

Lesson Objectives

This lesson provides an overview of various approaches to estimating techniques. Objectives covered in this lesson are:

- Identify the five approaches for estimating cost risk
- Identify the two Mathematical Approach techniques



Approaches for Estimating

A cost risk estimate depends on a sound methodology and a systematic approach. Cost analysts use different approaches to determine the uncertainty and risk in a cost estimate and determine the cost impacts.

The next pages will review the five most common approaches which include:

- Subjective Estimator's Judgment
- Expert Judgment
- Sensitivity Analysis
- High/Low Analysis
- Mathematical Approaches

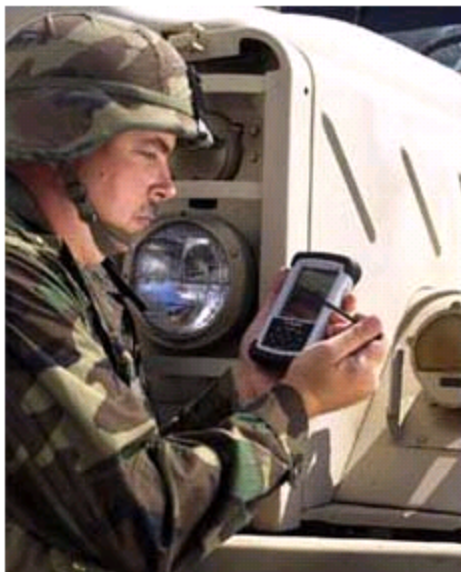


Oldest Method

Subjective Estimator's Judgment is a classical technique for determining uncertainty and is the basis for other approaches. The analyst using this method is an experienced estimator, and usually has experience with systems similar to the one currently being developed.

To employ this method, the analyst...

- Reflects back upon assumptions used as a basis for the estimate
- Evaluates influencing parameters
- Recognizes the uncertainties in the cost estimate



Expert Judgment

This method is also known as Expert Opinion. Sometimes a weapons system is extremely complex and sophisticated and requires a higher level of subjective assessment skills than an analyst may possess.

The analyst will gather a panel of experts or an individual to review certain aspects of the system. Their collective or individual assessment provides a quantitative measurement of uncertainty which is used to bound the original cost estimate.

Expert Judgment is sometimes more accurate than using a single expert because of the diversity of knowledge and experience of the panel members. The Delphi Technique is a common classical method that organizes the panel dynamics but takes time to process and analyze the results.



Sensitivity

What does it mean when cost is sensitive? It means that there are non-cost system parameters that affect cost and have the ability to cause large variations in the estimate. Examples of non-cost system parameters:

- Performance parameters (weight, range, payload, etc.)
- Deployment strategies
- Production schedules
- Programmatic requirements

Sensitivity Analysis is...

- A method of testing assumptions by adjusting cost drivers to indicate magnitude of variations

Sensitivity Analysis provides a quantity measurement of ...

- How sensitive a system is to the non-cost parameters
- Potential changes of 'cost drivers'

[Click here for a Sensitivity Table example.](#)



Sensitivity Example

[illegible]

High/Low

High/Low Analysis requires the identity of the lowest and highest value for each uncertain element.

The High/Low Analysis...

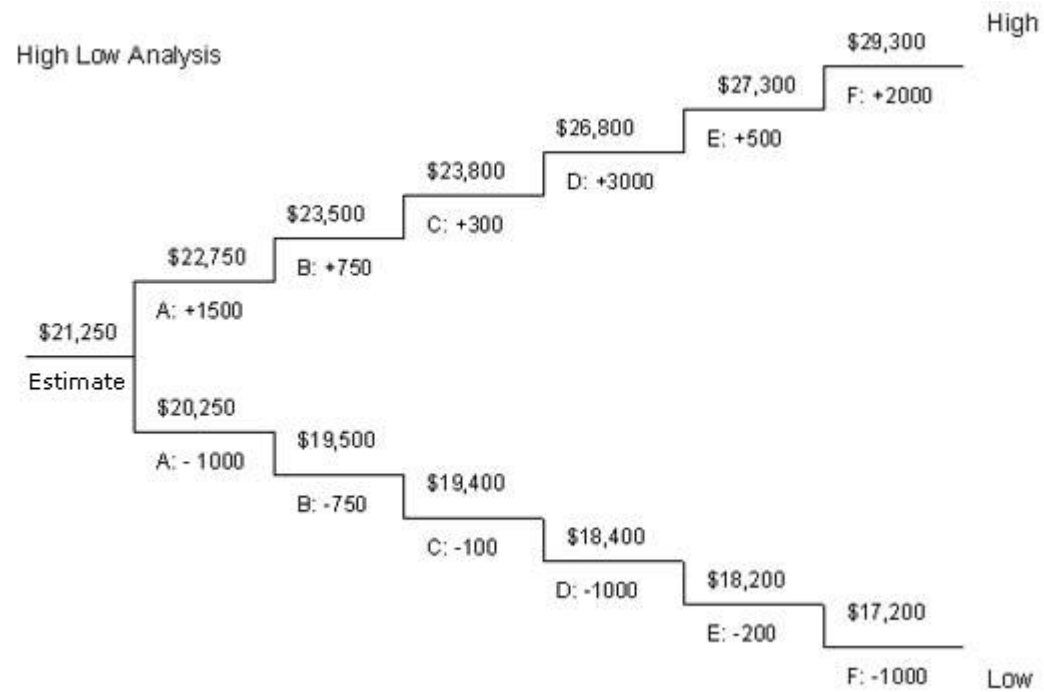
- Sums up all the lowest and highest values as the absolute bounds about the cost estimate
- Establishes the high and low values as the uncertainty range
- Exaggerates the uncertainty - since it is unlikely that all elements would achieve their high or low values

Shortfall: Probability is very low that all uncertain elements would realize all their lowest or highest values.

