Early COCOTS Workshop
Out-Brief

17 COCOMO/SCE Forum
October 2002
Workshop Attendees

- Chris Abts (Texas A&M)
- Ahmad Alswai (USC-CSE)
- Jesal Bhuta (USC-CSE)
- Linda Brooks (TRW)
- Brad Clark (Software-Metrics)
- Duane Eilers (IBM)
- Ronald Kohl (R.J. Kohl and associates)
- Ye Yang (USC-CSE)
Model Approach

• Model will estimate total life-cycle costs
• Lifecycle costs are estimated as a range of outputs, not a single point estimate
• Costs will be estimated at the system level, not at the level of individual components
• Cost will be aggregated across activities
Model Scope

Early COCOTS Estimated Lifecycle Phases

Investment Analysis

Inception

Elaboration

Construction

Transition

Investment

Analysis

Elaboration

Construction

Transition

Early COCOTS Usage
Workshop Focus

• Do we have a reasonable set of early-lifecycle cost drivers?
Effort Cost Driver Issue -1

• What is included in Total Cost of Ownership
  – Actual cost of the COTS products
  – Effort to build / integrate the COTS-Based system
  – Maintenance costs
Effort Cost Driver Issue -2

COTS-Solution Systems

COTS-Intensive Systems

Need to consider the range between the two endpoints in estimating cost

Vendor A
1. Commodity buy
2. Package solution
3. Multiple packages solution
4. Enterprise solution

Vendor B
1. Commodity buy
2. Package solution
3. Multiple packages solution
4. Enterprise solution

Application Architecture Interactions
Effort Cost Driver Issue -3

• Requirements Flexibility – Consensus of members is that it exists. However it is not a cost driver but a risk factor
  – You may not be able to convince the customer to tailor their process to suit of COTS products

• Data Conversion – very important and often overlooked
  – Great influence in real time systems.
  – Consider this driver with real-time versus business (application) interface.
Effort Cost Driver Issue -4

- Technical Architecture (aggregate several proposed cost drivers under this concept)
  - Operational Complexity: security levels, user profiles, user base complexity
  - Configuration Complexity: # of unique sites, # of software system configurations, # of platforms
  - Interface Complexity: # and type of interfacing new or legacy systems
    - Real-time interfaces
    - Application interfaces
Effort Cost Driver Issue -5

• Skill Mismatch
  – Recommend change driver name to BPR or changes in Operational Behavior
  – BPR depends upon the sort of COTS solution you plan to use.
  – It needs to be addressed, however, cannot be addressed accurately at this level
    • Recommend it needs to be considered but cannot be addressed by the model
  – Perhaps make this source of cost part of Operational Constraints
Size Cost Driver Issues -1

• Number of COTS Products
  – Intended to capture the cost of writing *glue code* to integrate pieces
  – Terminology: Products vs. Modules vs. Components
  – Proposed rating is a number of range bins:
    • Small: Single product
    • Medium: 2 – 5 products
    • Large: 6 – 20 products
    • Very Large: 21 – 50 products
    • Extra Large: Greater than 50 products
  – Recommendation: use the estimate number of products
    • Least – Most Likely – Most number of products
Size Cost Driver Issues -2

• Number of COTS-provided user functions
  – Intended to capture the cost of tailoring COTS products
  – Proposed rating is a number of range bins:
    • Small: Simple archive, cataloguing and access
    • Medium: Small business order processing
    • Large: Large business order processing
    • Very Large: Large business ERP
    • Extra Large: Nation-level critical services: air traffic, defense
  – Functions to be tailored
    • Percentage of fulfilled requirements
    • Percentage of functionality that has to be modified – Tailoring
    • Percentage of missing functionality – Custom dev.
  – Recommendation:
    Change ratings to a higher level of abstraction
Backup Slides

- Complete set of candidate cost drivers
  - Only a strawman set of drivers
## Size Drivers

<table>
<thead>
<tr>
<th>Driver</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Very Large</th>
<th>Extra Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Independent COTS Products</td>
<td>Single product</td>
<td>2 to 5 products</td>
<td>6 to 20 products</td>
<td>21 to 50 products</td>
<td>≥ 51 products</td>
</tr>
<tr>
<td>Number of COTS-provided user functions</td>
<td>Simple archive cataloguing and access</td>
<td>Small-business order processing</td>
<td>Large business order processing</td>
<td>Large business ERP</td>
<td>National-level critical services: air traffic, defense</td>
</tr>
<tr>
<td>Degree of Uncertainty about product choice</td>
<td>Clear choices</td>
<td>Manual ratings of key criteria</td>
<td>Simple exercise of 1 to 3 candidates</td>
<td>Thorough benchmarking, prototyping to access key criteria</td>
<td>Major evaluations of complex interoperability</td>
</tr>
<tr>
<td>Amount of newly developed software (equivalent SLOC)</td>
<td>&lt; 5 K</td>
<td>5 to 20 K</td>
<td>20 to 100 K</td>
<td>100 to 500 K</td>
<td>500 to 2,000 K</td>
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<tr>
<td>Multiplier</td>
<td>Very Low</td>
<td>Low</td>
<td>Nominal</td>
<td>High</td>
<td>Very High</td>
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<tr>
<td>Complexity of Integration</td>
<td>Simple Adaptations</td>
<td>Straightforward glue code</td>
<td>Some critical- issue glue-code engineering</td>
<td>Complex, coupled glue-code engineering</td>
<td>Very complex, highly coupled glue-code engineering</td>
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<tr>
<td>Required tailoring, BPR, training, data conversion</td>
<td>Minimal, straightforward</td>
<td>Modest, straightforward</td>
<td>A few workable complexities involved</td>
<td>Significant effort needed on key issues</td>
<td>Major organizational rework involved</td>
</tr>
<tr>
<td>Integrator difficulties with COTS products and integration</td>
<td>Highly capable and experienced</td>
<td>Capable and experienced</td>
<td>A few shortfalls in capability, experience</td>
<td>Large but workable shortfalls in capability, experience</td>
<td>Many serious shortfalls in capability, experience</td>
</tr>
<tr>
<td>Degree of mismatch between COTS capabilities and user needs: maturity, flexibility, levels of service</td>
<td>User needs fully covered</td>
<td>Modest work to satisfy user needs</td>
<td>A few mismatches requiring appreciable work to resolve</td>
<td>Some serious mismatches requiring major work</td>
<td>Many serious, interacting mismatches requiring major work</td>
</tr>
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<tr>
<td>Requirements Volatility</td>
<td>None</td>
<td>Small, non-critical redirections</td>
<td>Occasional moderate redirections</td>
<td>Frequent moderate or occasional major redirections</td>
<td>Frequent major redirections</td>
</tr>
<tr>
<td>COTS Volatility</td>
<td>Infrequent versions, low criticality components</td>
<td>Infrequent versions of loosely coupled or non-critical components</td>
<td>Frequent versions of loosely coupled components</td>
<td>Frequent versions of critical, moderately coupled components</td>
<td>Frequent versions of highly coupled, critical components</td>
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