RISK MANAGEMENT PROCESS

Lecture 3

RISK MANAGEMENT PROCESS

STEP2: RISK ASSESSMENT

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- **Assess risks in terms of:**
  - ✓ Likelihood of occurring
  - ✓ Severity of impact
- **Two-stages Analysis:**
  - ✓ Qualitative Risk Analysis
  - ✓ Quantitative Risk Analysis

STEP2: RISK ASSESSMENT

QUALITATIVE RISK ANALYSIS

QUALITATIVE RISK ANALYSIS DEFINITION:

As soon as Risks are **identified** as explained previously whether by **stake holders** (during establishing the context phase) OR by **Risk identification techniques** (during Risk Identification Phase), and list of potential project Risks is in hand

The next step is to analyze and prioritize them

QUALITATIVE RISK ANALYSIS

- Based on the carried out analysis; an appropriate and adequate response plan(s) is generated.
- At the end of the qualitative Risk analysis we shall be able to **identify the Risk magnitude** "subjectively" based on the two factors Probability (Likelihood) Impact (Consequence)

QUALITATIVE RISK ANALYSIS

- Analysis is carried out at project early stages
- Because at the early stages of the project we may face the problem of lack of information which will prevent us from being able to identify "**Risk Magnitude**" by numbers "Objectively"

QUALITATIVE RISK ANALYSIS
TOOLS AND TECHNIQUES

- Historical information.
- Techniques previously used for Risk identification (Brainstorming, Delphi, Diagramming … etc).
- Probability-Impact Matrix.

QUALITATIVE RISK ANALYSIS
TOOLS AND TECHNIQUES
HISTORICAL INFORMATION

- Reviewing documents of past project that are similar and could be comparable to our project, similarities could be size, complexity, techniques..etc.
- Lessons learned from past projects could be useful for the initial analysis of the identified risks in order to be able to answer the following two questions:

QUALITATIVE RISK ANALYSIS
TOOLS AND TECHNIQUES
PROBABILITY-IMPACT MATRIX

- How frequently this type of risk occurred during last projects (**Probability**)?
- What was its impact on the project when occurred (**Impact**)?

PROBABILITY-IMPACT MATRIX

	Probability		
Impact		Low	High
	Low		
	High		

EXAMPLE:
PROBABILITY IS LOW & IMPACT IS HIGH

	Probability		
Impact		Low	High
	Low		
	High	X	

PROBABILITY-IMPACT MATRIX
FIVE REGIONS COLORED MATRIX

	Probability					
Impact		Very Low	Low	Moderated	High	Very High
	Very Low					
	Low					
	Moderated					
	High					
	Very High					

PROBABILITY-IMPACT MATRIX

Another method could also describe the qualitative scale for both probability and impact numerically using:-

- Five Points Scale (1-5)
- Ten Points Scale (1-10)

PROBABILITY-IMPACT MATRIX
FIVE REGIONS COLORED MATRIX

	Probability					
Impact		Very Low (1)	Low (2)	Moderated (3)	High (4)	Very High (5)
	Very Low (1)	1*1=1	2*1=2	3*1=3	4*1=4	5*1=5
	Low (2)	1*2=2	2*2=4	3*2=6	4*2=8	5*2=10
	Moderated (3)	1*3=3	2*3=6	3*3=9	4*3=12	5*3=12
	High (4)	1*4=4	2*4=8	3*4=12	4*4=16	5*4=20
	Very High (5)	1*5=5	2*5=10	3*5=15	4*5=20	5*5=25

QUALITATIVE RISK ANALYSIS CONCLUSION

By making the Risk Analysis qualitatively using the "Matrix Method" we shall be able to prioritize Risks according to their impact on the project which will enable us to group high risks impact together, moderate risks together and low risks impact together in order to quantify them.

RISK ASSESSMENT

QUANTITATIVE RISK ANALYSIS

RISK MANAGEMENT PROCESS

QUANTITATIVE RISK ANALYSIS

- Quantitative Risk Analysis is carried out after finalizing Qualitative Risk Analysis.
- Risk are prioritized and ranked based on its effect on the project.
- Probability and Impact now could be represented by figures based on real experiments for similar events.

