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Identifying Best-Value Technologies Using Analogy-Based Cost Estimating Methods and Tools

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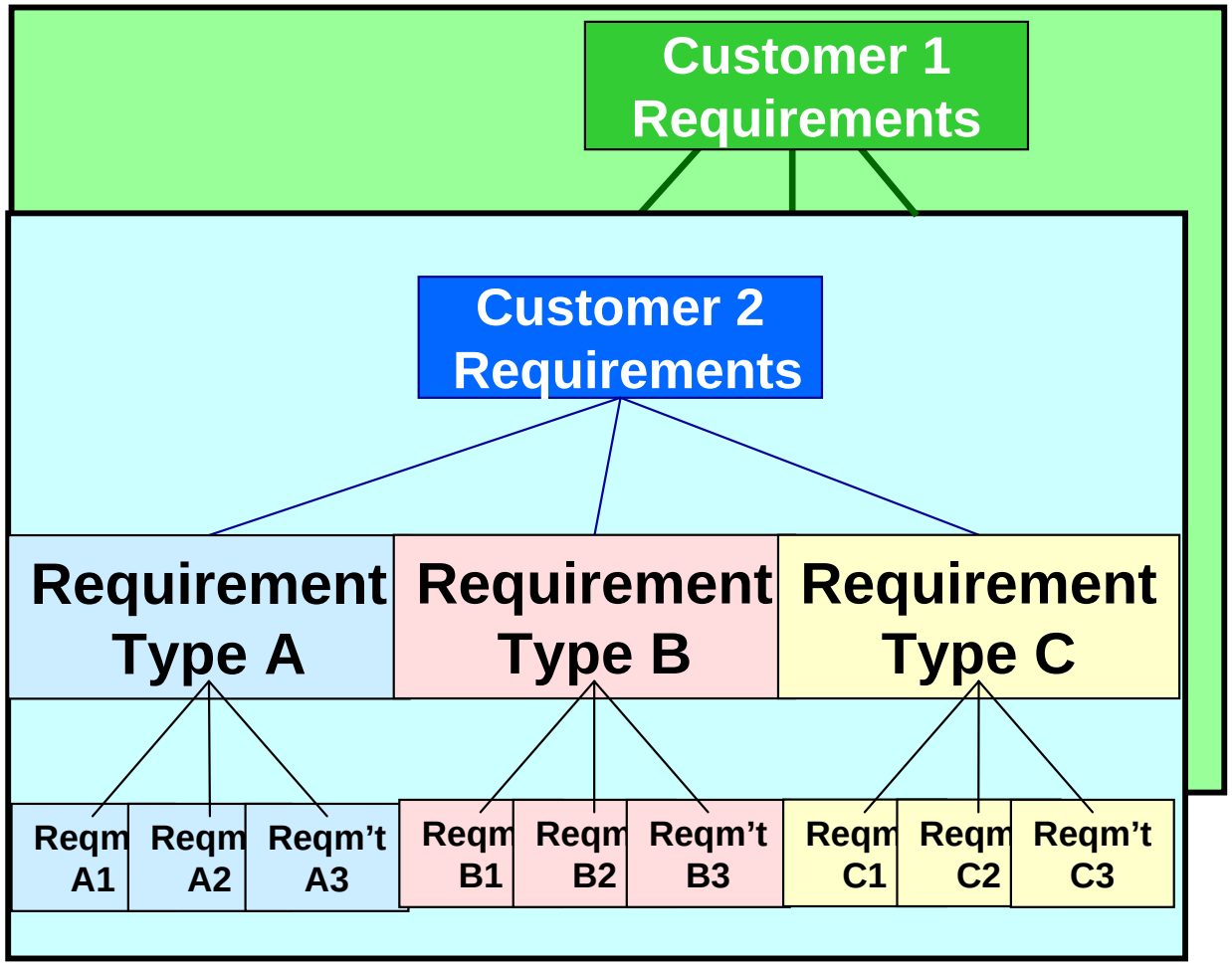
Outline

- Desire to Improve Technology Evaluation Methods
- Methods & Tools to Identify Best Value Solutions
- Applying Method to Example Technology Evaluation
- Introduction to Process Based Economic Analysis Tool (P-BEAT)
- Observations

Desired:
Objective Method to Help Evaluate Technology R&D Projects



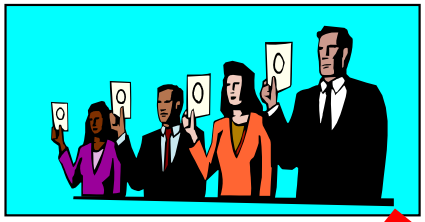
How to evaluate:

- Multiple customers
- Multiple requirements
- Requirements met by multiple attributes
- Level of attribute that satisfies customer
- Price customer will pay

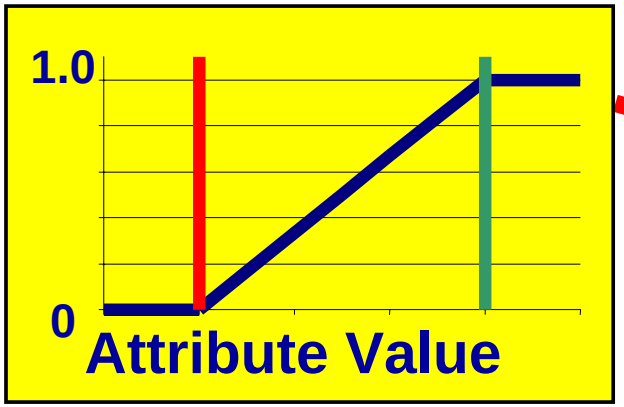
Improved Methods & Tools Can Help Identify Best Value Technology Projects for Contractors and Customers

