



FE 302

Advance Facilities Engineering

Lesson 3

RISK MANAGEMENT PLANNING

Given a scenario, apply risk management actions & processes for a facilities engineering project

- (1) Evaluate the risk management tools and approaches for a given project
- (2) Select the risk management tools and approaches best suited to the assigned project
- (3) Apply the risk management tools and approaches selected to the assigned project
- (4) Produce a proposed risk handling plan for the assigned project before project initiation

What does RISK means to YOU?

**Personally
&
Professionally**

Annual Risk Of Death During One's Lifetime

<u>Disease and Accidental Causes of Deaths</u>	<u>Annual Deaths</u>	<u>Death Risk During One's Lifetime</u>
<i>Heart disease</i>	652,486	1 in 5
<i>Cancer</i>	553,888	1 in 7
<i>Stroke</i>	150,074	1 in 24
<i>Hospital Infections</i>	99,000	1 in 38
<i>Flu</i>	59,664	1 in 63
<i>Car accidents</i>	44,757	1 in 84
<i>Suicide</i>	31,484	1 in 119
<i>Accidental poisoning</i>	19,456	1 in 193
<i>MRSA (resistant bacteria)</i>	19,000	1 in 197



Annual Risk Of Death During One's Lifetime

<u>Disease and Accidental Causes of Deaths</u>	<u>Annual Deaths</u>	<u>Death Risk During One's Lifetime</u>
<i>Falls</i>	17,229	1 in 218
<i>Drowning</i>	3,306	1 in 1,134
<i>Bike accident</i>	762	1 in 4,919
<i>Air/space accident</i>	742	1 in 5,051
<i>Excessive cold</i>	620	1 in 6,045
<i>Sun/heat exposure</i>	273	1 in 13,729
<i>Lightning</i>	47	1 in 79,746
<i>Train crash</i>	24	1 in 156,169
<i>Fireworks</i>	11	1 in 340,733
<i>Shark attack</i>	1	1 in 3,748,067

Sources: All accidental death information from National Safety Council. Disease death information from Centers for Disease Control and Prevention. Shark fatality data provided by the International Shark Attack File.

© International Shark Attack File Florida Museum of Natural History, University of Florida

Technology and Risk

More people have died from taking selfies, than shark attacks this year!



DoD Risk Definition

“A measure of future uncertainties in achieving program goals and objectives within defined cost, schedule and performance constraints.”



DoD Risk Definition

Each risk event has three components:

- A future root cause
- The probability of the future root cause occurring
- The consequence if the root cause occurs

Risks vs. Issues

Risks should not be confused with issues

- **Issues** are root causes that *have occurred* or are so imminent they can not be avoided.
 - Issue management applies resources to resolve current issues or problems.
- **Risks** are *future, potential* root causes and their *consequences*.
 - Risk management applies resources to mitigate future potential root causes and their consequences.

