"PROJECT MANAGEMENT IS RISK MANAGEMENT AND RISK MANAGEMENT IS PROJECT MANAGEMENT"

CMAA Breakfast Session
18 December 2019

INTRODUCTION OF PRESENTERS

<table>
<thead>
<tr>
<th></th>
<th>Eric Lowther</th>
<th>Jerry Klanac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years with PMA</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>PMA Home</td>
<td>Boston, Massachusetts</td>
<td>Ann Arbor, Michigan</td>
</tr>
<tr>
<td>Years of Risk Consulting</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Number of Projects (Risk Consulting)</td>
<td>~10</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Industry Sectors (Risk Consulting)</td>
<td>Rail, oil &amp; gas, hospitality, pharma/biomed, manufacturing, vertical/building</td>
<td>Oil &amp; gas, petrochemicals, renewable energy, pharmaceutical/life science</td>
</tr>
<tr>
<td>Key Competencies</td>
<td>Project controls, planning &amp; scheduling, claims &amp; changes analysis, training, facilitation, schedule risk analysis</td>
<td>Project controls, cost estimating, planning &amp; scheduling, claims &amp; changes analysis, training, facilitation, cost/schedule risk analysis</td>
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</table>
OVERVIEW

- Foundational Concepts
- Tour of Key Risk Management Processes
- Presentation/Discussion of Key Deliverables
- 7 Tips for Success in Risk Management
- 3 Things to Avoid in Risk Management
- Case Studies – Project Experiences

FOUNDATIONAL CONCEPT: WHAT IS RISK?

PMI Definition:

Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project’s objectives.

- Event with positive effect – opportunity
- Event with negative effect – threat
FOUNDATIONAL CONCEPT: TWO DIMENSIONS OF RISK

Risk Probability: likelihood each risk will occur

Risk Impact: Possible effect of risk on schedule, cost, quality, safety or performance

PROJECT MANAGEMENT INSTITUTE (PMI)

PMI, in its PMBOK, identifies 10 project management knowledge areas. Risk Management is one of them.
PMI’S RISK MANAGEMENT PROCESS

Project Risk Management Overview

- Plan Risk Management
  - Process of defining how to conduct risk management activities for a project

- Identify Risks
  - Process of determining which risks may affect the project and documenting their characteristics

- Perform Qualitative Risk Analysis
  - Process of prioritizing risks for further analysis or action by assessing and combining probability of occurrence and impact

- Perform Quantitative Risk Analysis
  - Process of numerically analyzing the effect of identified risks on overall project objectives

- Plan & Implement Risk Responses
  - Processes of (a) developing options, selecting strategies, and agreeing actions to address overall risk exposure as well as to treat individual risks and (b) implementing the agreed-upon plans

- Monitor Risks
  - Process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating the risk process effectiveness


RISK MANAGEMENT PROCESS IN ACTION

A Project (Cycle Approach)

Review → Plan → Identify → Risk Register → Mitigate → Assess → Respond

- Risk Identification Techniques
- Qualitative Analysis
- Quantitative Analysis

Risk Mitigation Strategies
APPLYING RISK MANAGEMENT ACROSS LIFECYCLE OF PROJECT

Overall Project Duration: Concept to Fully Operational

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>First comprehensive risk evaluation for project</td>
</tr>
<tr>
<td>Definition</td>
<td>Emphasis is on qualitative analysis</td>
</tr>
<tr>
<td>Design</td>
<td>Mitigate actions may occur over entire duration of project</td>
</tr>
<tr>
<td>Develop or Build</td>
<td>Respond actions may occur over entire duration of project</td>
</tr>
<tr>
<td>Application (Testing)</td>
<td>Risk Register (updated routinely over course of project)</td>
</tr>
<tr>
<td>Post-Completion</td>
<td>Second comprehensive risk evaluation for project, often done in conjunction with evaluation of project options</td>
</tr>
</tbody>
</table>

