Data-Driven Estimating to Improve Bid Process

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The Current Environment

- Over the last 40 years, creating realistic cost estimates based on sound data and methodologies has proved an elusive goal.
  - As far back as 1972, the US GAO stated that cost estimates for specific systems were “frequently revisions of previously developed estimates and that accurate revisions of both the original and updated cost estimates required documentation showing data sources, assumptions, methods, and decisions basic to the estimates. “
  - This has led to estimates that were too optimistic, leading to costly over runs.
  - Early initiatives such as CAIV in the mid-1990’s have failed to contain over optimistic estimates.
    - Of the six original CAIV programs, half experienced a Nunn-McCurdy Cost Breach and none of the programs reviewed achieved a 50% savings as was originality envisioned.
  - Recent initiatives such as the Weapons System Reform Act of 2009 has placed more emphasis earlier attention on both requirements, cost and schedule.
  - US GAO Cost Estimating and Assessment Guide provides best practices to develop sound estimates and is ongoing.
Main Features of Credible Cost Estimating Systems

- Data-Driven Cost Estimating
  - Cost Estimates based on sound normalized/calibrated cost data, along with methods of collection
  - Historical data normalized, analyzed and correlated to find predictive trends.
- Emphasis on Cost Analytics
- Well Documented
  - Documentation ties estimates back to actual cost data
  - “Findings” stored with estimates
- Traceable to Requirements and Inputs
  - Cost Estimates traceable back to requirements with full audit trail.

Recent benchmark data highlights the need for greater investments in these areas
APMP Benchmark– Tools/Resources

Association of Proposal Management Professionals (APMP)

- 100% of those surveyed reported that “Historic cost databases” are important to success and that 87% reported the same for “Parametric cost estimating tools”

![Perceived Importance to Success Table]

Source: APMP Benchmarks in Price-to-Win and Competitive Analysis Capability. Howard Nutt
APMP Benchmark- Commonly Used Tools

Association of Proposal Management Professionals (APMP)

- 40% perceive PRICE model (TruePlanning®) as important for success while...
- 80% commonly perceive “Custom Excel spreadsheets” as important for success while another report says that 88% of spreadsheets have errors according to MarketWatch!

![Table showing perceived importance of various tools](http://www.marketwatch.com/story/88-of-spreadsheets-have-errors-2013-04-17?siteid=nwtpm)

Source: APMP Benchmarks in Price-to-Win and Competitive Analysis Capability. Howard Nutt
Sustaining Long Term Affordability

- Cost Estimating practitioners must have robust tools to:
  - Perform data analytics, create usable findings to drive parametric models.
  - Store results in easily searchable databases to use as estimate building blocks.
  - Fully store documentation along with estimates, key inputs fully traceable to data analyzed.
  - Closed loop, integrated with other tools across the life cycle from requirements to EVM.

Organizations that implement estimating systems with *data-driven characteristics* using *integrated, repeatable and standardized systems* produce credible estimate that win!
Everyday, a major decision depends on an estimate.
Best Practices of Knowledge Based Bid and Proposal Systems

- **Data Driven**
  - Standard, historical data capture and reuse including estimates and metrics, normalization, categorization, attributes, etc.

- **Data Analytics**
  - Ability to store and mine both historical data and performance parameters to develop correlation/trends and predictive CERs

- **Integrated**
  - Integration with all processes supporting estimating; will have a growing level of automation and integration: BoEs, PtW, Bid / No Bid, Estimate validation

- **Repeatable**
  - Estimating Systems Integration - Closed loop, repeatable process, maintaining persistent link between PBS and WBS

- **Standardized**
  - Integrated, consistent, standardized models and estimating framework
Estimating Systems that win must have proficiency in Data Driven Analysis linked to Auditable “Findings”
Integrated / Repeatable Results

- **Integrated**
  - Estimating system supports all business functions, able to send/receive data from a wide range of tools.

- **Repeatable**
  - Both creators and consumers of estimates can share all input parameters and get the same results. Fully auditable.

- **Cross-Walk**
  - Easy to link the Product Breakdown Structure (PBS) to WBS in a logical and persistent manner.

- **Confidence Levels**
  - Able to quickly perform sensitivity/risk analysis at any level and provide decision makers associated confidence levels.

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**Estimating Systems That Win are based on Integrated and Repeatable Results**
Standardized Framework

Comprehensive  
Can address opportunities ranging across the lifecycle.

Standardized  
Common “estimating language” well understood by Subject Matter Experts.

Consistent  
Results are repeatable and well documented.

Estimating Systems That Win are based on Closed Loop, Standardized Framework
Knowledge Based Estimation Systems Integration

1. **DATA CAPTURE**
   - Private or Public Data
   - Data dictionary
   - Data Quality Standard
   - Define Collection Cycle
   - Define Collection Scope
   - Selective automation
   - Supplier Training

2. **DATA MINING & ANALYSIS**
   - Determine Taxonomy
   - Build Database
   - Data Cleansing
   - Categorization
   - Normalization
   - Calibration
   - Selective automation

3. **KNOWLEDGE MANAGEMENT**
   - Historical data repository
   - Statistical tools
   - Perform Data Studies
   - Create Findings, metrics, CER’s
   - Inject historical perspective into cost models
   - Foundation for data-driven estimates

4. **PARAMETRIC MODELS**
   - Proven, reusable Parametric Models
   - Effort
   - Materials
   - Activity Duration
   - Metrics
   - Activity-based models
   - Integrated
   - Custom Model Development Platform

5. **ESTIMATION FRAMEWORK**
   - Estimate cost, schedule and risk
   - Estimate parts to programs
   - Comprehensive
   - Burdening
   - Escalation
   - Schedule
   - Risk
   - Systems & Integration level
   - Integrated with Common Tools
   - COM API

6. **ESTIMATE MAPPING**
   - Map your estimate into your customers’ preferred format, WBS, CES, OBS, etc.

7. **Bottom Up**
   - Estimate
   - Reconciliation

8. **Bid or Should Cost ESTIMATE**
   - (Cost, Schedule, Risk)

9. **DATA INTEGRATION**

Program Execution
   - (PLM, EVM, PPM, PM)
Bid Verification: Comparison of Parametric & Bottoms Up Methods

**Parametric Estimates**

- Top down
- Less detail
- Based on performance metrics
- Less labor intensive
- Quicker
- Ease of trade-offs analyses
- Parametric database
- Not always accepted
- “Black Magic” aura dispelled with data-driven
- Generally more disciplined
  - Standard methodology
  - Independent
  - Done by trained analysts
  - Captures totality of past programs

**Detailed Build-Up Estimates***

- Bottoms up
- More detail
- Based on time and material
- Labor intensive
- Time consuming
- Trade offs need details
- Performance standards
- Accepted method
- Generally understood
- More susceptible to distortions
  - Optimism/Pessimism
  - Special interest/buy-in
  - Done by managers/engineers
  - Missing
    - “I forgots”
    - Unknowns

*AKA “labor-material build up”, “grass roots”, “bottoms up” “engineering estimates”

Source: Joe Hamaker
Conclusion

- Consistent use of Knowledge Based Bid Verification/Validation methodologies avoids over optimism
  - Unbiased metrics from measured benchmarks
  - Provides consistent and credible link to Price-to-Win

- Persistent link between “as built” Product Breakdown Structure (PBS) and “reporting” Work Breakdown Structure (WBS)
  - Reveals missing or inconsistent estimates
  - Reconciles Data-Driven estimates with grassroots estimates
  - Mitigates Risk

  - Creates “buy-in” across the organization
  - Minimizes errors and omissions