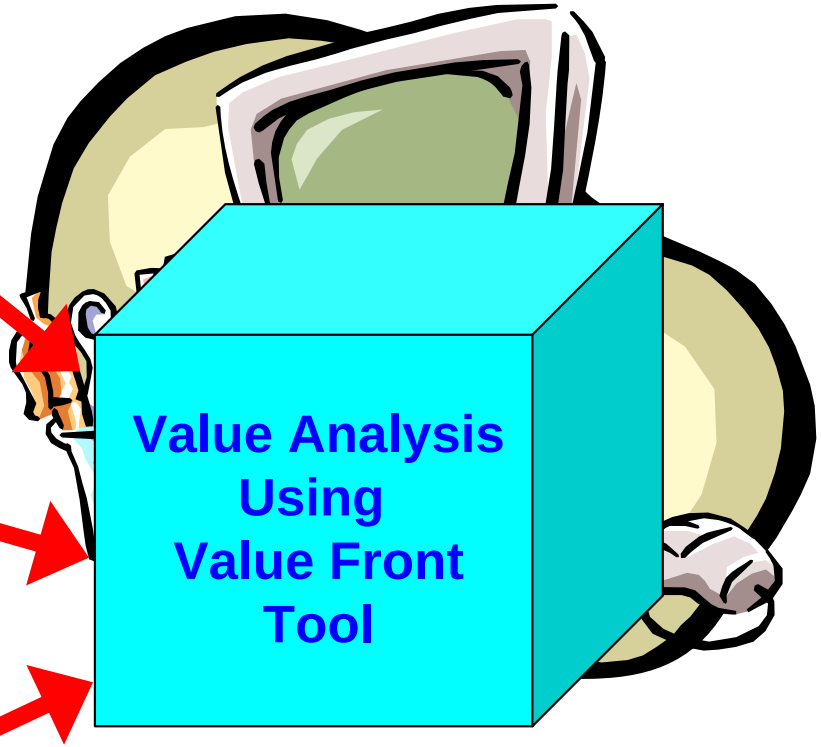
Value Analysis Methods Translate Customer Needs to Desired Performance, Cost, and Risk

Customer Attribute Priorities (Decision Analysis)



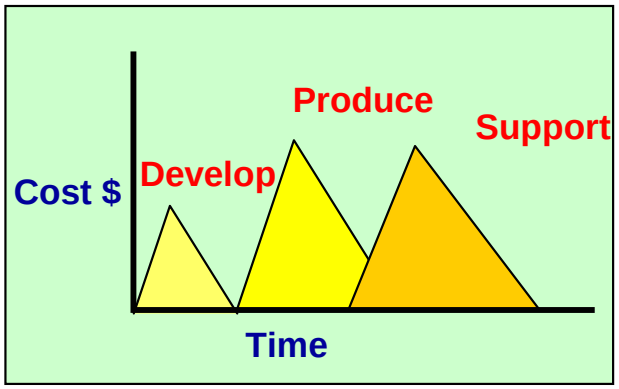
Customer Desirability (utility)