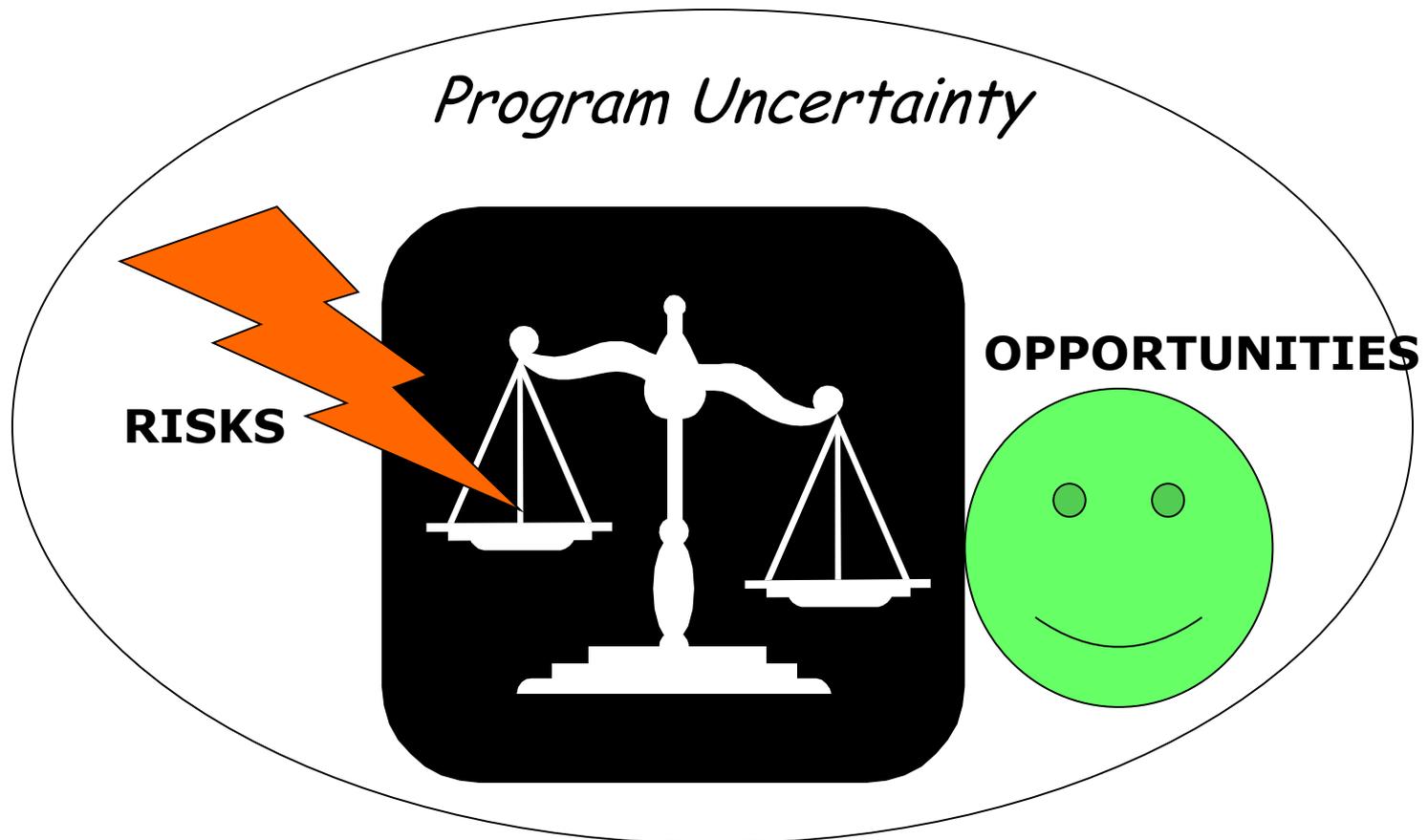
Risk Management

Purpose:

- To help ensure program cost, schedule, and performance objectives are achieved at every stage in the program
- To communicate to all stakeholders the process for uncovering, determining the scope of, and managing program uncertainties
- To address risks associated with all aspects of a program
- It involves all members of acquisition planning team

Program Management

Program decisions are made weighing risk versus opportunity using incomplete information!



DoD Risk Management and Opportunity Guide



Figure 1-2. Risk Management Process

Biases to Consider When Evaluating Risks (1 of 2)

- **Status quo bias**
 - Strong bias toward alternatives that perpetuate the status quo
 - More choices = increased attraction to status quo
- **Confirming evidence bias**
 - We seek out information that supports our existing point of view while avoiding information that contradicts it
 - Underlying factors
 - Tendency to be engaged more by things we like than dislike
 - Tendency to subconsciously decide what we want to do before we figure out why

Biases to Consider When Evaluating Risks (2 of 2)

- **Anchoring bias**
 - We tend to give disproportionate weight to the first information we receive
 - Most common anchor: a past event or trend
 - Underlying factors
 - Initial impressions, estimates, or data “anchor” subsequent thoughts and judgments
- **Sunk cost bias**
 - We tend to make choices in a way that justifies past choices
 - Allowing old investments of time/money to influence new decisions
 - Underlying factors
 - Failure to admit to past mistakes; failure to recognize previous investments as “unrecoverable”

Risk Planning Duties

When planning for risk management:

- Assign roles, responsibilities, and authorities
- Document overall approach:
 - Process and procedures
 - Risk analysis criteria for likelihood and consequences
 - Risk handling procedures
- Establish traceability of risk to technical requirements and overall program objectives
- Align government and contractor roles, responsibilities, tools, and information exchange
- Determine risk management resources, to include budget, facilities, personnel, schedule
- Determine risk management battle rhythm

