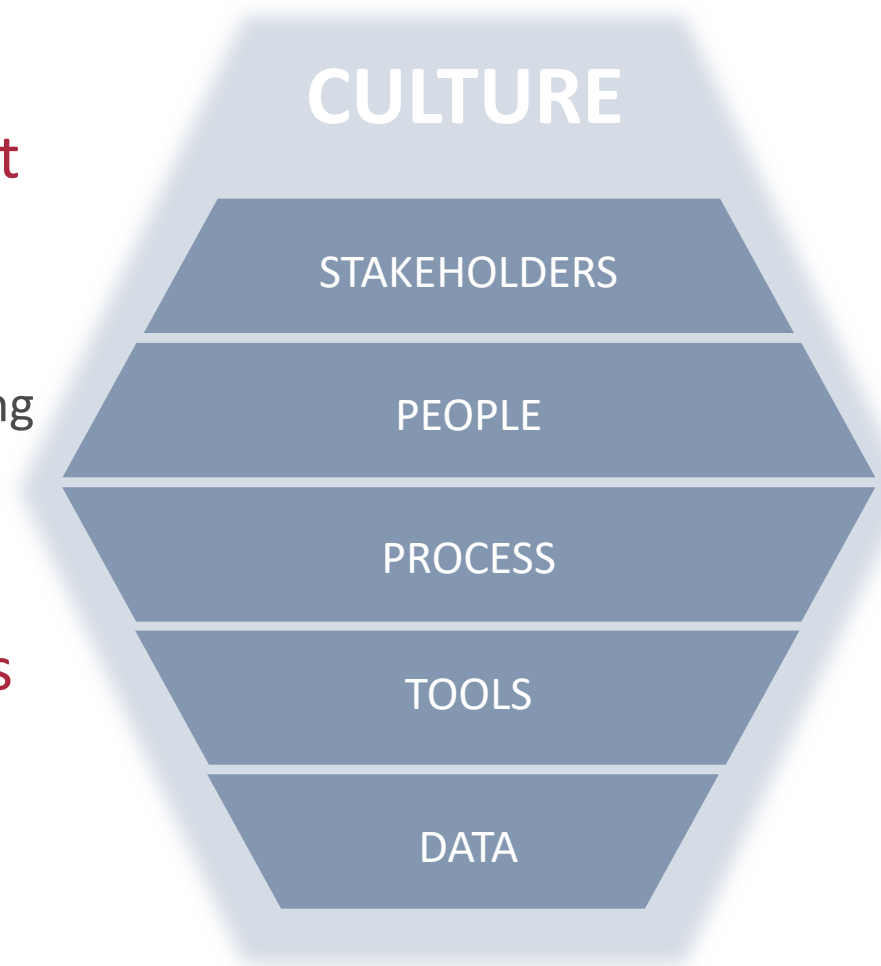
PRICE Cost Analytics - Investment Analysis		
SCENARIO - Bid Quantity & Win Rate Held Constant		
	Current Process	PRICE Cost Analytics BOE
Average Bid (Dollars)	16,544,785.28	16,544,785.28
Estimator cost per hour (Dollars)	\$ 175.00	\$ 175.00
Average hours consumed per bid	894.01	357.60
Total bids submitted each year	163.00	163.00
Win Rate (%)	64.18%	64.18%
<b>METRICS</b>		
Annual estimation effort (Hours)	\$ 145,724.00	58,289.60
Annual estimating costs	\$ 25,501,700.00	10,200,680.00
Average Cost per Bid	\$ 156,452.15	62,580.86
Total Revenue Bid	\$ 2,696,800,000.00	\$ 2,696,800,000.00
Total Revenue Won	\$ 1,730,768,000.00	\$ 1,730,768,000.00
Hours saved per bid	N/A	536.41
Cost savings per bid	N/A	\$ 93,871.29
Hours saved per year	N/A	87,434.83
Cost savings per year	N/A	\$ 15,301,095.25