QUANTITATIVE RISK ANALYSIS

- **Probability** of occurrence of the event "Risk" is estimated based on statistical studies made for similar Projects.
- **Impact** of event "Risk" whether it is money and/or time is estimated and represented based on previous experiences for similar cases

QUANTITATIVE RISK ANALYSIS TOOLS AND TECHNIQUES

- Sensitivity Analysis
- Scenario Analysis
- Probability Analysis
- Expected Value Analysis
- Decision Tree Analysis
- PERT Analysis

SENSITIVITY ANALYSIS

- Sensitivity Analysis is one of risk analysis techniques oriented toward project outputs and its affection of inputs.
- By other meaning, to what extend outputs are sensitive to inputs?
- In general what will be the “outputs” when inputs changed ?

EXAMPLE

- Normal Quantities of Poured Concrete in Water Structure Project " DAM" located at Aswan is 3000 m3/day at 35° *Temperature in Summer Season*
- In Summer Season Temperature Degrees Varies Between 30° and 45°
- Changing of Temperature Degrees Could Affect Quantities of Poured Concrete Whether By Decrease or Increase

SENSITIVITY ANALYSIS
ADVANTAGES

- Simple and Easy, especially When We Have Sufficient Information
- Risks Could be Ranked Easily Based on Their Impact

SENSITIVITY ANALYSIS
DISADVANTAGES

- Needs Long Time (No of Events is Big).
- Ignore Probability Factor.
- Not Realistic (Only deals with each event individually without taking into consideration concurrency event)
- Doesn't express the "Project Total Risks"

QUANTITATIVE RISK ANALYSIS TOOLS AND TECHNIQUES

- Sensitivity Analysis
- Scenario Analysis
- Probability Analysis
- Expected Value Analysis
- Decision Tree Analysis
- PERT Analysis

SCENARIO ANALYSIS

- It is when we allow for all scenarios that could happened to our project.
- Some Risk events to occur at one time

SCENARIO ANALYSIS
ADVANTAGES

- Initiated to Avoid Disadvantages of Sensitivity Analysis
- More realistic (deals with group of events, concurrency is taken into Consideration)
- Gives better Understanding of the Project Overall Risks

SCENARIO ANALYSIS
DISADVANTAGES

- Needs Long Time (No of Scenarios Could be Endless).
- Ignore Probability Factor.
- Not that Easy (As it Needs Very Solid and Strong Data Base) in addition to special kind of Experts
- Scenarios hypothesized Not Necessary Right.
- Scenarios hypothesized Not Necessary Happen.

AS EXPLAINED

Sensitivity Analysis and Scenario Analysis ignore probability factor while calculating "Risk Magnitude"

In order to solve this issue, probability analysis will be a helping tool to get the probability distribution describing "Risk Occurrence"

QUANTITATIVE RISK ANALYSIS TOOLS AND TECHNIQUES

- Sensitivity Analysis
- Scenario Analysis
- Probability Analysis
- Expected Value Analysis
- Decision Tree Analysis
- PERT Analysis

PROBABILITY ANALYSIS

- Calculating the probability of occurrence of one risk using probability analysis is not that easy as it needs Lot of Data (Market, financial, vendors, previous experiences, surrounding conditions of our project…etc)

PROBABILITY ANALYSIS

Assuming we have the required date and familiarity of the statistical techniques probability analysis could be carried out as follow:-

1- Check the available data and identify its “Range”

