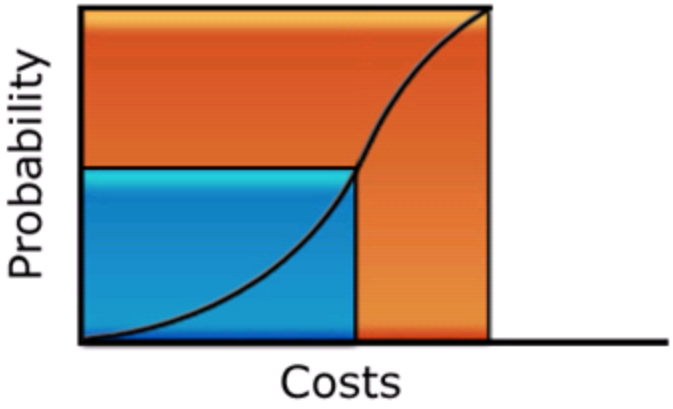
Lesson Objectives

This lesson provides an overview of the causal factors of risk and what end results are expected in the stages of conducting a risk analysis.

Objectives covered in this lesson are:

- Identify typical outputs from cost risk analysis
- Distinguish between risk and uncertainty



Project Cost Estimates

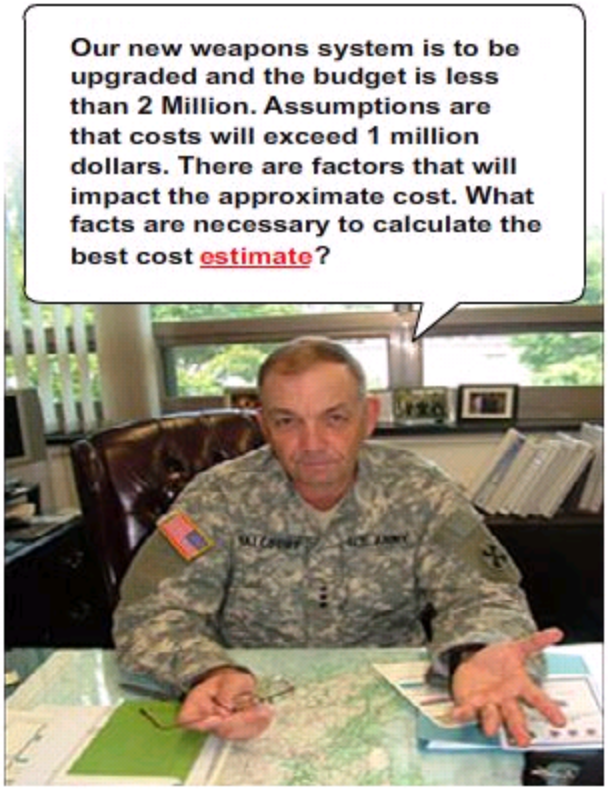
Cost Analysts are not comfortable presenting a point estimate due to the inherent risk and uncertainty within the estimate. This point estimate, the standard product of a cost estimate and a single number, will almost always be wrong.

For estimating purposes, the overall system is disaggregated into components, cost elements, or Work Breakdown Structure elements, depending upon where the system is in its life cycle, the resources available to perform the analysis, and the objectives of the analysis. The point estimate for the overall system is the sum of estimated costs for the components or elements. At the component or cost element level, the following type information is used:

Historical data:

- Engineering estimates
- Bids from contractors and suppliers
- Labor productivity rates
- Pricing experience
- Parametric equations
- Industry database

Click "**estimate**" in the graphic for a quick definition.



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Long Description

Project Cost Estimates

Illustration of a military officer dressed in Fatigues making a statement about a new weapons system. He says, "Our new weapons system is to be upgraded and the budget is less than 2 Million. Assumptions are that costs will exceed 1 Million dollars. There are factors that will impact the approximate cost. What facts are necessary to calculate the best cost estimate?"

Project Cost Estimates Cont.

Questions that must also be taken into account to get the final estimate with all risks and uncertainties considered are:

- How is the uncertainty expressed (numerically) in the estimate?
- What assumptions were also used to generate the point estimate which may or may not come true?

The first question above mentions uncertainty. How do you distinguish between risk and uncertainty? The two definitions are usually defined as a blended characteristic.