Project Risk Types

Technical

Requirements

Technology

Engineering

Integration

Test

Manufacturing

Quality

Logistics

System Security/
Cybersecurity

Training

Programmatic

Estimates

Program Planning

Program Execution

Communication

Contract Structure /
Provisions

Schedule

Business (External)

Dependencies

Resources

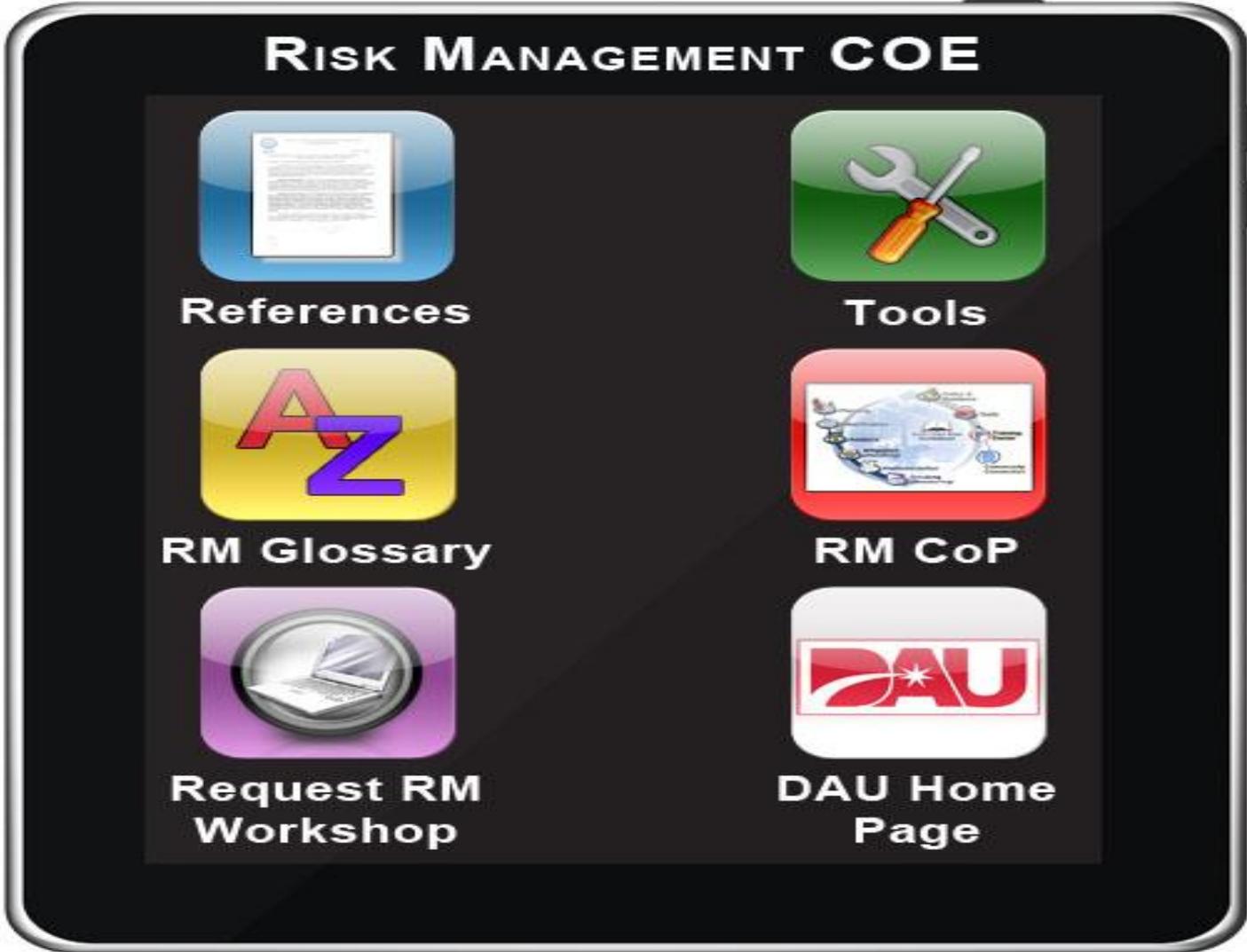
Priorities

Regulations/Laws

Market