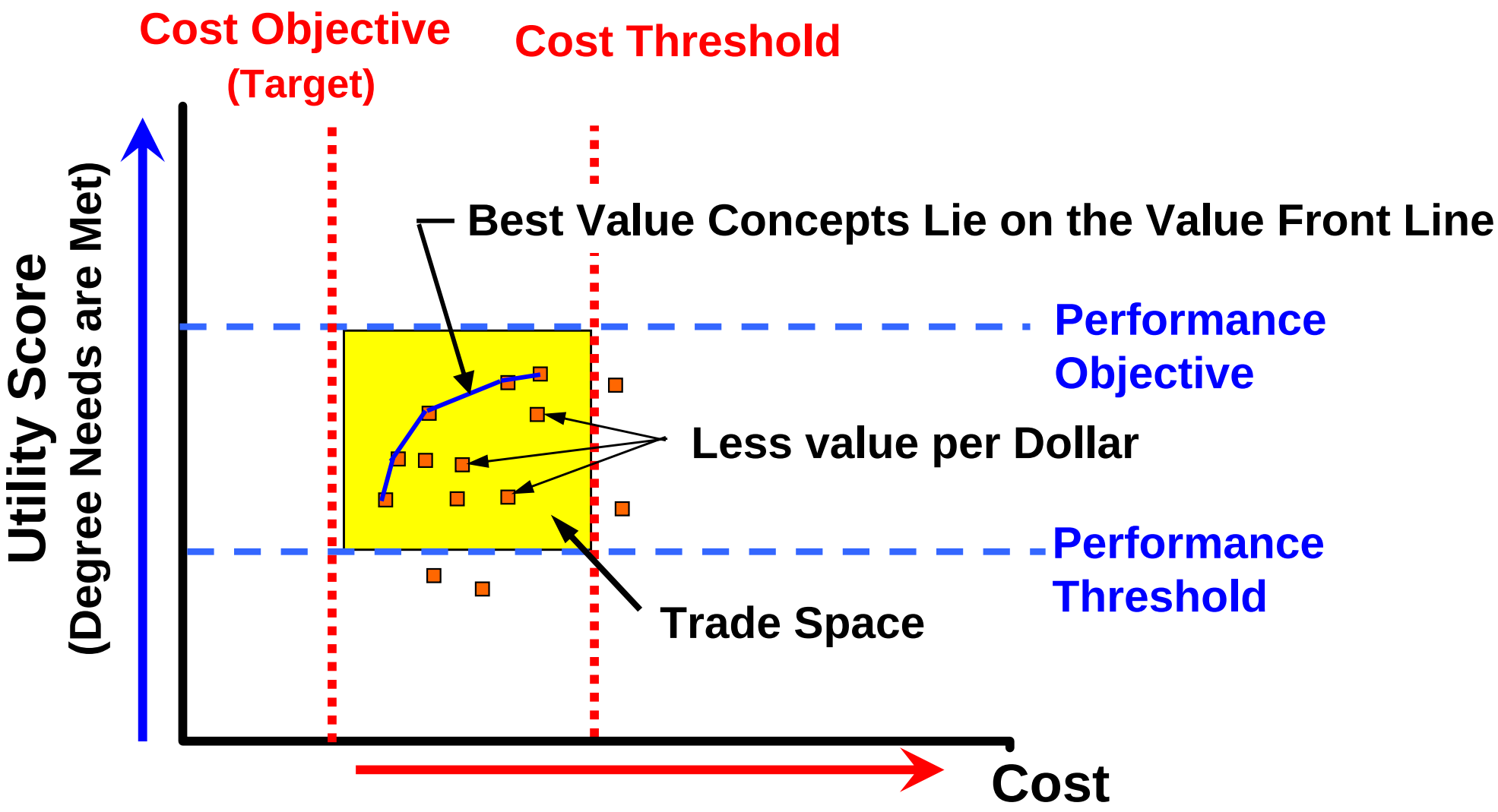


P-BEAT
(Process Based Economic Analysis Tool)
- Cost Relationships & Metrics

Cost-risk



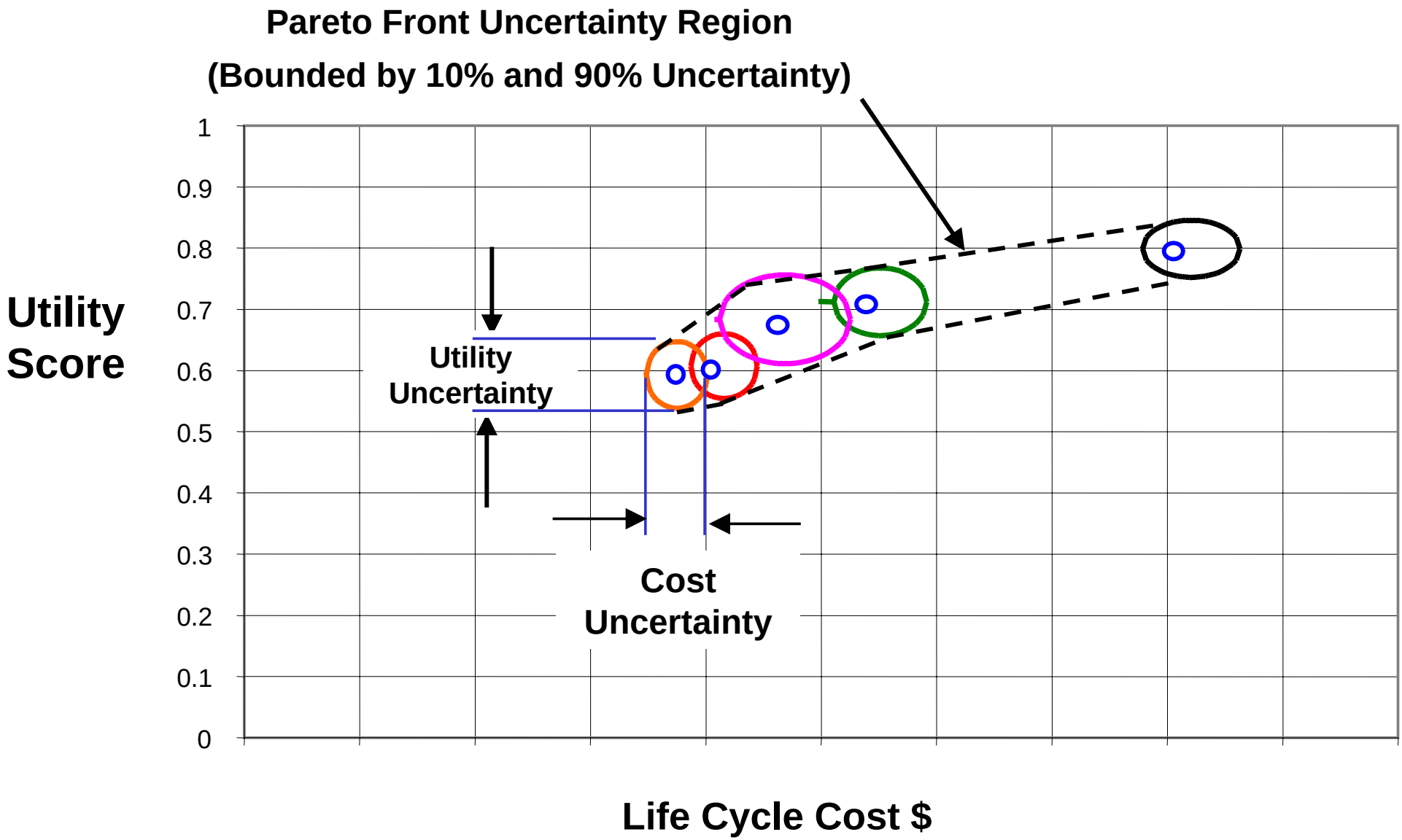
Best Value Alternatives Can Be Identified Graphically



Affordability Best Value Methodology is Captured in Value Front Tool

Value Front Tool Output Plot

Example Trade Study

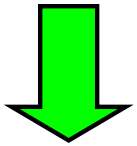


Example Technology Evaluation

Technology Development Projects

Metrics:

- **Benefit:**
  - **Economic Yield (Increased Revenue)**
  - **Qualitative Attributes**
- **Cost to Mature and Apply Technology to Platforms**



Value Analysis Methods and Tool (Value Front)

Cost-Benefit Has Been Quantified for Technology Development Projects

Value Front Tool
Application to Technology Project Evaluations

Total Relative Priorities: 20

	Priority
Risk	2
Technology Yield	5
Product impact	4
Leverage technology	2
Productivity	4
Time to implement	3