Risk Management During Execution of Project

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan Risk Responses</td>
<td>Review and evaluation can be &quot;ad hoc&quot; or performed on regular frequency</td>
</tr>
<tr>
<td>Plan Risk Management</td>
<td>Qualitative + Quantitative analyses</td>
</tr>
<tr>
<td>Identify Risks</td>
<td>Mitigate actions may occur over entire duration of project</td>
</tr>
<tr>
<td>Assess Risks</td>
<td>Respond actions may occur over entire duration of project</td>
</tr>
</tbody>
</table>

PMI PROJECT RISK MANAGEMENT

Flow Diagram

Plan Risk Management
- Tailored risk management process
- Risk thresholds
- Process Rules
- Risk Management Plan

Perform Qualitative Risk Analysis
- Probability, impact
- Root causes
- Importance
- Prioritized list

Perform Quantitative Risk Analysis
- Numerical Models
- Combined outcomes
- Confidence limits
- Sensitivity analysis
- Prioritized list updates
- Simulation

Plan Risk Responses
- Strategies
- Actions
- Action Owners
- Timing
- Analysis
- Project plan updates

Monitor & Control Risks
- Status and trends
- Reporting
- Trends in risk exposure

Source: Practice Standard for Project Risk Management, PMI, pg. 17
COST & SCHEDULE RISK ANALYSIS
Commonly Used 6-Step Process for Analysis

Review
- Ensure starting point – either estimate or schedule – is suitable to use as basis for the analysis.

Identify
- Identify and prioritize risks that can affect the project’s cost and schedule outcome.

Model
- Create model and set up inputs to use for Monte Carlo simulation.

Range
- Determine probabilistic characteristics of model inputs (probability distributions, ranges, etc.).

Simulate
- Perform Monte Carlo simulation. Select number of iterations in order results are stable and repeatable.

Report
- Interpret simulation results for project team’s use.

KEY DELIVERABLES FROM EFFECTIVE RISK MANAGEMENT
## RISK MANAGEMENT PLAN

**Items to Address in Risk Management Plan**

- Project description
- Risk management methodology
- Risk management organization
- Roles & responsibility + authority
- Stakeholder risk tolerance
- Risk breakdown structure
- Criteria for success
- Risk management tools and guidelines for use
- Risk thresholds and corresponding definitions
- Templates to use (such as risk register)
- Communication plan (relating to risk management activities)
- Risk strategy considerations

Adapted from Practice Standard for Project Risk Management, PMI, pg. 21-22

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### RISK REGISTER

<table>
<thead>
<tr>
<th>Risk Identification</th>
<th>Risk Evaluation</th>
<th>Risk Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>IMPACT</td>
<td>PROB.</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

- Repository for information regarding each project risk:
  - Status
  - Risk Statement
  - Probability & Impact evaluation
  - Responses
  - Risk Owner
  - Current Action Items

Most risk registers are either an Excel spreadsheet or customized database.
PROBABILITY IMPACT MATRIX

Qualitative Risk Analysis:
Probability – Impact Approach to Project Risk Analysis

<table>
<thead>
<tr>
<th>Probability</th>
<th>Very High</th>
<th>Med</th>
<th>Med</th>
<th>High</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
<td>Med</td>
<td>Med</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td>Med</td>
<td>Med</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>Med</td>
<td>Med</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Very Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Med</td>
<td>Med</td>
<td>High</td>
</tr>
<tr>
<td>Very Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td></td>
</tr>
</tbody>
</table>

Impact on Project Objective

This is a simple example of a probability-impact matrix. Some call this a probability-impact grid (PIG) or “risk heat map”.

PROBABILITY DISTRIBUTION PROFILE

Example from Schedule Risk Analysis Simulation

Key information to use to set targets and contingencies
The schedule sensitivity index of a task is calculated by multiplying its criticality index by the ratio of its variance against the variance of the project (or key task).

