Risk and Uncertainty

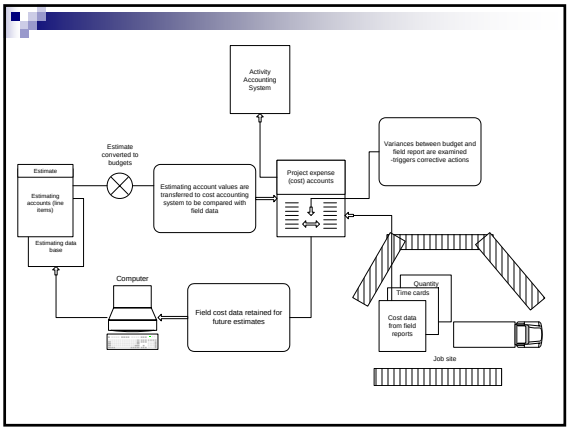
An estimate is a “Prediction” of future construction costs.

An Estimate is the FOUNDATION

- **Bid**
- **Cost Accounts**
- **Purchasing**
- **Monitoring**
- **Control**
- **Database**
- **Future Estimates**

An Estimate is the FOUNDATION

- **Determine Time**
  - **Schedule**
  - **Production Rates**
  - **Crew Sizes**
  - **Equipment Needs**



Fundamental Estimating Equation

$$\text{Total Dollars} = \sum_{i=1}^{n} (Quantity_i) * (\$/Unit_i)$$

Uncertainty

- How to estimate the cost of a project, never been built before?
- What are the associated risks?
- How to take advantage of historical bidding data?
- How to incorporate uncertainty and risks into the final estimate?

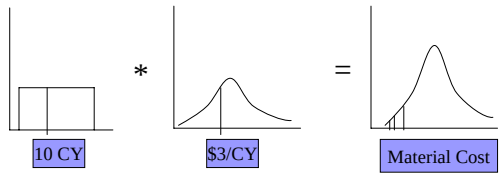
Background

- Axioms of probability
- Histograms
- Mean, Variance
- Probability Distribution Functions
- Distributions
- Monte Carlo Simulations

Types of Distributions

- Uniform:
  - Uniform probability across all ranges
- Triangle:
  - Bounded by optimistic, pessimistic and mean values
- Normal:
  - Distribution of the sum of a large number of variables is normal
  - A family of distributions defined by location and scale parameters: the mean ("average") and standard deviation ("variability").
- Log-normal:
  - A variable modeled as log-normal if it can be thought of as the multiplicative product of many small independent factors.
  - Example: Long-term return rate on a stock investment: it can be considered as the product of the daily return rates.

Application



Concerns

- Probability of exceeding deterministic cost
- The cost at which there is a X% chance that cost will not be exceeded
- Analyze correlations
- Sensitivity analysis
  - Contribution of variables to variability