Evaluation attributes and relative priorities

	Tech 1	Tech 2	Tech 3	Tech 4
Risk	Tolerable	Low	Tolerable	Low
Technology Yield	1.5-2.0	> 5.0	1.5-2.0	3.0-5.0
Product impact	Few	Many	Many	Many
Leverage technology	Average	Above average	Average	Above average
Productivity	< $10M	< $10M	$10M - $100M	> $1000M
Time to implement	<1 year	<1 year	1 yr - 2 yr	>10 yr
Development Cost	250	2050	700	1500

Input Data for Value Front Tool:

- Evaluation attribute utility scores
- Technology Development Cost

Quantitative and Qualitative Attribute Scores Measure Desirability of Technology Development Projects

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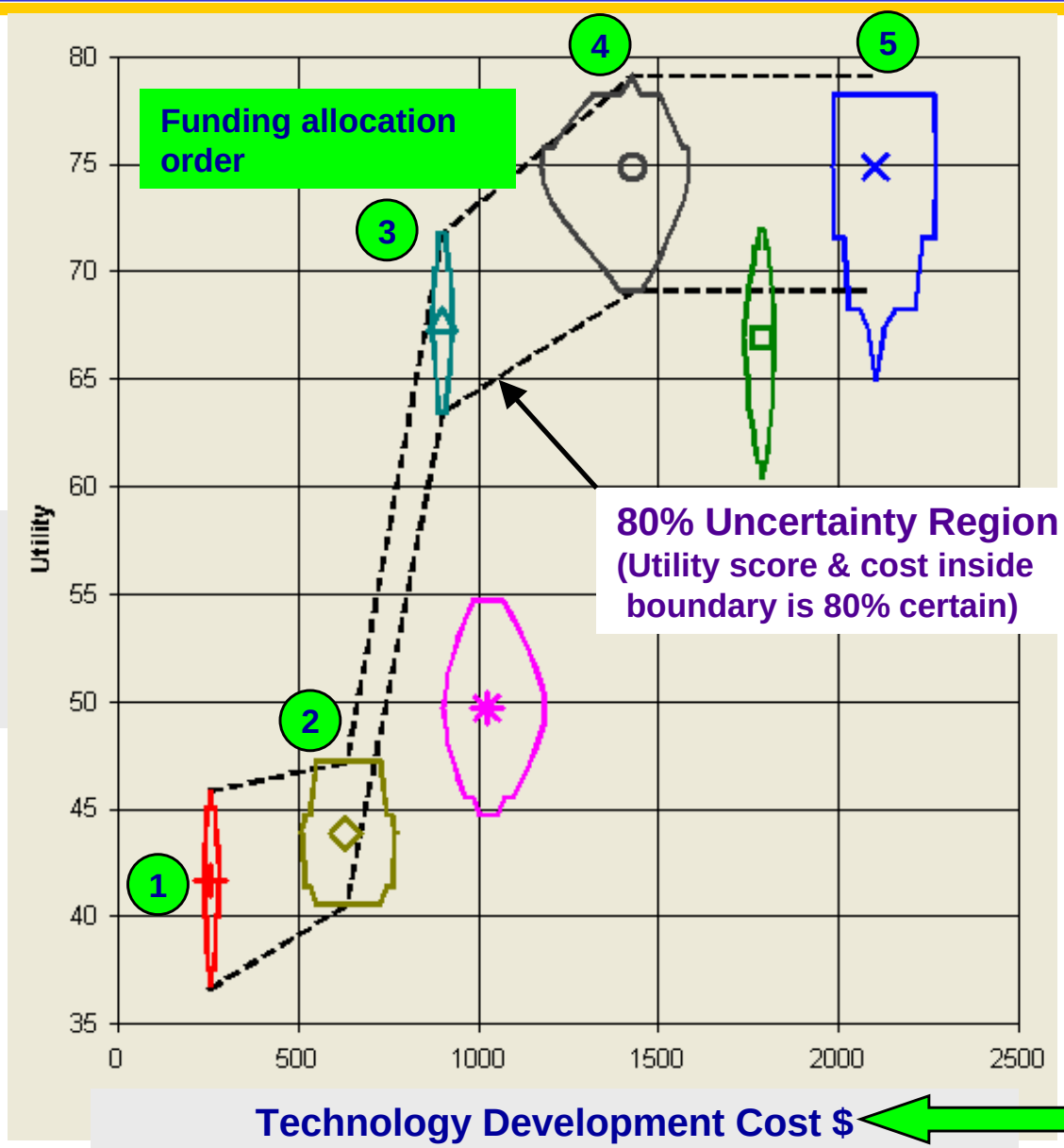
Value Front Tool Results

Project Desirability vs. Technology Development Cost

Combined Utility Score

(Desirability)



Technology Development Cost $

(cost to mature technology to threshold TRL)