**Typical Investment Analysis shows savings of 87,000 hours and \$15M per year**



# Parametric Bidding is Strategic

- Must address six key areas
- An organizational commitment for B&P cost estimation process improvement
  - A reasonable amount of NRE funding
- A disciplined, well executed Parametric Bidding Implementation Plan / Process



\* Partial credit for this slide is given to Mr. Dale Shermon and Mark Gilmour for their book entitled "Cost Engineering Health Check"

Presented at the 2019 ICEAA Professional Development & Training Workshop - [www.iceaaonline.com](http://www.iceaaonline.com)

# Key Elements of a Parametric Bidding Solution



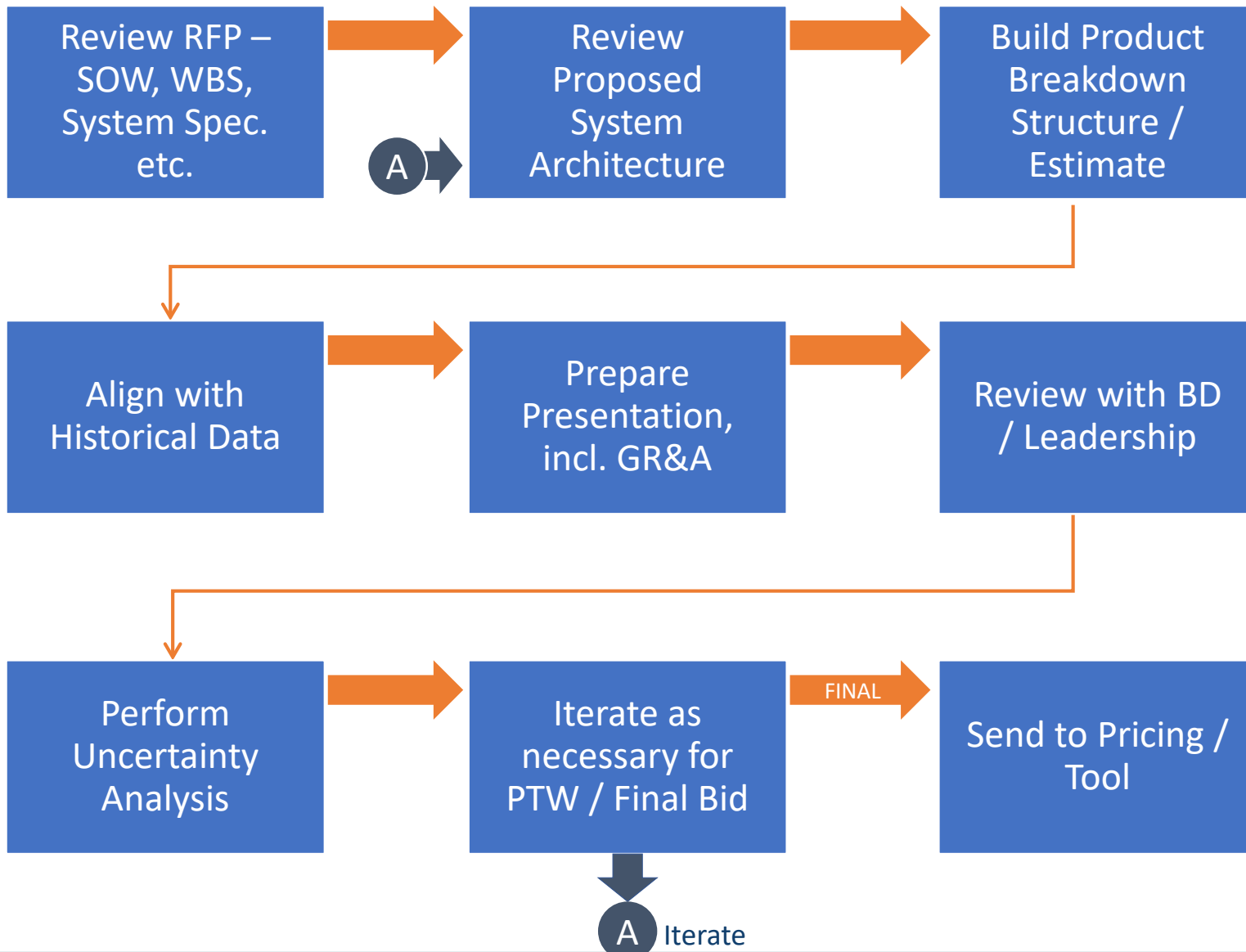
- **Culture.** A culture, starting with leadership, willing to think outside the box to achieve profitable success.
- **Stakeholders.** Leadership support is not an option. Funding and philosophy will need to come from stakeholders.
- **People.** Identify a core team to build the solution (internal and external). No belly button, no success.
- **Process.** A well defined Implementation Process supported by competent Solution Architects. (more on this later...)
- **Tools.** Credible, Predictive Power. Mature predictive analytic solution with a Basis-of-Estimate capability and integration capability to your existing pricing system.
- **Data.** Ability to align and trace estimates directly back to an organization's historical data and supplier quotes. Data-Driven.