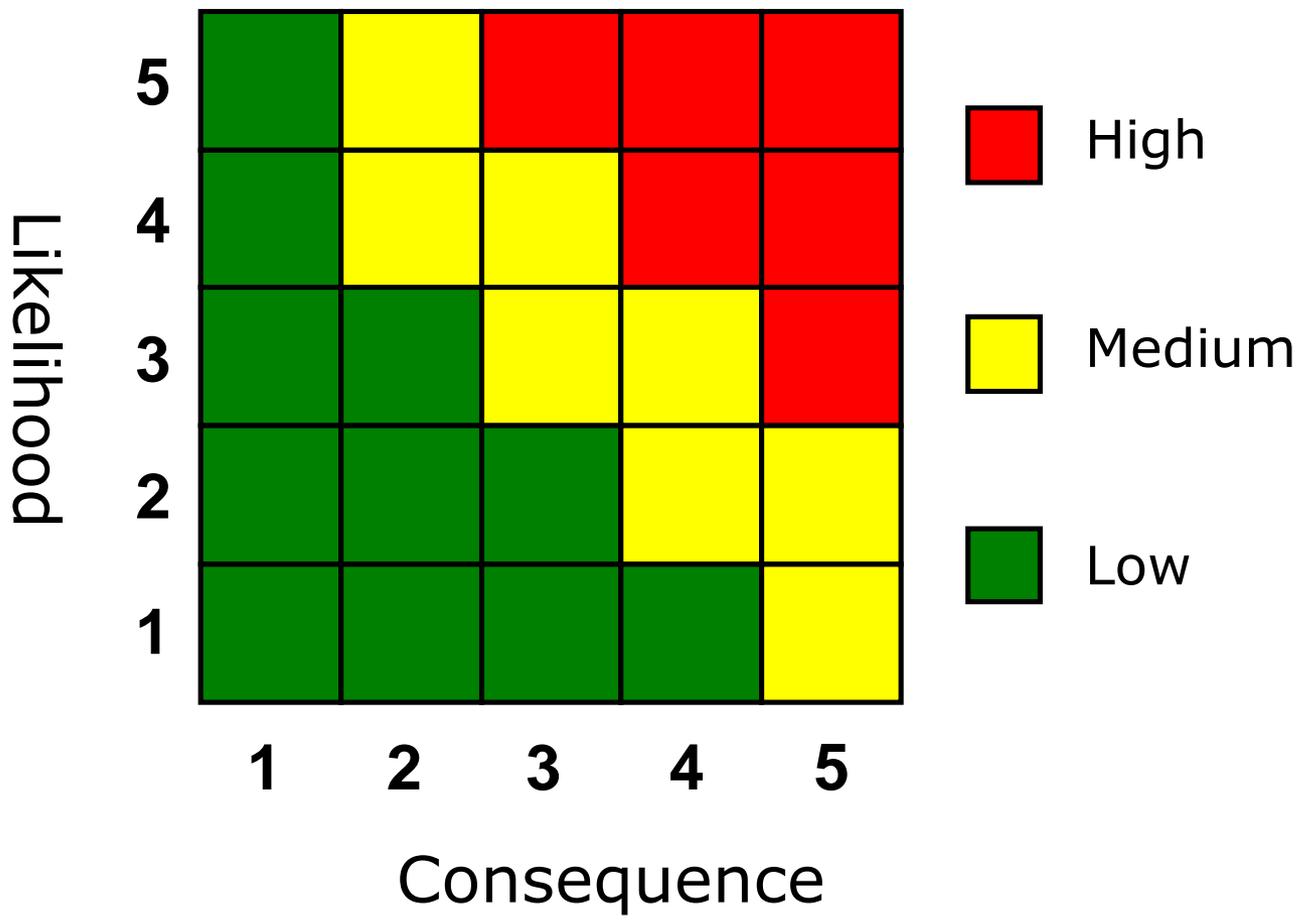
Customer

Weather

A tablet interface for the Risk Management Center of Excellence (COE). The screen has a black background with rounded corners and a silver border. At the top, the text 'RISK MANAGEMENT COE' is displayed in white, bold, sans-serif font. Below this, there are six icons arranged in a 3x2 grid, each with a corresponding label in white, bold, sans-serif font.