Cost Analysis With P-BEAT

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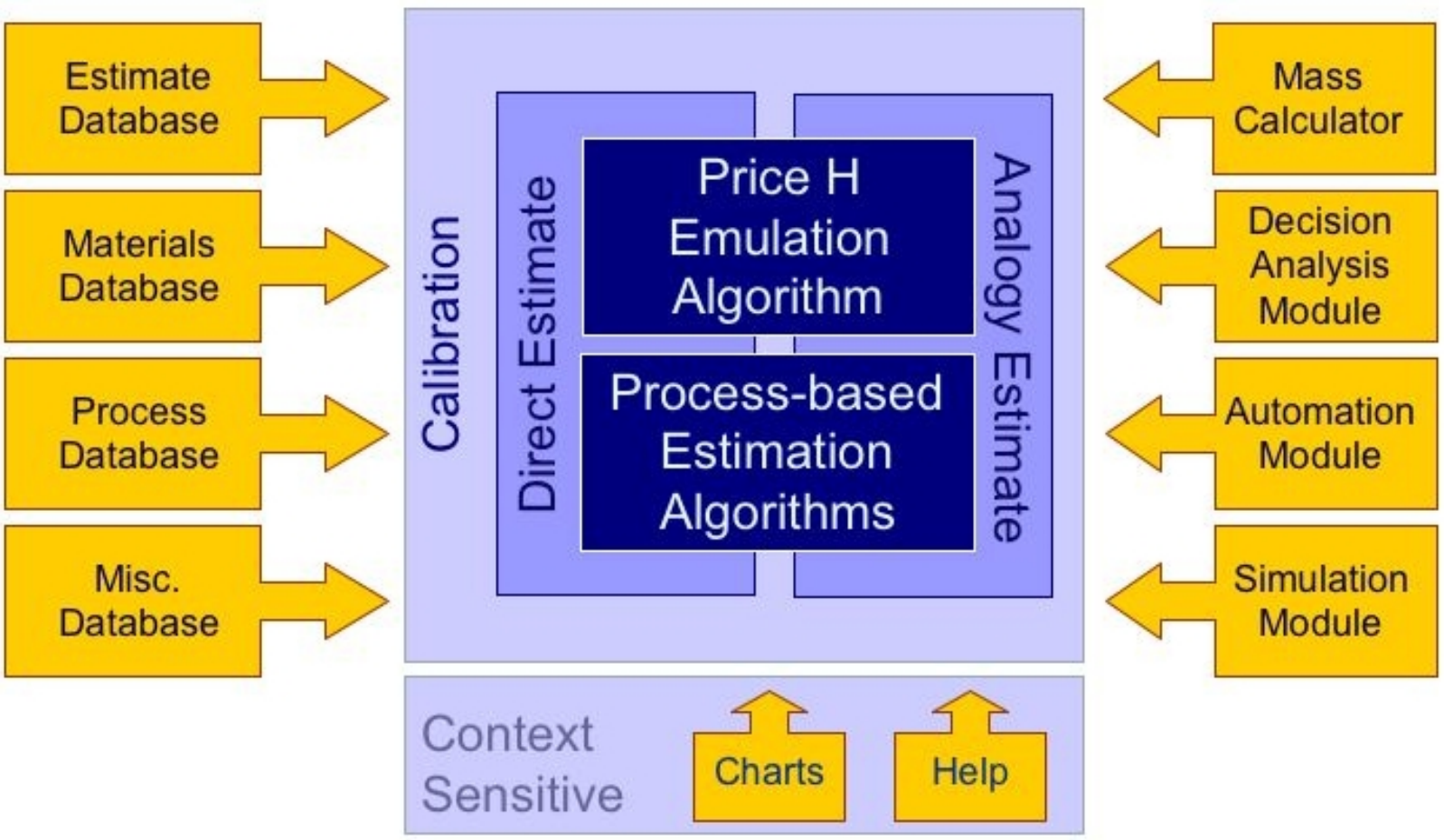
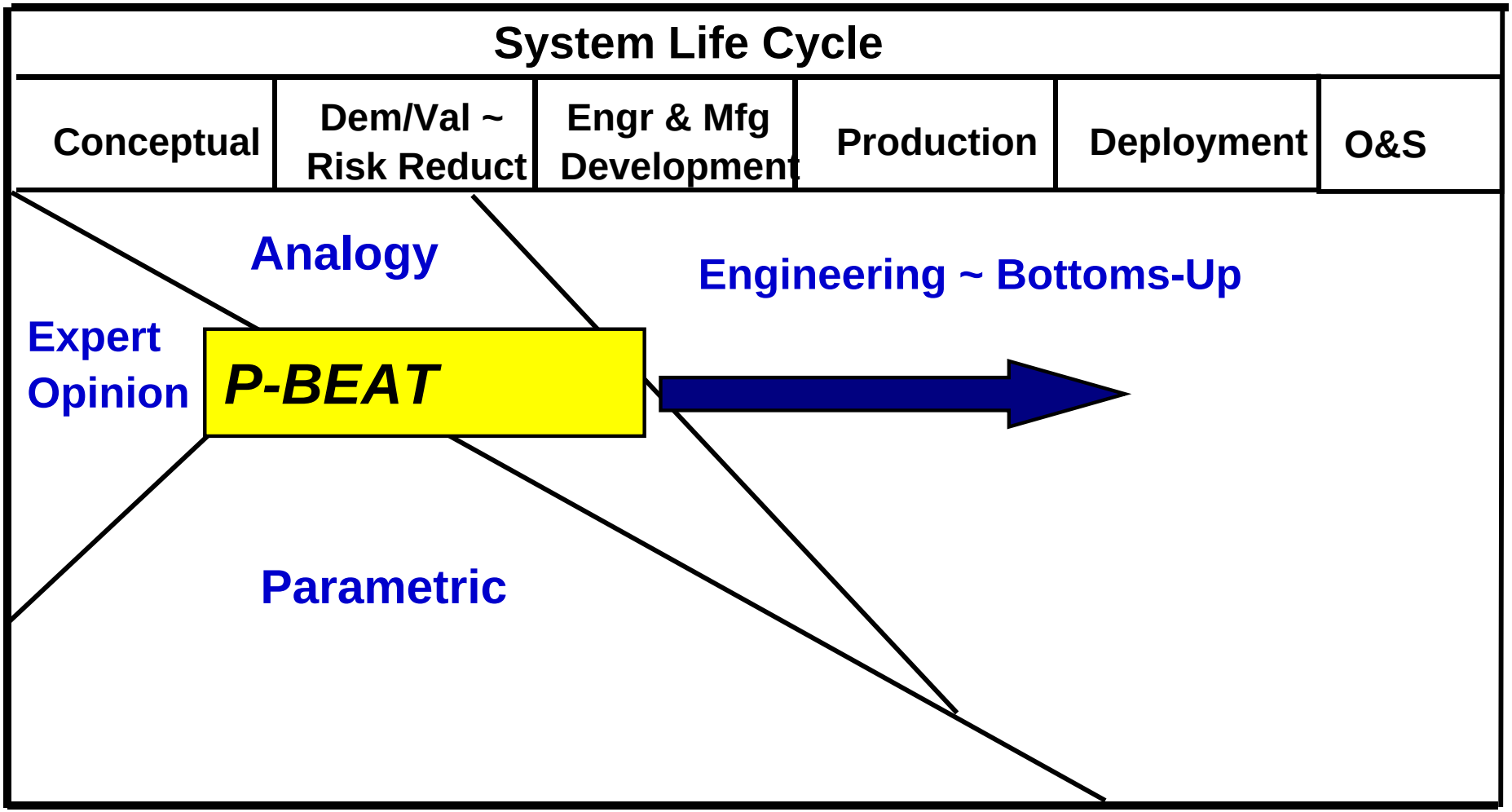
Process Based Economic Analysis Tool (P-BEAT) Provided by NASA