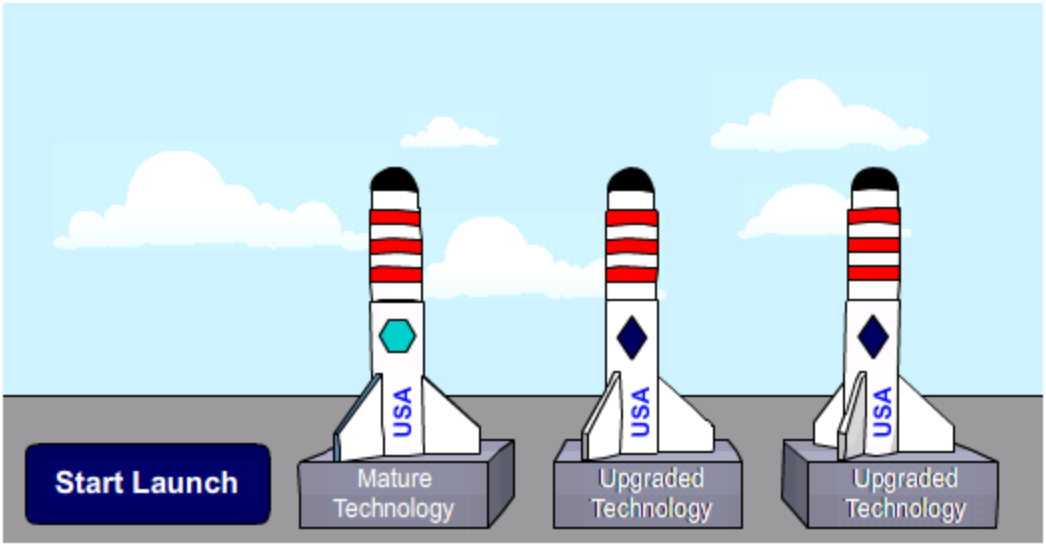
The next page elaborates on the differences of the two.

Risk vs. Uncertainty

Risk implies probabilities can be assigned to chance events.

Uncertainty implies no such probabilities can be assigned.

Let's take for example a missile taking off with the new technological improvements. The performance of the old technology is already known, but the performance of the new technology and it's integration with mature/tested components is not.



Click the **Start Launch** button to see the example.

Click here for an alternate description of the animation.

Long Description

Rocket Launch Example

There is three identical missiles. One is labeled Mature Technology which launches perfectly. The other two missiles are labeled Upgraded Technology.

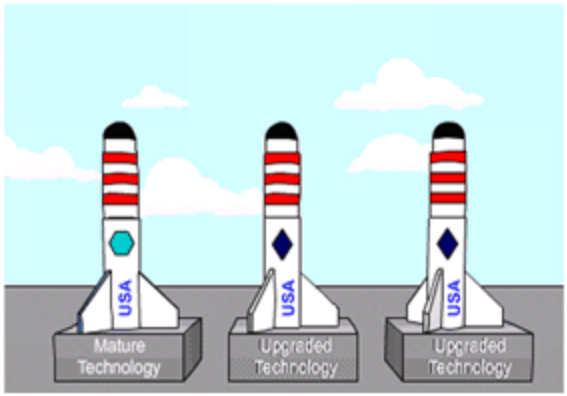
The second missile launches but crashes due to a Guidance Malfunction and the third missile begins a launch but does not complete it due to an Ignition Malfunction.

Risk vs. Uncertainty, Cont.

Uncertain Situation

There is also a risk the missile won't launch with the NEW technology. Before testing and with no past experience, we would say that we have no way of assigning a probability distribution. This would then be called an uncertain situation. Probabilities of possible types of malfunctions, and any costs to resolve design or production problems would be unknown.

Risk and Uncertainty are intertwined and difficult to clearly separate. The terms are often interchanged and intermingled. For the rest of this module we will generally consider them as Cost Uncertainty/Risk Analysis (CU/RA) and sidestep the issue of their differences.



Risky Situation

There is a risk the missile won't launch with the OLD technology. Historical data would allow this to be expressed with a probability distribution.

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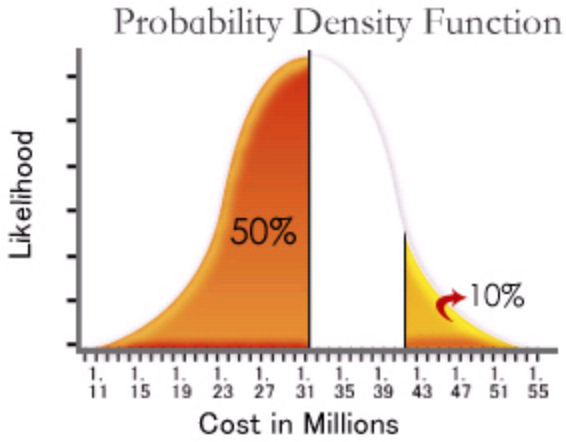
Long Description

Three missiles with the following labels, "Mature Technology, Upgraded Technology, and Upgraded Technology".