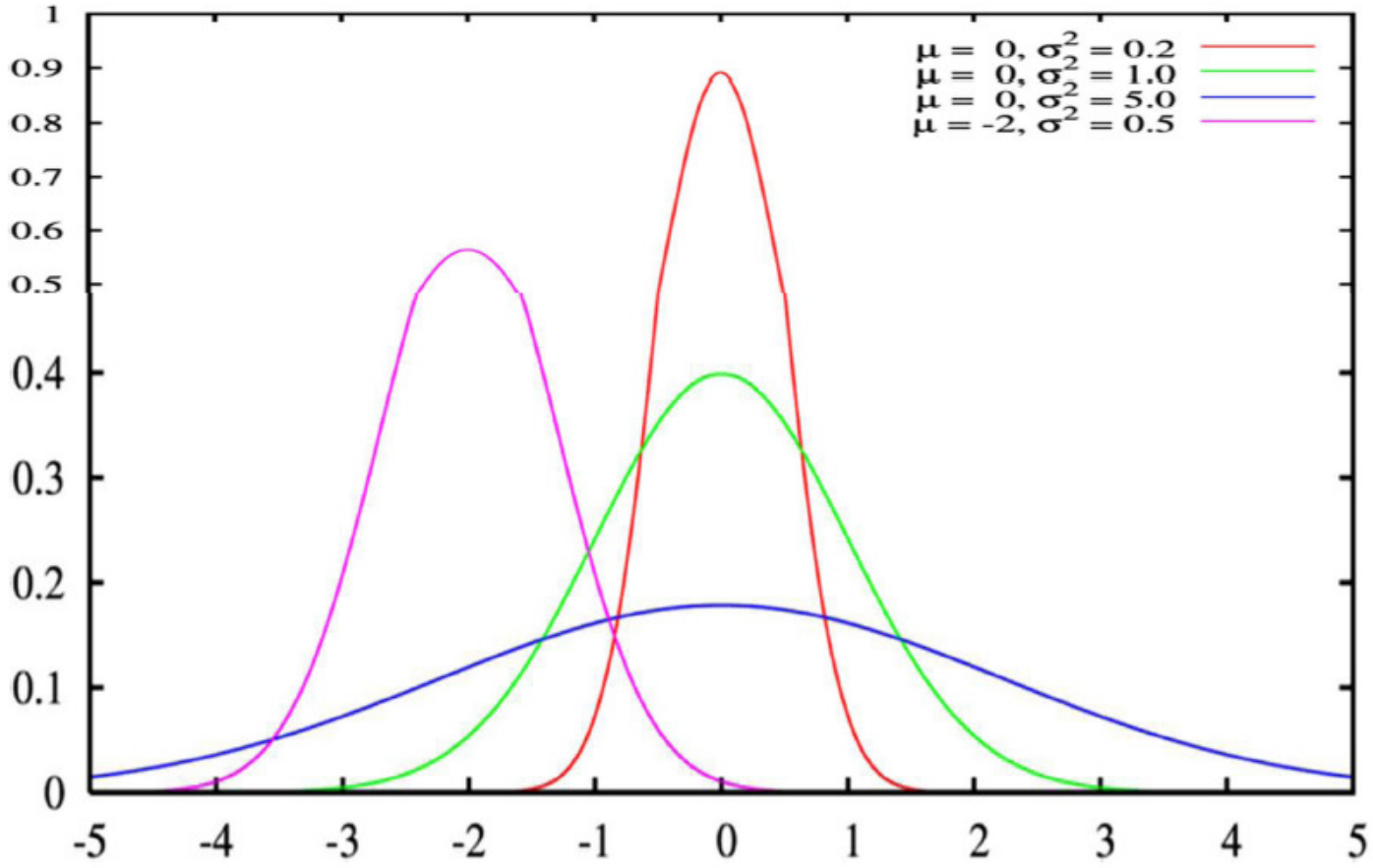
2- Develop A Histogram to gather data having the same frequency of occurrence "Probability” in the same bar.

3- Generate from the “Histogram” the corresponding probability distribution curve.