Provides Parametric and Process-based Cost Relationships Using Analogy Cost Estimating

Cost Estimating Approaches vs. Program Phases



P-BEAT Provides Analogy Cost Estimating Approach Needed During Early Life Cycle Phases

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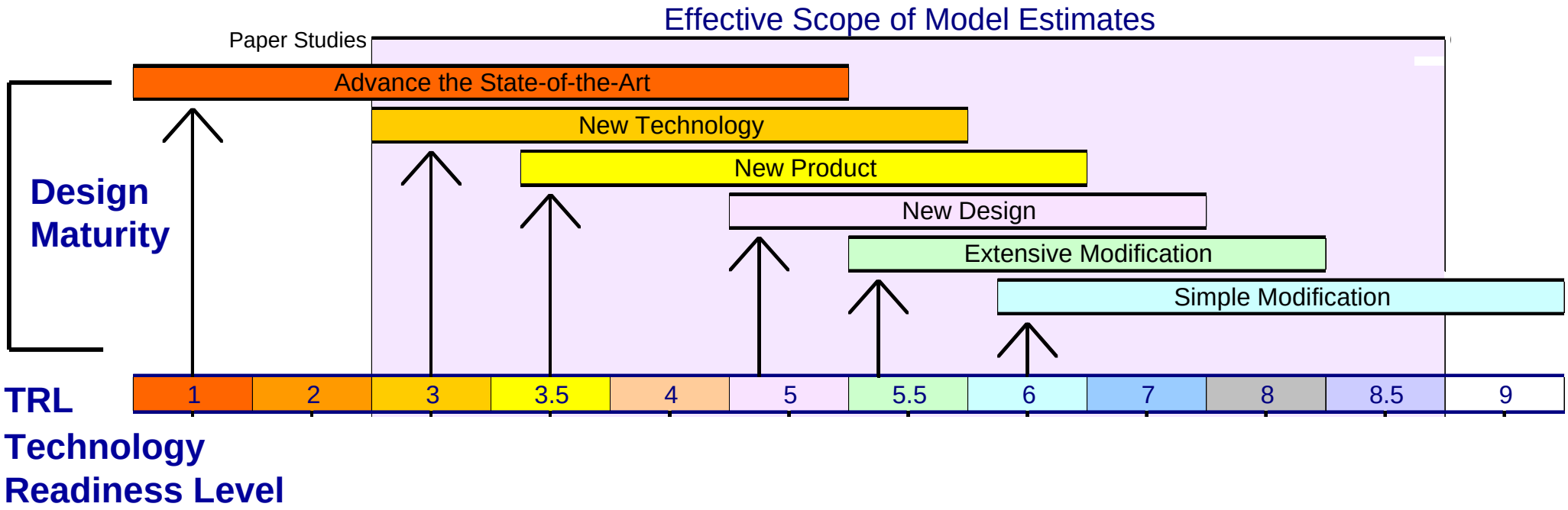
Technology Readiness Level and Design Maturity Drive Cost in P-BEAT



Technology Maturity and Readiness Levels are Cost Driver Inputs in P-BEAT Cost Methodology

