

## Overview of Decision Analysis and Applications for Cost Professionals

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### Outline

Decision Analysis Overview: decision policy

Project Crashing Decision: simple EV calculation, decision tree, Monte Carlo simulation

Feasibility and Appraisal Analyses: stochastic variance

Bonus topics (time permitting)

### Decision Analysis

Tools and techniques to help a decision maker choose wisely about uncertainty

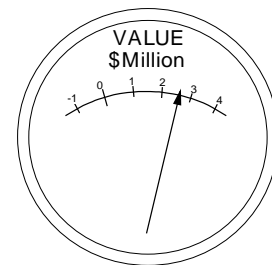
Three problem types: Ranking alternatives, optimizing, appraising

Expected Value: probability-weighted average

$$EV = \sum_{i=1}^N x_i P(x_i)$$

Symbols:  $EV$ ,  $E(\ )$ ,  $E$ , mean, and  $\mu$

Recommended for cost:  $EV\ Cost$ ,  $E(Cost)$



Key features of a decision analysis:

1. Probabilities are used
2. There is a way to measure value (= decision policy)
3. Combining (1) and (2): The optimal choice has the best  $EV$

Max. Expected Monetary Value =  $EMV = EV\ NPV$

Minimize  $EV\ Cost$

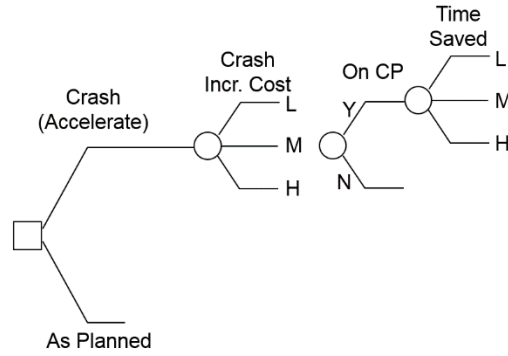
### Crashing Decision (among others)

Very useful information to the Task manager:

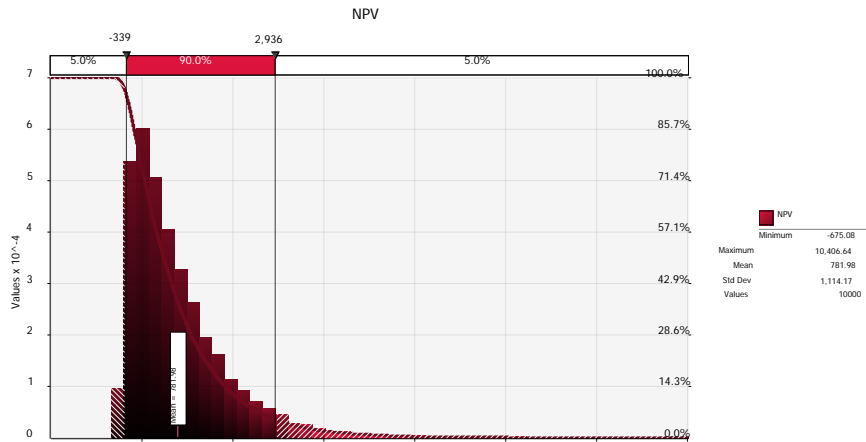
- $EV$  forecast for when predecessor tasks will complete
- Probability her task is on the CP
- Project value  $EMV$  impacts on cost, schedule and performance

Beta distribution kernel, for a 0 to 1 range:  $B(\alpha_1, \alpha_2) = x^{\alpha_1} (1-x)^{\alpha_2}$

Structural decision tree:



Typical Simulation Output:



534.5	NPV	Before adding
515.5	EMV	Economic Cutoff

$\Delta = -\$159.7M$   
 $= \text{Stochastic Variance}$

622.2	NPV	← New Base Case
782.0	EMV	← New Stochastic Forecast

**Key points**

Measuring value is key: making tradeoffs, something to optimize

Probabilities and EVs are important: getting a better number, stochastic variance

DA isn't especially difficult, and most people can do this.

**Follow-on reading of possible interest:**

“Resolving Decision Dilemmas” at <http://www.maxvalue.com/Dilemma.pdf>

“Decision Analysis in Cost Engineering” at <http://www.maxvalue.com/AACE2.pdf>

And this page has links to 10 Important Concept Summaries: <http://www.maxvalue.com/dwr.htm>

Follow-on questions are welcome: Contact John Schuyler, 303-693-0067, [john@maxvalue.com](mailto:john@maxvalue.com)