COMMON TYPES OF PROBABILITY DISTRIBUTION CURVES

- Normal distribution
- Beta distribution
- Triangular distribution
- Trapezoidal distribution
- Rectangular distribution

NORMAL DISTRIBUTION CURVE



NORMAL DISTRIBUTION CURVE CHARACTERISTICS

1. Continuous Random Variable.

2. Bell-shaped curve.

3. The normal curve extends indefinitely in both directions, approaching, but never touching, the horizontal axis.

4. Mean = Median = Mode

NORMAL DISTRIBUTION CURVE CHARACTERISTICS

Mean , median , mode

- **The mean of a set of data is found by taking the sum of the** data, and then dividing the sum by the total number of values in the set. A mean is commonly referred to as an average.
- **The median of a set of data is the middlemost number in** the set. The median is also the number that is halfway into the set. To find the median, the data should first be arranged in order from least to greatest.
- **The mode of a set of data is the value in the set that occurs** most often

NORMAL DISTRIBUTION CURVE CHARACTERISTICS

5. Symmetrical with respect to the mean

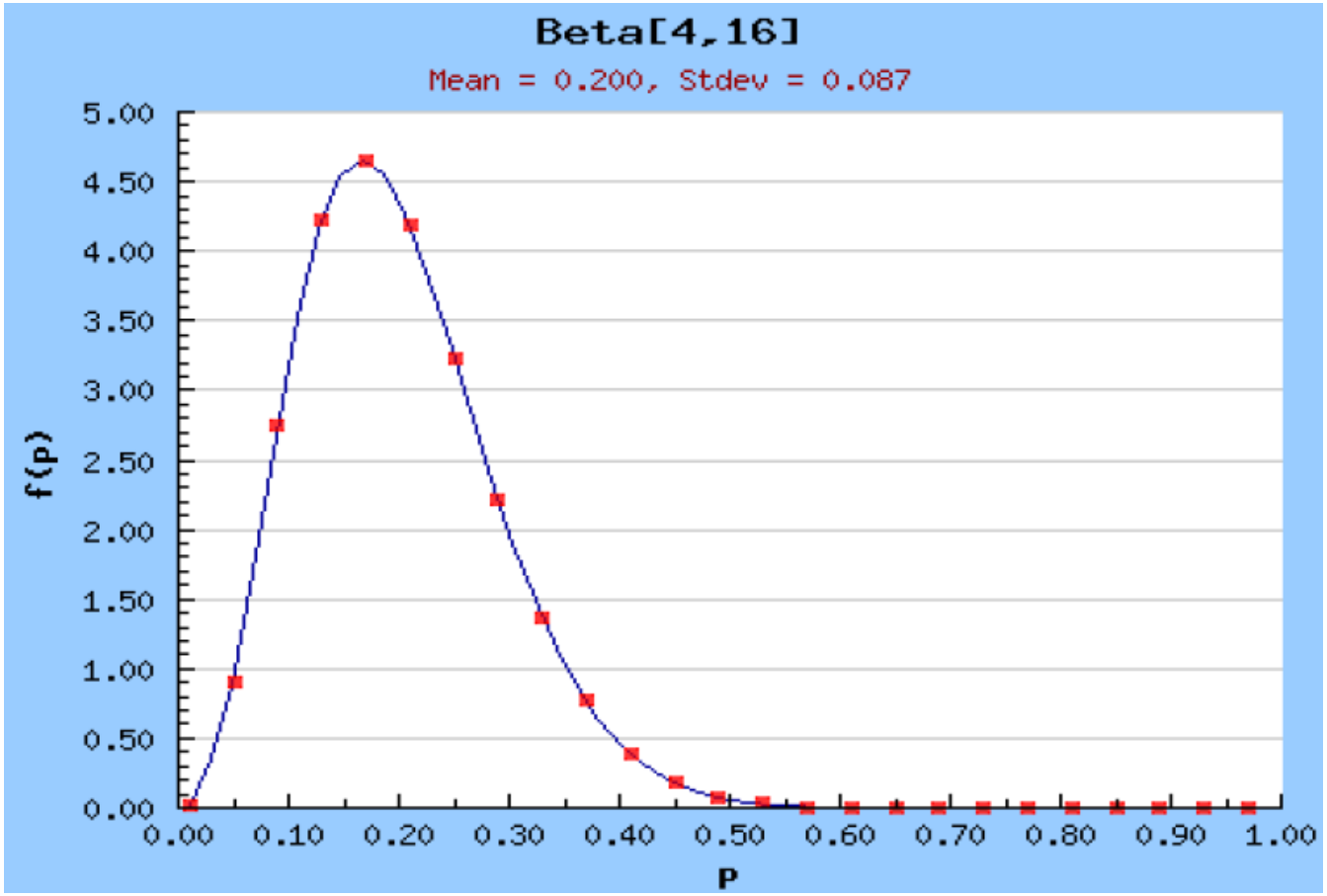
6. 68% of the area under the curve is within one standard deviation