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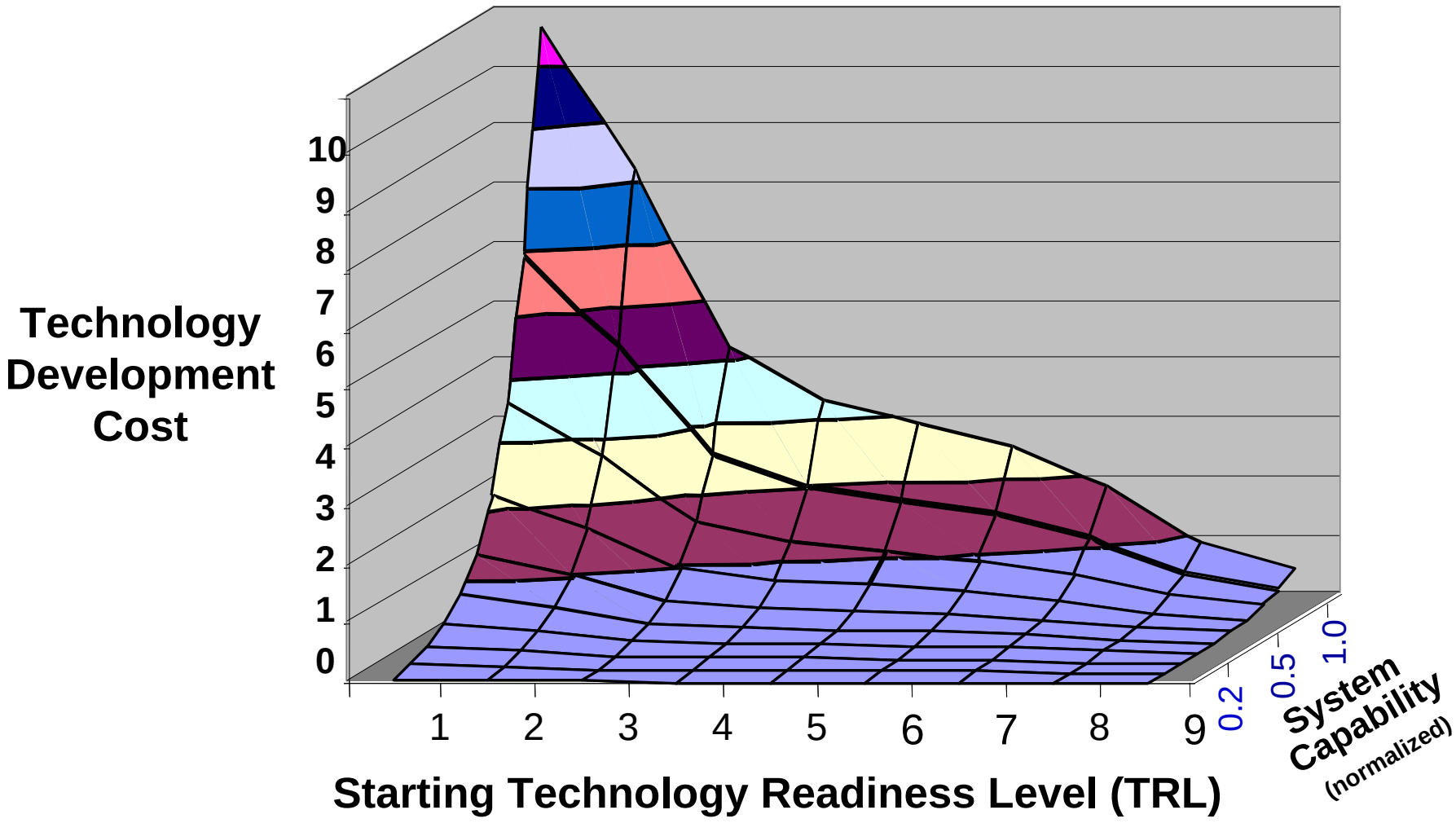
Cost Impact of Technology Maturity Is Modeled with P-BEAT Methodology



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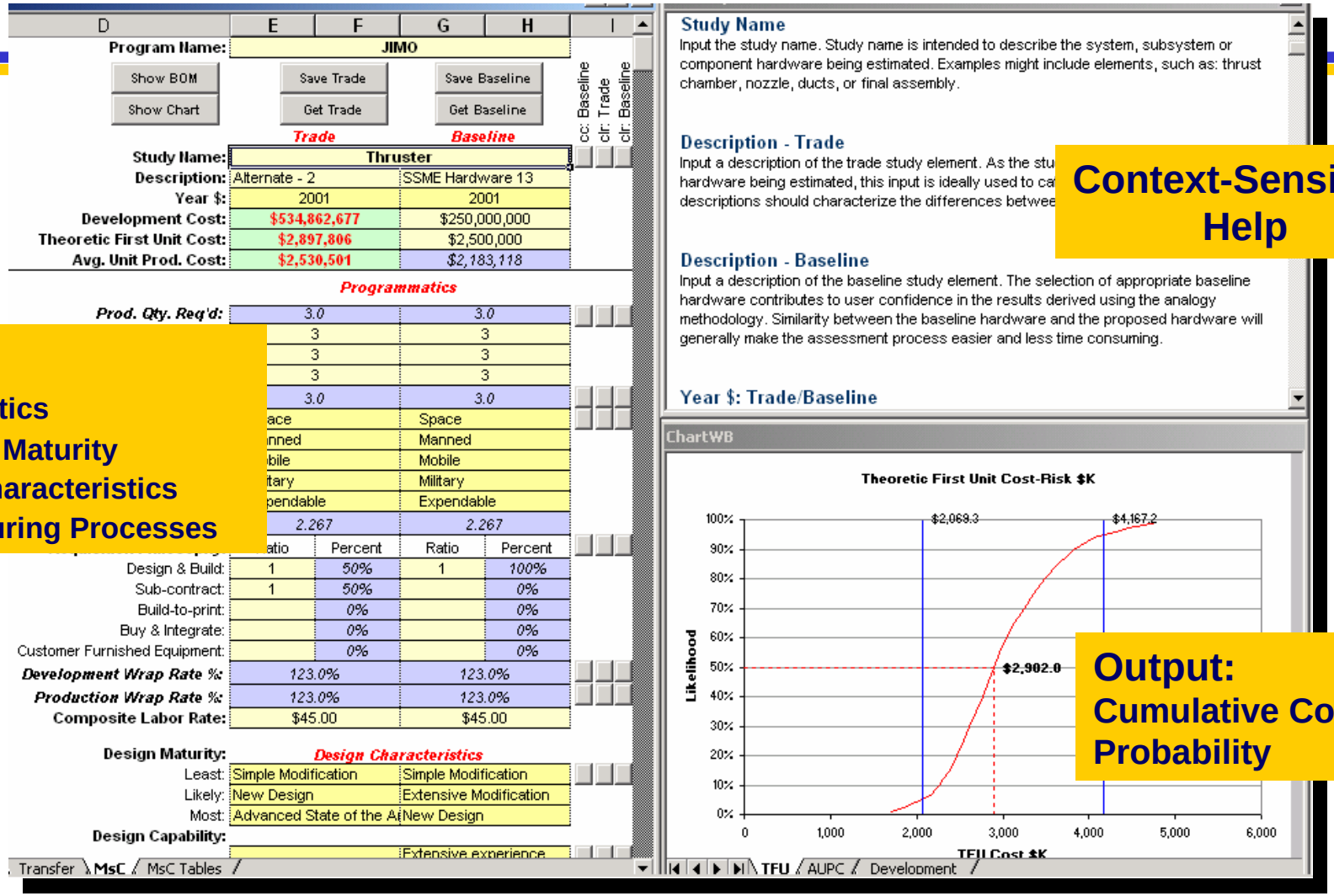
P-BEAT Screen Layout is Designed for Usability