# PRECISE Implementation Methodology

	Discovery	Design	Build	Test	Deliver	Maintain
PEOPLE	<ul style="list-style-type: none"> <li>Sponsor / Stakeholder</li> <li>Project Managers</li> <li>Key Players</li> <li>IT Support / Integration</li> <li>PRICE Consultants</li> </ul>	<ul style="list-style-type: none"> <li>Practice Director(s)</li> <li>Project Managers</li> <li>Key Players</li> <li>IT Support / Integration</li> <li>PRICE Consultants</li> <li>Strategic Coach</li> </ul>	<ul style="list-style-type: none"> <li>Project Managers</li> <li>IT Support / Integration</li> <li>PRICE Consultants</li> <li>Strategic Coach</li> </ul>	<ul style="list-style-type: none"> <li>Sponsor / Stakeholder</li> <li>Project Managers</li> <li>Business SME's</li> <li>IT Support / Integration</li> <li>PRICE Consultants</li> </ul>	<ul style="list-style-type: none"> <li>Project Managers</li> <li>All End Users</li> <li>IT Support / Integration</li> <li>PRICE Consultants</li> <li>PRICE Support</li> </ul>	<ul style="list-style-type: none"> <li>Sponsor / Stakeholder</li> <li>Project Managers</li> <li>PRICE Administrator</li> <li>PRICE Consultants</li> <li>PRICE Support</li> </ul>
PROCESS	<ul style="list-style-type: none"> <li>Business Requirements Definition by Practice</li> <li>Map Current Org Structure by Practice</li> <li>Map Current Processes</li> <li>Map Organizational Data</li> <li>Education/Support Programs</li> </ul>	<ul style="list-style-type: none"> <li>Future Process State</li> <li>Data Mining &amp; Analytics Strategy</li> <li>Organizational Impact Analysis</li> <li>Reporting Requirements</li> <li>Model Refresh Analysis &amp; Planning</li> </ul>	<ul style="list-style-type: none"> <li>Configure to design specifications</li> <li>Model Generation Process</li> <li>Validation</li> <li>Knowledge Transfer</li> </ul>	<ul style="list-style-type: none"> <li>Execute Test Plan Strategy</li> <li>Success Criteria Validation</li> <li>Go-Live Critical Issue Resolution</li> <li>Establish Standards/Best Practice</li> <li>Evaluate Production Readiness</li> </ul>	<ul style="list-style-type: none"> <li>TruePlanning User Training</li> <li>System Readiness</li> <li>Transition to PRICE Support Team</li> <li>Define and Train internal Support team</li> </ul>	<ul style="list-style-type: none"> <li>Setup Change Management Process</li> <li>PRICE Support team Quarterly Reviews</li> <li>Plan for required new releases/ Updates</li> </ul>
TECHNOLOGY	<ul style="list-style-type: none"> <li>Demonstrate baseline capability</li> <li>PRICE Cost Analytics Setup &amp; Configuration</li> <li>Define PCA Users</li> <li>Team training plan</li> <li>Define Installation Plan</li> </ul>	<ul style="list-style-type: none"> <li>Cost Realism Plan</li> <li>ConvergeOne Model Plan</li> <li>PCA Calibration Plan</li> <li>Integration Plan</li> <li>Mapping Plan</li> <li>Companion App Plan</li> <li>Model enhancements</li> <li>Education/Support Plan</li> </ul>	<ul style="list-style-type: none"> <li>Educate Pilot Team</li> <li>Test Output / Reporting</li> <li>Configure Design Specifications &amp; Test</li> <li>Build Mappings &amp; Test</li> <li>Configure Companion &amp; Test</li> </ul>	<ul style="list-style-type: none"> <li>Validate all procedures and results</li> <li>Full System Test</li> <li>UAT Validation /Issue Resolution</li> <li>Integration Test</li> <li>Production Readiness</li> </ul>	<ul style="list-style-type: none"> <li>Operation Support for new procedures</li> <li>Setup internal support team</li> <li>Maintain Best Practices</li> <li>PRICE Support</li> </ul>	<ul style="list-style-type: none"> <li>Review Outstanding Issues</li> <li>Review Stability Usability &amp; Adoption</li> <li>Review Integration Strategy</li> <li>Review Changes for Ongoing Value</li> </ul>
DATA	<ul style="list-style-type: none"> <li>Identify current state-of-data in organization</li> </ul>	<ul style="list-style-type: none"> <li>Data ETL Plan</li> <li>Integration with PCA Calibration Plan</li> <li>Data Integration Plan</li> <li>Data Companion App Plan</li> </ul>	<ul style="list-style-type: none"> <li>Execute extraction plan</li> <li>Execute transformation Plan</li> <li>Execute data load plan into estimating database</li> <li>Configure estimating database</li> </ul>	<ul style="list-style-type: none"> <li>Validate all procedures and results related to ETL</li> <li>ETL Full System Test</li> <li>ETL UAT Validation /Issue Resolution</li> <li>ETL Integration Test</li> <li>ETL Production Readiness</li> </ul>	<ul style="list-style-type: none"> <li>ETL Operation Support for new procedures</li> <li>Setup internal ETL support team</li> <li>Maintain ETL Best Practices</li> <li>PRICE ETL Support</li> </ul>	<ul style="list-style-type: none"> <li>Review Outstanding ETL Issues</li> <li>Review ETL Stability Usability &amp; Adoption</li> <li>Review ETL Integration Strategy</li> <li>Review ETL Changes for Ongoing Value</li> </ul>