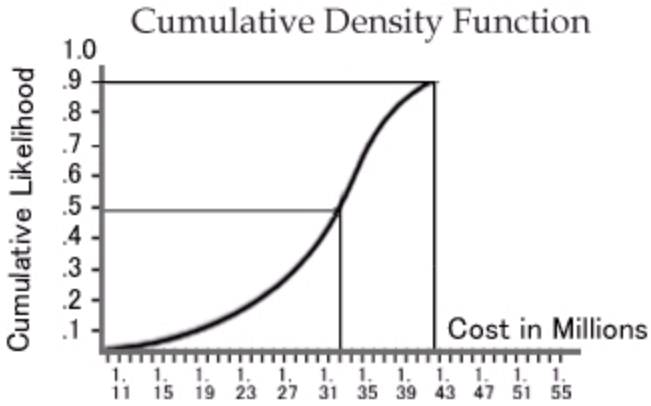
Typical Outputs

The end product of one cost risk analysis methodology is a total cost distribution in the form of a probability density function or a cumulative density function. The two graphics below indicate how these products could be displayed.



Represents a 50% probability that cost will be less than $1.33M

Represents a 10% probability that cost will be greater than $1.41M



There is a 50% chance (probability) that the cost will be less than $1.32M

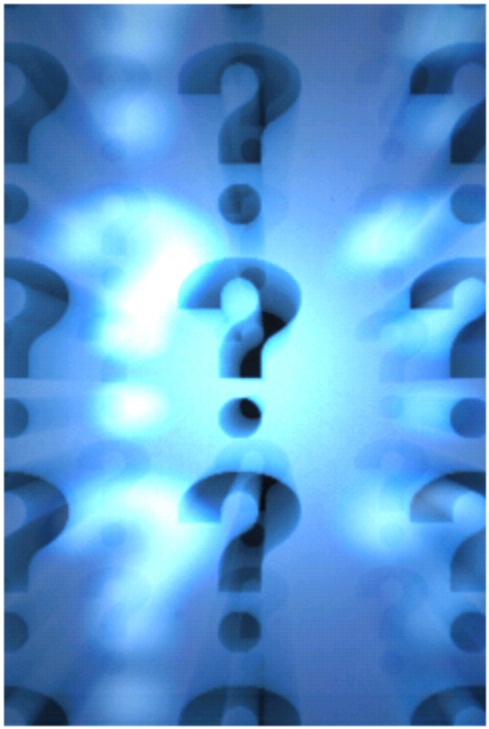
There is a 90% chance (probability) that the cost will be less than $1.43M

Knowledge Review

The cumulative density function, a product of a cost risk analysis, could be used to determine probabilities associated with different funding levels.

- [x] True
- [ ] False

Check Answer

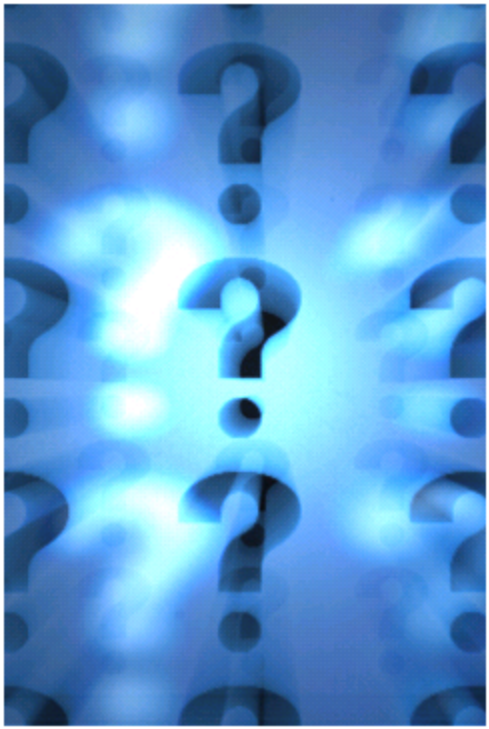


This is a **True** statement. The cumulative density function, a product of a cost risk analysis, could be used to determine probabilities associated with different funding levels.

Knowledge Review

A risky situation can be defined as one where probabilities can not be assigned because the risks are unknown but controllable events.

- [ ] True
- [x] False



Check Answer

This is a **False** statement.

Summary

- The cost estimate is the expected dollar cost.
- Cost risk analysis involves the aggregation of the uncertainty in a cost estimate and determines the total cost risk.
- A risky situation has known random events that can be represented as a Probability Distribution.
- An uncertain situation has unknown random events. A Probability Distribution can not be established.
- Cost Uncertainty/Risk Analysis (CU/RA) is a process of quantifying the cost impacts of uncertainties. PDF (Probability Density Function) and CDF (Cumulative Density Function) are the common and widely used outputs for cost risk analyses.

Lesson Completion

You have completed the content for this lesson.

To continue, select another lesson from the Table of Contents on the left.

If you have closed or hidden the Table of Contents, click the Show TOC button at the top in the Atlas navigation bar.