Context-Sensitive Help

Inputs:
- Programatics
- Technical Maturity
- Design Characteristics
- Manufacturing Processes

Output:
Cumulative Cost Probability

Tool Features

- Help screens readily available
- Data stored in MS Access files
- Use only inputs at indenture level required
- Extensive Benchmark Database
- Simulation Tool for cost-risk
- Sensitivity analysis module

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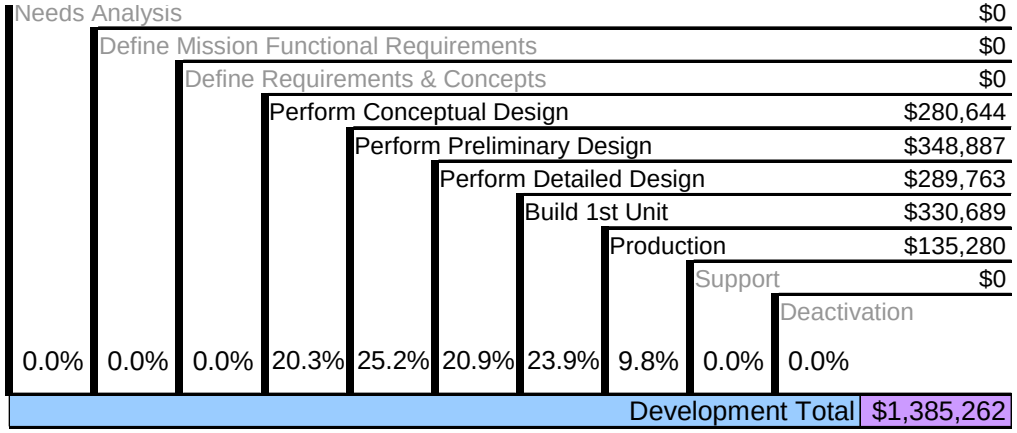
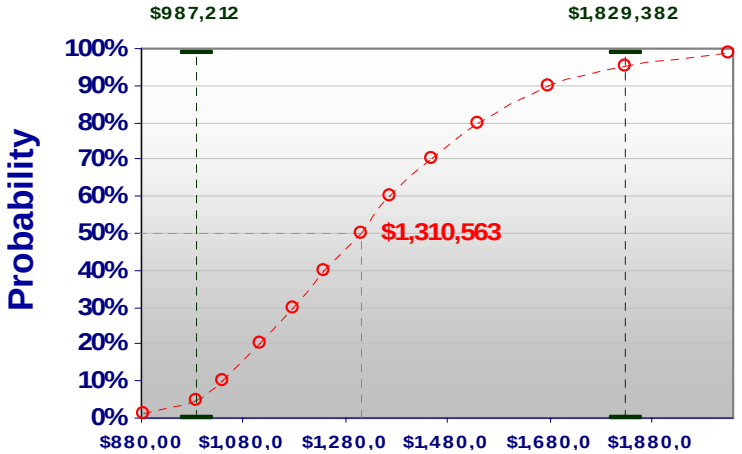
Example P-BEAT Chart and Table Outputs

Cost Distribution by Phase



Cost Uncertainty Output



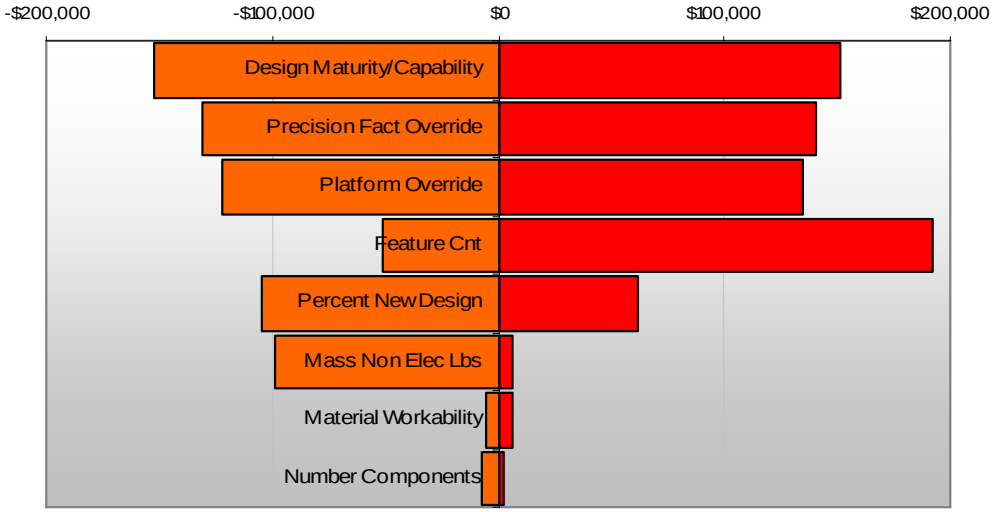
Cost Derived from Technology Maturity

Trade Desc Trade
Baseline Desc Baseline
Yr $ Trade: 2006 Baseline: 2004

LC Phase	Tade	Baseline
Start	Needs Analysis	Perform Conceptual Design
End	Production	Production

$987	5%
$1,042	10%
$1,112	20%
$1,178	30%
$1,239	40%
$1,311	50%
$1,367	60%
$1,451	70%
$1,539	80%
$1,678	90%
$1,829	95%
$2,033	99%

Cost Sensitivity Output



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Observations

- NASA-Glenn Research Center Provides P-BEAT Support (no license cost)
- Boeing Phantom Works Continues to Apply Value Front & P-BEAT Tools
- P-BEAT Provides Consistent Method throughout life of program
- Engineers' Confidence in cost results is based on relative complexity of item estimated compared to known item cost

Value Analysis & NASA Cost Tool Can Improve Ability to Evaluate Best Value Technology Development Projects