7. 99.95% of the area under the curve is within two standard deviations

8. 99.7% of the area (data) under the curve is within three standard deviations

9. The total area under the normal curve is equal to 1

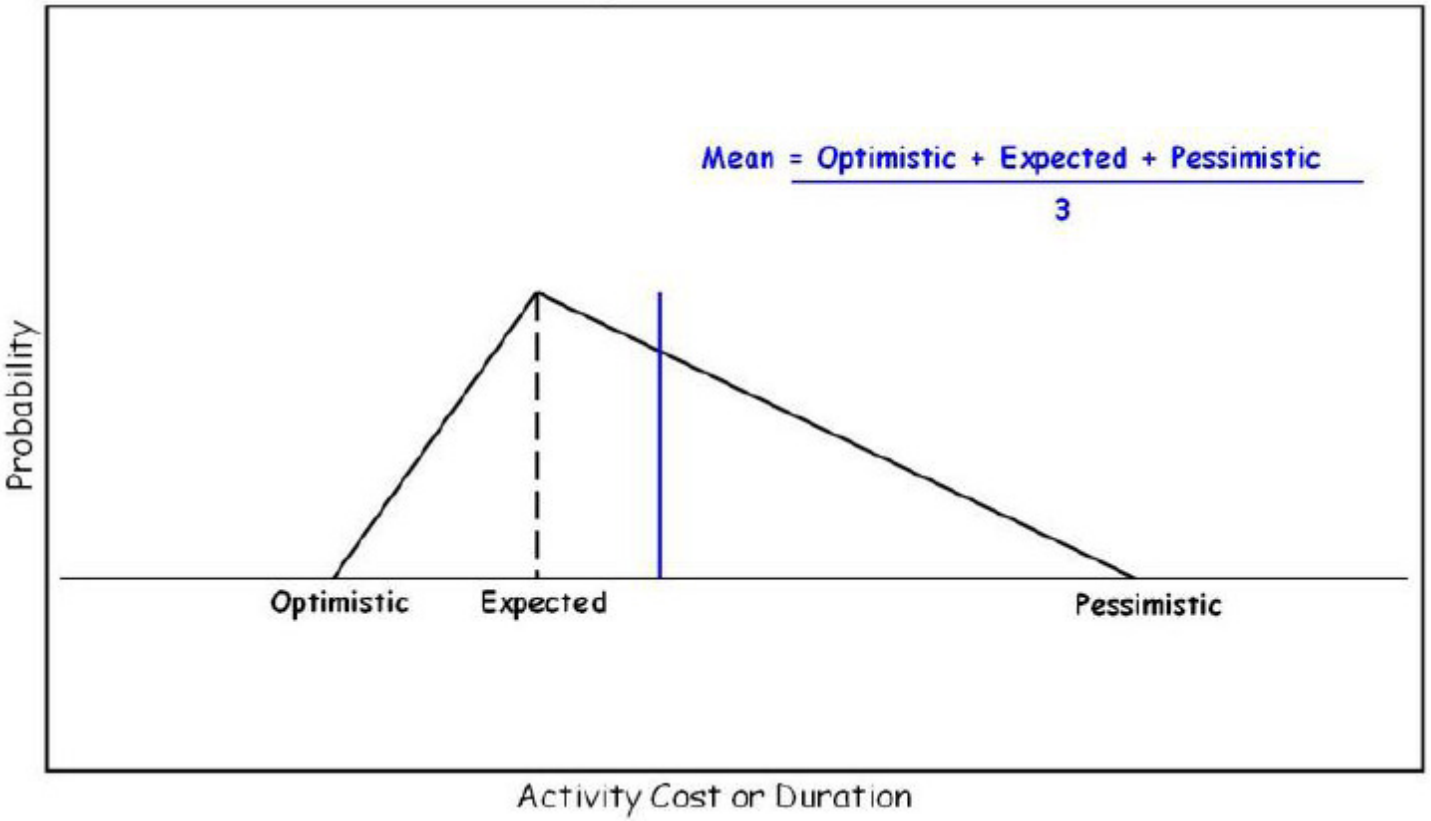
BETA DISTRIBUTION CURVE



BETA DISTRIBUTION CURVE CHARACTERISTICS

1. Not Symmetric.
2. Probability vary homogeneously.