Icon Description	Label
Blue icon with a document page	References
Green icon with a wrench and screwdriver	Tools
Yellow icon with the letters 'A' and 'Z'	RM Glossary
Red icon with a globe and network diagram	RM CoP
Purple icon with a laptop and papers	Request RM Workshop
White icon with the DAU logo	DAU Home Page

Qualitative Risk Analysis - Probability & Consequence Matrix



USACE Risk Tools

Table 1: Probability Definition Index

Probability	
Highly Likely	Occurs often, continuously experienced.
Likely	Occurs several times.
Possible	Occurs sporadically.
Unlikely	Unlikely, but could occur at some time.
Very Unlikely	Can assume it will not occur.

USACE Risk Tools

Table 2: Risk Severity Index

Severity Threat/Opportunity	Consequence:	Rating
Catastrophic	Loss of ability to accomplish the project or extremely enhances value.	100
Substantial	Significantly degrades capabilities to accomplish the project or significantly enhances value.	50
Moderate		20
Marginal	Degrades project accomplishment capabilities or enhances value.	5
Negligible	Little or no impact on project accomplishment (or gain if opportunity).	1

USACE Risk Tools

Table 3: Risk Rating

Rating	Color Code
Extremely High	Red (50-500)
High	Orange(15-49)
Moderate	Yellow(3-14)
Low	Green(0-2.9)

Risk Response/Handling Efforts

- Risk Analysis identifies potential items which have the highest consequence to the project
- Risk Handling efforts can be used to help reduce future potential consequences
- Rerun of risk model may be required as risk handling efforts are enacted

Market Analysis by Cost Engineer

- Local Economy effect on Project
 - Materials
 - Labor Availability
 - Equipment Availability
 - Fuel
 - Available Contractors



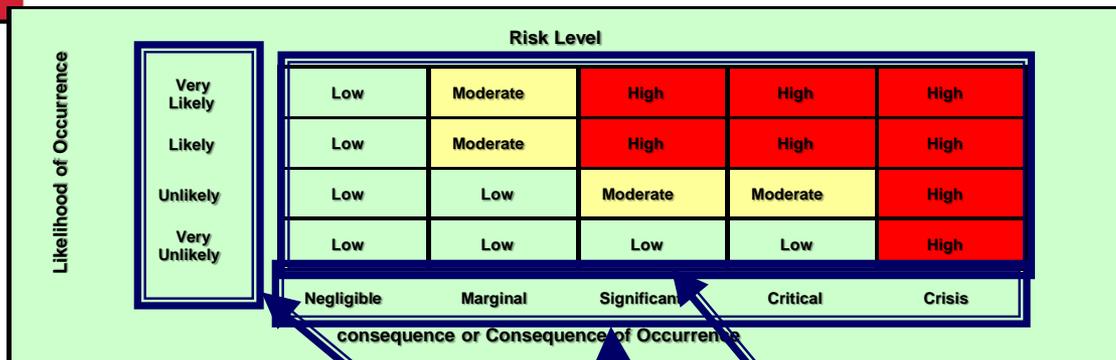
Schedule Risk Analysis



A schedule risk analysis uses statistical techniques to predict the level of confidence in meeting a program's completion date. This analysis focuses not only on critical path activities but also on activities near the critical path, since they can potentially affect program status.