# Example B&P Parametric Bidding Process



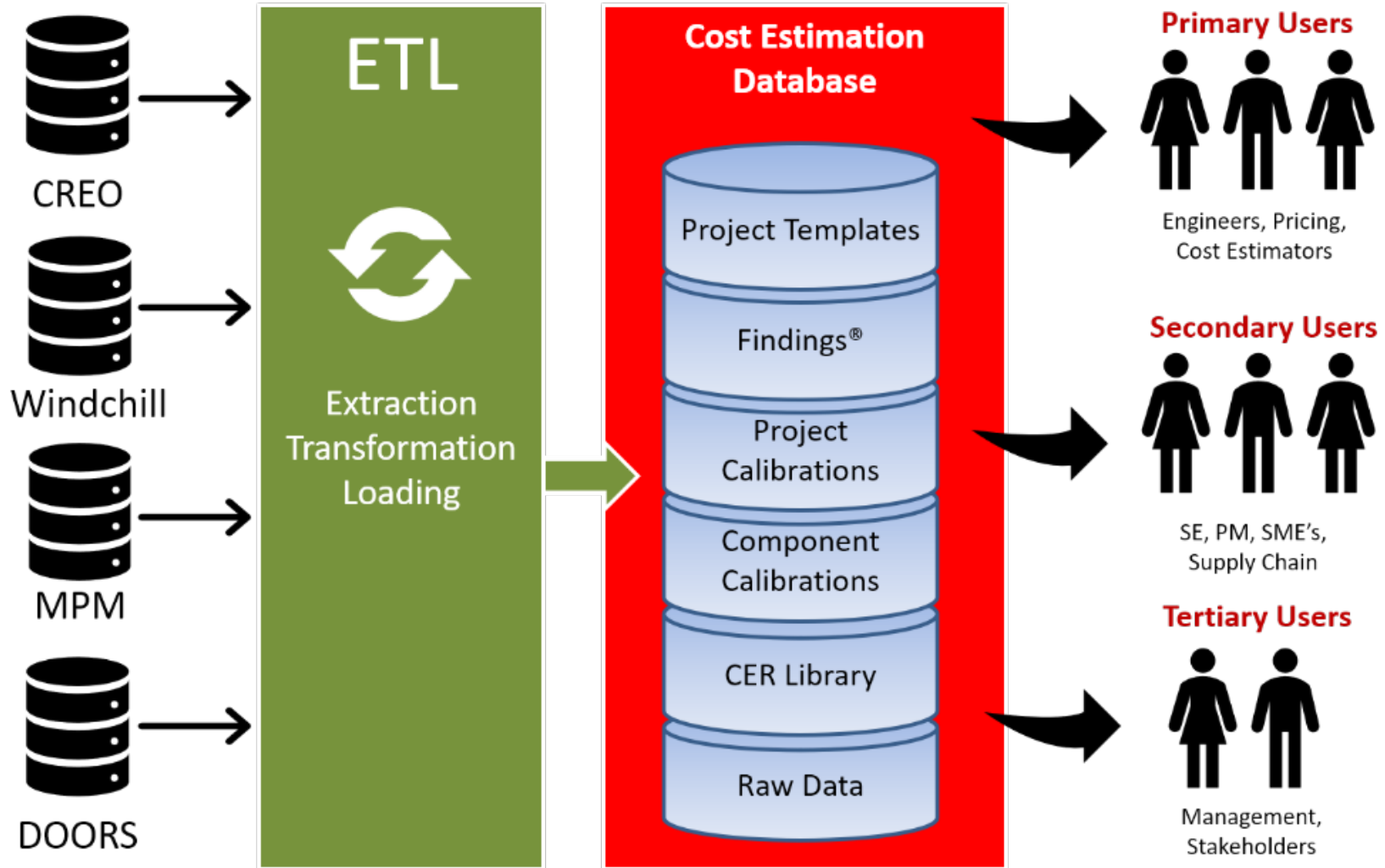
# More than Predictive Power...

- Early Program Phase Estimates based on Industry Historical Data
- Customizable Rates & Factors
  - Labor Rates
  - Overhead %
  - Overtime %
  - G&A %
  - Fee or Profit %
  - FCCOM %
- Customizable Escalation
- Integrated Uncertainty Analysis

# More than Predictive Power.

- Model Calibration
- Comprehensive documentation
  - GR&A Inputs and Replication of the Estimate
  - Attach Documents to support Inputs and Estimate
- Mapping to B&P WBS, OBS, etc.
- Data-driven custom CER's.
- “Ghost” the competition
- “Should Cost” subcontractors
- Affordability and Identification of target costs and cost drivers
- Integrated scheduling estimation

# Harnessing Corporate History



# Data Extraction, Transformation and Loading (E,T,L) Process



- Determine data requirements
- Determine sources of data – technical as well as financial
- Determine appropriate Extraction Methods – where and how to extract the data from the repositories in which it currently exists – past, present, and future, as appropriate
- Develop, test and deploy extraction methods
- Extract data
- Develop Transformation / Normalization requirements
- Develop, test, and deploy Transformation / Normalization Methods
- Loading of data into parametric cost estimation tool



# Parametric BOE

- BOE by CLIN
- Labor/Material/ODC\$ by Activity and Resource
- Key model driver including default and value, sensitivity analysis
- Effective CER = transparency
- Scatterplot of data points which comprise CER.
- *Actual Screen Captures of Word file.*

## BOE Report

CLIN	CLIN
CWBS Id	1.2.3
CWBS Desc	Reconnaissance Payload 1n (Specify)
CO Name	Gimbal
ActName	Development Engineering
Description	This activity includes all the engineering tasks necessary to develop new and/or modify existing hardware components. The sub-activities included in this activity include developing specifications, drawings used to manufacture prototypes and production items, design engineering, development engineering, normal bread-boarding, testing and documentation for prototypes and production use.