3. Require minimum 4 parameters to be drawn.
4. more realistic for expressing real situations.

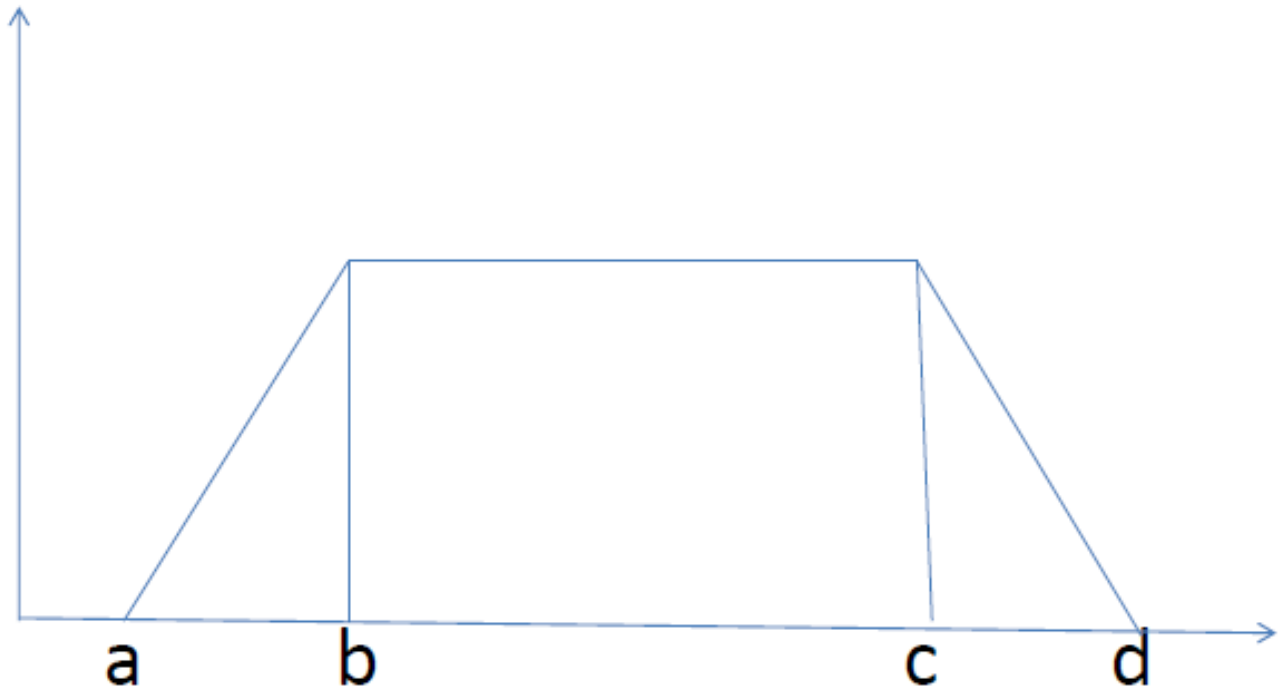
TRIANGULAR DISTRIBUTION CURVE:-



TRIANGULAR DISTRIBUTION CURVE:- CHARACTERISTIC

1. Peak is one Point.
2. Probability varies quickly around the two side.
3. Not necessary symmetric.
4. Range and peak point is quite enough to draw the curve.