Risk Register

Defense Ac



Risk No.	Risk Event	Likelihood	consequence	Risk Level	Notes
1	Bidding Climate – Saturated Local Market	LIKELY	MARGINAL	MODERATE	\$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.
2	Volatile Real Estate Values	UNLIKELY	NEGLIGIBLE	LOW	Little to no Real Estate to be purchased
3	Scope Definition	UNLIKELY	NEGLIGIBLE	LOW	Scope is well defined, There is minimal likelihood of scope increase or changes from the current documents used for estimate development
4	Scope Growth / Reduction	LIKELY	NEGLIGIBLE	LOW	Scope is well defined, There is minimal likelihood of scope increase or changes from the current documents used for estimate development
5	Weather	LIKELY	MARGINAL	MODERATE	Work will be done on the river, unpredictable, scour protection is more vulnerable
6	Schedule Constraints	LIKELY	SIGNIFICANT	HIGH	There are tight delivery windows that will require mitigation efforts if not met.
7	Labor Availability/Pricing	LIKELY	MARGINAL	MODERATE	\$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.
8	Equipment Availability/Pricing	UNLIKELY	NEGLIGIBLE	LOW	Fuel prices will consequence equipment operating costs
9	Material Availability/Pricing	LIKELY	SIGNIFICANT	MODERATE	Fuel prices will consequence delivery of materials and the cost of petroleum based materials, steel market still potentially volatile
10	Fuel Prices	VERY LIKELY	SIGNIFICANT	HIGH	\$2.65 per gallon was used in the Oct 06 MCACES, increases will effect equipment and delivery or materials
11	Potential savings due to innovation, streamlining, and gains in efficiency	UNLIKELY	NEGLIGIBLE	LOW	Value Engineering has already been incorporated into the project
12	Acquisition Plan	LIKELY	SIGNIFICANT	HIGH	The estimate was based on full and open competition, with minimal tiering of contractor subs. The Acq Plan has not been finalized, therefore there is a potential for additional tiering of the contracts

Risk Handling

- **Control**
- **Avoid**
- **Assume**
- **Transfer**

Risk Handling

Risk Mitigation examples:

- **Goals: Fewer failures, less rework, less waste**
 - **Lessons learned**
 - **Use of correct procurement method**
 - **Relevant evaluation criteria**
 - **QA/QC/QM**
 - **Training**
 - **Empowerment**

Risk Handling

Risk Avoidance examples:

- **Eliminate / modify requirements**
 - Done with coordination with customer
 - Maybe your req. is too state-of-the-art?
 - Do a cost to benefit analysis
- **Redesign (product or processes)**
 - Lean Six Sigma

Risk Handling

Risk Assumption examples:

- **Identify resources (time, \$, people) to overcome and actions to take if the risk occurs**
- **Contingency reserve for MILCON projects**
- **Use of contract clauses**

Risk Handling

Risk Transfer examples:

- **Performance and Payment Bonds**
- **Warranties**
- **Contract type: FP vice CR**
- **Insurance**
- **Design Build vice Design Bid Build**

What Are You to Do Next?

1. Develop and plot one Probability & Consequence Matrix include, at a minimum, the cost, schedule, quality, performance, environmental, and third-party risks on the Probability & Consequence Matrix.

Example:

Each Probability & Consequence Matrix should look something like this or use the USACE Matrix (next slide):

Likelihood	5	Green	Yellow	Red	Red	Red
	4	Green	Yellow	Yellow	A	Red
	3	Green	Green	Yellow	D	Red
	2	C	B	Green	Yellow	Yellow
	1	F	Green	E	Green	Yellow
		1	2	3	4	5
		Consequence				

Cost = A
 Schedule = B
 Quality = C
 Performance = D
 Environmental = E
 Third-Party
 consequence = F
 Other = G....

Don't forget to explain why you assigned a risk to a particular cell.

Identify Risk Items

- Cost Engineer explains the Basis of the Government Estimate (“Most Likely Cost”).
- The PT brainstorms potential risk elements.
- The PT then assigns the “likelihood” of occurrence.
- The PT assigns the “consequence” level if occurrence does happen.
- Based on the previous input, risk level events are identified for further action.

Risk Register						
Risk level						
Likelihood of Occurrence	Very Likely	Low	Moderate	High	High	High
	Likely	Low	Moderate	High	High	High
	Unlikely	Low	Low	Moderate	Moderate	High
	Very Unlikely	Low	Low	Low	Low	High
Impact or Consequence of Occurrence						
		Negligible	Marginal	Significant	Critical	Crisis
Risk No.	Risk Event	Likelihood	Impact	Risk Level	Notes	
1	Bidding Climate – Saturated Local Market	LIKELY	MARGINAL	MODERATE	\$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.	
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Finally...

2. Develop a risk handling plan (one paragraph each) for the three highest risks your group determines for the assigned project.
3. Remember the four risk mitigation strategies:
 - i. Mitigate
 - ii. Avoid
 - iii. Assume
 - iv. Transfer

Summary

Risk Analysis (Cost & Schedule) :

- Provides a communication tool to highlight potential risk items.
- Provides ability to develop more accurate cost and schedule information.
- Highlights critical areas for risk handling efforts



QUESTIONS?