HYBRID PARAMETRIC ESTIMATION FOR GREATER ACCURACY

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- Hybrid parametric estimation
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Abstract

• With hybrid parametric estimation, a high-level-object, or HLO, catalog is created based on historic data to represent estimation components at different levels of granularity. An HLO catalog based approach is in between traditional parametric estimation and estimation using implementation metrics (e.g., SLOC/FP) in terms of both precision and required level of application design work. With hybrid parametric estimation we apply the statistical analysis and modeling techniques used for parametric estimation, but we look specifically for functional outcomes as our independent variables.
William (MBA, CCEA, PMP, RMP, CISA, CRISC, IFPUG) is one of the world’s leading cost model development experts. He developed two commercial cost estimating tools, Cost Xpert and ExcelerTools. He has personally estimated over 500 information technology projects with a cumulative value over $7 Billion, including multiple states; 13 of the Fortune 100 companies; plus many Federal organizations. He has written 27 published books, over 100 articles, dealing with a variety of management and technology issues.

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Estimation Approaches

• Estimation approaches and applicability:
  – Catalog look-up.
  – Learning curve.
  – Analogy.
  – Parametric:
    • High level.
    • Parameterized catalog (High Level Objects, or HLOs).
  – Bottom-up.

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Estimating Lifecycle

- Client Engagement
- Assess
- Spec and Plan
- Execute and Build
- Test and Validate
- Deliver

- Level 1
  - ROM
  - Analogy
- Level 2
  - Impacted Components
- Level 3
  - Detailed Sizing
- As Built For Calibration & Benchmarking
Core Estimating Concept

- Define HLOs
- Define Adjusting Variables
- Define Productivity Curves
- Determine Cost Related Outputs
- Determine Non-Cost Outputs
- Determine Lifecycle Support Costs
(True) Parametric estimation

• Description.

• Uses, advantages, disadvantages:
  – Dimensions: Accurate; Comprehensive; Credible; Replicable and Auditable; Timely; Traceable.

• Development of Cost Estimating Relationships (CERs):
  – Identification of independent and dependent variables.
  – Collection and clean-up of historic data.
  – Correlation analysis to identify adjusting parameters.
  – Regression analysis to identify core equations (often power function).
  – ANOVA to help fine tune the model.

• Applicability to non-traditional modeling:
  – IT acquisition timeline.
  – Benefits from taxation modernization.
Hybrid parametric estimation

1. Decompose to HLOs
2. Adjust HLOs
3. Compute Adjusted Size
4. HLO Catalog
5. Environment Variables
6. Allocate Effort (Roles, Tasks, Business Requirements, etc.)
7. Use Equations to Compute Total Effort
8. Allocation Templates
9. Parametric Curves
10. Done
# Some HLO Catalogs

<table>
<thead>
<tr>
<th>SAP</th>
<th>Demo-Financial</th>
<th>IVR</th>
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<tbody>
<tr>
<td>Other or Unknown</td>
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<td>Admin Screen</td>
</tr>
<tr>
<td>Batch</td>
<td>Batch/Service</td>
<td>Call Initiation</td>
</tr>
<tr>
<td>Business Requirement</td>
<td>Business Requirement</td>
<td>Call Tree Option</td>
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<tr>
<td>Configuration</td>
<td>Configuration</td>
<td>Interface</td>
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<tr>
<td>Defect</td>
<td>Consulting-Configuration</td>
<td>Report</td>
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<td>Consulting-Other</td>
<td>Security Profile</td>
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<td>Interface</td>
<td>Consulting-Performance</td>
<td>Table</td>
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<td>Consulting-Security</td>
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<tr>
<td>Screen</td>
<td>Interface</td>
<td>Other IVR Work</td>
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<td>Workflow</td>
<td>Report</td>
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<td>Class-Control</td>
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<td>Logical Internal Tables</td>
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<tr>
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</table>
Hybrid parametric estimation

• Uses, advantages, disadvantages:
  – Dimensions: Accurate; Comprehensive; Credible; Replicable and Auditable; Timely; Traceable.

• May be used “out of the box” or configured:
  – Configuration advantages: Extend to new domains; improve accuracy; simplify use using preset variables.
For each model

Configure Environmental Variables

Obtain Stakeholder Buy-In

Determine Desired Outputs

Configure Standard

Configure Lifecycle

Configure Sizing Objects (HLOs)

Adjust Project Type If Needed

Validate Accuracy

Install and Train

Done

More Models?
Data collection and clean-up

- Org. Historic Data
- Cleanse Normalize Synthesize Consolidate
- Select and Filter
- Analyze
- Investigate and Validate
- Done

Industry Benchmark Data
Calibration

- Industry Benchmark Data
- Org. Historic Data
- Define Models
  - Model Noise
  - Calibration Errors
- Adjust Equations
  - Input Noise
- Collect Actuals

Precision
Accuracy
Under the covers

\[ SU_n = Q_n \times A_n \times HLO_n \times C_n \times W_n \]

Where

- \( Q \) = quantity
- \( A \) = Area adjustment
- \( HLO \) = HLO type multiple
- \( C \) = Complexity adjustment
- \( W \) = Work adjustment

\[ SU_t = \prod_{1}^{p} E_s \times \sum_{1}^{n} SU_n \]

Where

- \( E_s \) = Environmental param size adjustment

\[ Ph = \alpha_t \times \alpha_w \times \alpha_l \times \alpha_a \prod_{1}^{p} E_\alpha \times SU_t^{\beta_t} + \beta_w + \beta_l + \beta_a + \sum_1^{p} E_\beta \]

Where:

- \( Ph \) = Person hours of effort
- \( \alpha_t \) = Linear type multiple
- \( \alpha_w \) = Linear WBS multiple
- \( \alpha_l \) = Linear labor multiple
- \( \alpha_a \) = Linear artifact multiple
- \( E_\alpha \) = Environmental linear multiple
- And \( \beta \) is the non-linear component of the above
Demonstration

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Demonstration