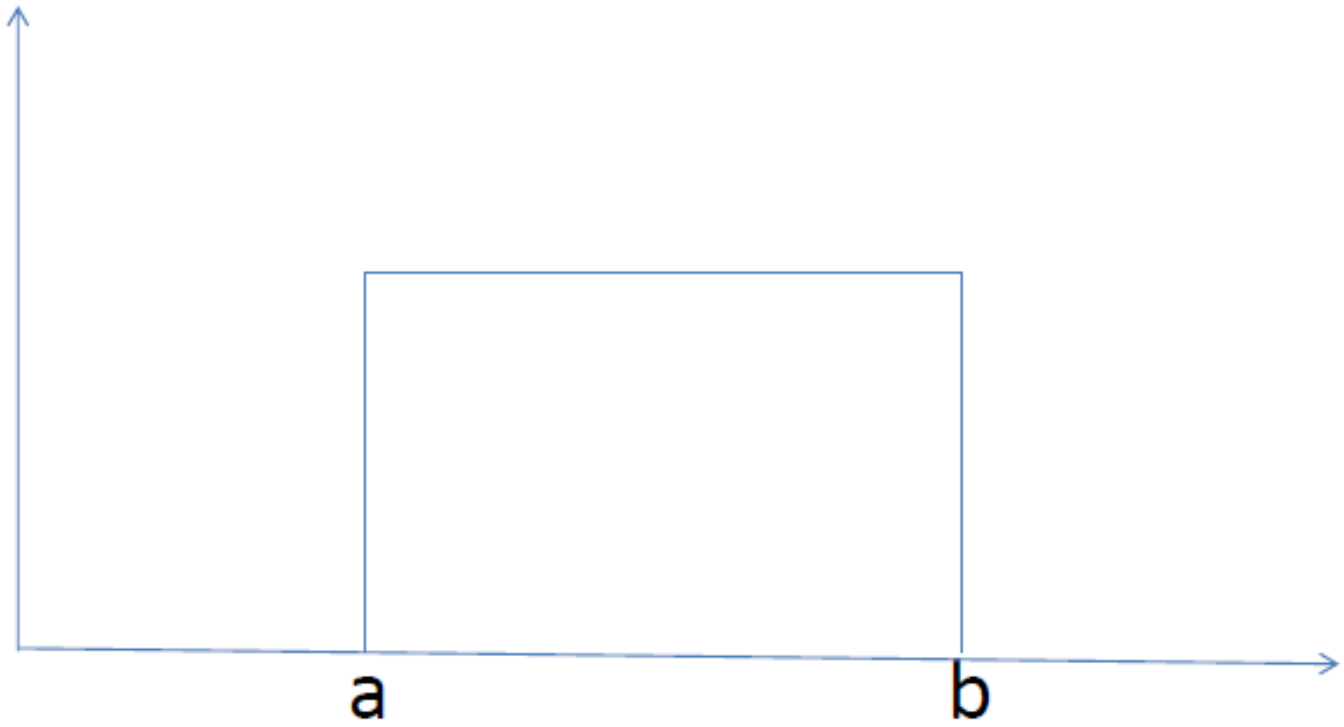
TRAPEZOIDAL DISTRIBUTION CURVE



TRAPEZOIDAL DISTRIBUTION CURVE CHARACTERISTIC

1. Peak is a range.
2. Data is not enough to draw other types of curves(Beta, Triangular)
3. It gives almost what is required.

RECTANGULAR DISTRIBUTION CURVE:



RECTANGULAR DISTRIBUTION CURVE CHARACTERISTIC

1. Peak is a range.
2. Uniform Distribution
3. Data is not enough to draw other types of curves(Beta, Triangular)
4. It gives almost what is required.

IN GENERAL

1.If we have enough data Beta and Triangular curves are most suitable to express probability

2. If we don't have enough data Trapezoidal, Rectangular are more suitable.

AS A CONCLUSION

- Sensitivity Analysis and Scenario Analysis disregard Risk Probability and Concentrate only With Risk Impact.

- Probability Analysis is a tool to calculate Risk Probability using statistical rules.

It is necessary to have a tool to combine Impact and Probability together, this technique is Expected Value Analysis

THANK YOU