[Click here for a High/Low Analysis example.](#)

Popup Text

High / Low Analysis Example

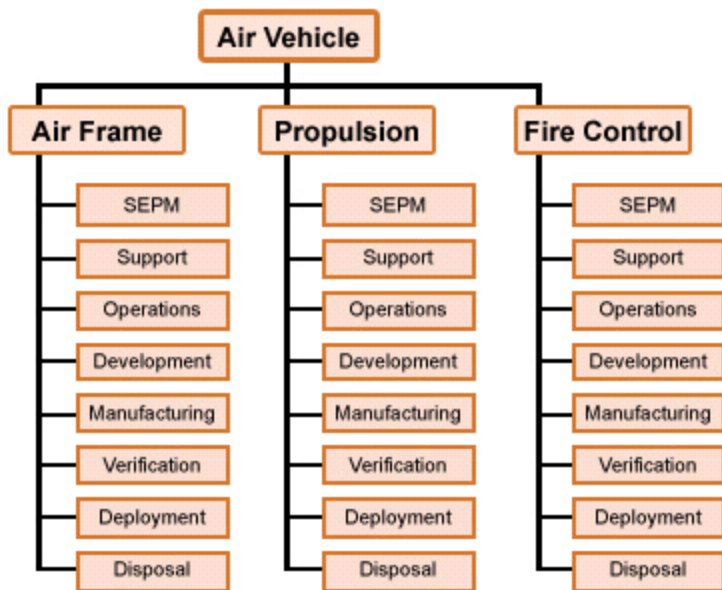


Mathematical Approaches

The Work Breakdown Structure is comprised of individual elements with their respective cost (these costs can be regarded as random variables). A random variable is a measurable and well-behaved function.

If the individual cost elements can be regarded as random variables and their probability distributions determined, then the total system cost can be expressed as a probability distribution (PD) around the point estimate. This is the basis for the Mathematical approaches.

In this WBS, each individual element (e.g. Air Frame Manufacturing) that has uncertainty associated with it would be defined as a probability distribution (PD). The PDs of each WBS element would be combined to create a single probability distribution representing total system cost.



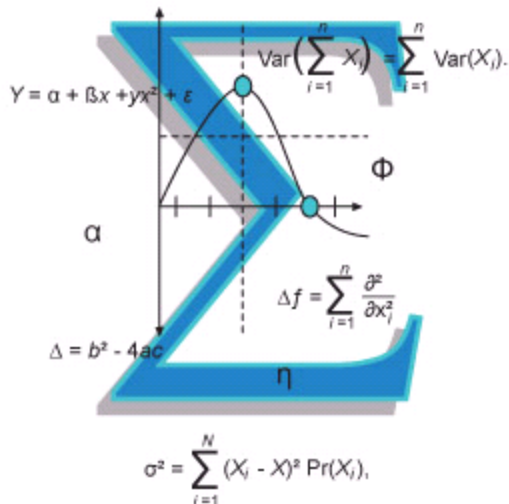
Mathematical Approaches, Cont.

Mathematical approaches require a solution to two problems...

- How to determine a PD for each cost element
- How to combine the individual cost elements and their uncertainty into a total system cost estimate

Two commonly used solutions are:

- Symmetric Approximation
- Monte Carlo Simulation



Knowledge Review

Which technique is a type of the Expert Judgment approach?

☐ Systematic

☐ Alpha

☒ Delphi

☐ Delta

Check Answer



The **Delphi** technique is a type of the Expert Judgment approach.

Knowledge Review

Determine if the following matches between Approaches for Estimating Cost Risk and Risk Characteristics are True or False.

Approach: High/Low Analysis

Characteristic: Delphi Technique

Approach: Expert Judgment

Characteristic: Uses the expertise of the cost estimator

Approach: Mathematical Approaches

Characteristic: System Cost is a PD

Approach: Subjective Estimator's Judgement

Characteristic: An absolute range on potential total systems costs

Approach: Sensitivity Analysis

Characteristic: Takes into account the potential changes in 'cost drivers'

☐

True



False

Check Answer

The correct matches are: **High/Low Analysis: An absolute range on potential total systems costs; Expert Judgment: Delphi Technique; Mathematical Approaches: System cost is a PD; Subjective Estimator's Judgment: Uses the expertise of the cost estimator; and Sensitivity Analysis: Takes into account the potential changes in 'cost drivers.'**

Summary

There are several methods that can be used for conducting a cost risk analysis. A complete cost risk analysis may make use of more than one of these methods.

They are:

1. Subjective Estimator's Judgment
 2. Expert Judgment
 3. Sensitivity Analysis
 4. High/Low Analysis
 5. Mathematical Approaches
- High/Low Analysis restricts measurement to two points - lowest and highest
 - Subjective Estimator's Judgment requires the cost analyst to reflect on uncertainties in the just completed estimate
 - Expert Opinion uses one or more expert individuals to answer questions with respect to uncertainties in the estimate
 - Sensitivity of a cost element is an indication of how the cost is affected by non-cost system parameters known as 'cost-drivers'
 - Mathematical Approaches include the use of Symmetric Approximation and Monte Carlo Simulation
 - Mathematical Approaches require the development of probability distributions for each uncertain cost element and the development of a total system cost probability distribution from these individual cost element distributions

Lesson Completion

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