## Resources

Resource Name	Start Date	End Date	Labor Hrs	Material \$	ODC \$
Design Engineering	10/18/2016	8/18/2017	6,569	\$0	\$0
System Engineering	10/18/2016	8/18/2017	282	\$0	\$0
Support Engineering	10/18/2016	8/18/2017	3,574	\$0	\$0

## Inputs

Name	Manufacturing Complexity for Structure
Default	6
Value	6.3
Description	<p>The Manufacturing Complexity for Structure represents a technology index for the structural portion of the component being described. Manufacturing Complexity is a measure of the component's technology, it's producibility (material machining and assembly tolerances, machining difficulty, surface finish, etc.), and yield. Manufacturing Complexity is a major cost and schedule driver.</p> <p>The value for Manufacturing Complexity for Structure should be determined either through calibration using historical data from past projects or by taking advantage of one of the many tools in the product designed to help with this critical input. Values can be selected from the PRICE Reference table for Manufacturing Complexity for Structure; by using the Conceptual Complexity generator which uses top level descriptions of the components; or the Detailed Complexity Generator which allows for a detailed description of the many parts that comprise the component.</p> <p>The Equipment Type drop down input contains typical Manufacturing Complexity values for many equipment types and should be used for guidance in the absence of actual complexity data.</p>
Driver	
CER	<u>Power</u> : $y = 4,890.50 * (x^{3.77})$

# Conclusion

- Parametric Bidding promises to revolutionize the Bid and Proposal Process
- The conventional Analogous ‘Bottom-up’ BOE estimating approach is time consuming and expensive
- A well-constructed Parametric Bidding approach saves time and money, and promises to produce better, more repeatable estimates
- Based on a robust Implementation Process that fully considers People, Process, and Technology

# Predictive Power for Bid & Proposal



---

# Back-up

# Bid and Proposal (B&P) Defined

B&P costs, by definition, are the costs of preparing bids, proposals, and applications for potential activities such as federal and non-federal grants, contracts and other agreements. B&P costs include the development of scientific, cost, and other data needed to support such bids, proposals, and applications.

- 60 FR 43508; 08/21/1995 CFR: 48 CFR 31. Agency/Docket Number: FAR Case 93-18. RIN: 9000-AG58

# Comparison of Bottom-up and Parametric

## Bottom-up

- **Advantages**
  - Detailed estimate at lowest levels of the WBS/CES/PBS
  - Normally Auditable
  - Tasks and Parameters defined
- **Disadvantages**
  - Only useful after detailed design
  - Time Consuming
  - Relies heavily on SME/analogous program inputs
  - SME estimates/inputs not always reliable
  - Overly detailed
  - Potential oversight of some inputs/costs
  - Effort/material input/cost required to estimate cost come from:
    - Subject Matter Expert (SME) Opinion/Estimate
    - Labor Hours
    - Material Dollars
    - Program Phase (Color of Money/Appropriation Classification)
    - Analogous Program Actuals
    - Program Phase (Color of Money/Appropriation Classification)

## Parametric

- **Advantages**
  - Speed/Efficiency
  - Effectively used with little or much data
  - Does not require a detailed design
  - Useful from Conceptual Phase onwards
  - Model Algorithms based on industry historical actuals
  - Easier/quicker alternative analysis
- **Disadvantages**
  - Need trained estimator for models
  - Cost of parametric models
  - Need historical data
  - SME estimates/inputs not always reliable



# Discovery – Business Requirements Document

- First key step in the Parametric Bidding process implementation is Discovery
- Two key elements of Discovery are:
  - Multi-Day Discovery Workshop
    - *Focusing on details of the Current State of Cost Estimation, and the desired future state*
  - Preparation of a Business Requirements Document (BRD)
    - *Documenting the above, along with a prescriptive implementation plan / approach*



# PRECISE Implementation – Question Plan

## Discovery

## Key Questions

### PEOPLE

- Sponsor / Stakeholder
- Project Managers
- Facilitators (Six Sigma)
- Key Players
- IT Support / Integration
- PRICE Consultants

- What are the key goals / expectations of each sponsor / stakeholder. Who are they key facilitators /champions. ?
- What are the key challenges in sponsor / stakeholder areas?
- Are there gaps in the current estimating process? What risks do these gaps pose?
- For each stakeholder , who will be Responsible , Accountable, Informed, Consulted, Quality Review (RACI-Q)
- Is the estimating function be centralized in one location (e.g. Finance) or distributed between organizations.
- Can you provide the organization chart showing the relationships to the cost estimating function?
- What is the level of Supply Chain Procurement in the estimating process? What challenges do they have?
- What level of IT Support exists to deploy TruePlanning, what security is enforced by the IT Department, any barriers to integration?

### PROCESS

- Business Requirements Definition
- Map Current Org Structure
- Map Current Processes
- Map Organizational Data
- DCAA Engagement
- Education/Support Programs

- What are the short term goals /capabilities (2-3 months) that iGov wants to accomplish .For example “Should Cost”, “Independent Estimates”, “Vendor Cross Checks”
- What are the mid range goals/capabilities (6-12 months)? For example calibration and tailoring (rates /factors) of TruePlanning
- What are the longer term goals/capabilities (13-24 months)? For example, developing a fully DCAA certified Parametric Bidding System based on TruePlanning.
- What is iGov’s timeframe for the short / mid and long term goals? What is vitally important? When? What is of secondary importance? When?
- What type of cost estimating training is currently provided? What organizations are involved? Is training formalized?
- What is your current relationship with the local DCAA? Are there any compliance issues?
- Will your DCAA accept TruePlanning as Basis of Estimate? If not, what barriers exist.
- Do you have a current process map showing the complete estimating process from generation through Proposal submission?
- What is the ultimate “to be” state?
- What is the maturity of ongoing data collection of labor/material historical data? How /where is the historical data stored? What type of systems (e.g. SAP) is used to capture and store labor / material actuals.
- How are Vendor quotes stored? Do you maintain a database of Vendor Quotes vs. actual cost?
- For each iGov program do you maintain a database of physical parameters e.g., weight, size, technology type etc.

### TECHNOLOGY

- PRICE Cost Analytics Setup
- Define PCA Users
- Team training plan
- Define Installation Plan

- Please provide a list of both the key users (e.g. those who will perform the estimating).
- Please provide a list of secondary users (e.g. those who will do further analysis on a TruePlanning Project File. For example, engineers who want to run “what if” analysis.
- Please provide a list of tertiary users (e.g. those who are consumers of the outputs and may require specialized views). If so , what are the typical views/ reporting formats?
- At what level are your resources and activities? Can you provide a breakout? At what level would you require to see them in TruePlanning?
- Please provide a listing of your standard resource types and labor grade breakout. Are the specific resource type and labor grades associated with DCAA.
- Do you have external reporting requirement to report out at a standardized WorkBreakDown Structure or OrganizationalBreakDown Structure. Any other specialized reports (WBS/OBS) requirements from customers.
- Do you have standard tasks in your functional WBS?
- As part of your current estimating process, do you have any special estimating techniques or models?
- Do you have requirements for Classified processing or requirements to access Army network? Do you require virtualizing or client / server installs?

The PRECISE Implementation Methodology is a proven, repeatable, manageable and consistent implementation methodology which integrates a series of best practice processes, people and PRICE Cost Analytics. PRICE Cost Analytics is a prescriptive implementation of predictive cost analytics encompassing a suite of proven processes, automation software, and predictive models

# Challenges

- Thorough identification of all applicable information and data needed for a bid and proposal
- Timely gathering of appropriate and reliable information and data
- Verifiable information and data
- Reliability of Subject Matter Expert (SME) Inputs
- Repeatable results
- Standardized Tools and Processes
- Trained Cost Estimators / Managers / IPT Team Members