In 2008, PMA started to use “end-node” diagrams to graphically show the flow of “criticality” across the risk model schedule network. Criticality is frequency an activity was critical in the simulation iterations: For simulation using 1,000 iterations, an activity with 31% criticality would be on the project’s critical path in 310 iterations.
EXECUTING EFFECTIVE RISK MANAGEMENT:

7 TIPS FOR SUCCESS

TIP #1:
APPLY RISK BREAKDOWN STRUCTURE

What is a risk breakdown structure (RBS)?
- Hierarchical representation of risks according to their risk categories

Why use a RBS?
- Organizes risks by logical or meaningful groups – it is common that a normal construction project will have 50 or more risks
- Serves as a high-level checklist to ensure risks from all project features are considered
- Helps to create identification scheme for risks
### EXAMPLE OF RISK BREAKDOWN STRUCTURE

**Textbook Approach**

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
<td>Change in legal or regulatory requirements, possibility of claims (from various sources)</td>
</tr>
<tr>
<td>Organizational</td>
<td>Ability for Owner to define project and/or make effective decisions, project management concerns (obtaining project personnel, effective communications and application of processes), ability to perform contracting and procurement</td>
</tr>
<tr>
<td>Technical (Scope)</td>
<td>New technology application or innovation challenges, revamp/retrofit concerns, disappointing performance by designer and contractors, ability to define project scope and prepare reliable cost and schedule estimates.</td>
</tr>
<tr>
<td>Zoning (Site Characteristics)</td>
<td>Differing site conditions, underground obstructions, unusual climatic conditions, quality of soil conditions, environmental concerns (protected species or fauna), construction logistics (laydown areas, access, transportation links)</td>
</tr>
<tr>
<td>Financial</td>
<td>Price increases, bankruptcy of Owner or contractor, inability to secure project funds, change in taxes, change in currency rates</td>
</tr>
<tr>
<td>Social</td>
<td>Public relations issues, delays or demonstrations by locals, strikes, noise or light pollution issues during construction</td>
</tr>
<tr>
<td>Political</td>
<td>Failure to obtain permits, lack of agreements with local authorities, insufficient insight into municipal requirements (execution method, architectural design, adaptation to surrounding environment)</td>
</tr>
</tbody>
</table>

Adapted from *Project Risk Management*, Appendix 1, Daniella van Wel-Stam, Fianne Lindenaar, Suzanne van Kinderen, Bouke van den Bunt, pg. 143-147

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### SIMPLE RISK TOLERANCE EXERCISE

- Here's the bet:
  - If I roll a die and it comes up 3 or 4, I win.
  - If I roll a die and it comes up 1, 2, 5, or 6, you win.

- Show of hands: **How much money are you willing to wager on winning this bet?**
TIP #2: USE RISK SCALES TO DOCUMENT RISK THRESHOLDS

What are risk scales?
- Risk scales are used to assess the severity of a risk's uncertainty (probability of occurrence) and impact.
- Most organizations use a 5-level scale: very low, low, medium, high and very high.
- Each level is set based on the risk threshold perspective of the organization, which relates the organization's tolerance for risk.

Why are these scales important?
- Once the risk scales are set, they create consistency – especially when risk management is applied over a portfolio of projects.

How do you assess a risk using these scales?
- Project team tries to establish the “worst credible” view of the risk and then apply that view against the scales.

RISK THRESHOLDS

Probability

<table>
<thead>
<tr>
<th>General Rating</th>
<th>Cardinal</th>
<th>Cardinal (w/Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>10%</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>Low</td>
<td>30%</td>
<td>10% - 30%</td>
</tr>
<tr>
<td>Medium (or Moderate)</td>
<td>50%</td>
<td>30% - 60%</td>
</tr>
<tr>
<td>High</td>
<td>70%</td>
<td>60% - 90%</td>
</tr>
<tr>
<td>Very High</td>
<td>90%</td>
<td>&gt; 90%</td>
</tr>
</tbody>
</table>

Risk thresholds can be modified to suit the risk attitudes of an organization and the nuances of a project. If a project is part of a portfolio, often a common risk threshold is developed for all projects – this creates consistency as information may be “rolled up” into a portfolio level.
### RISK THRESHOLDS

**Impact**

<table>
<thead>
<tr>
<th>General Rating</th>
<th>Cardinal (linear)</th>
<th>Cardinal (non-linear)</th>
<th>Ordinal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>0.1</td>
<td>0.05</td>
<td>A</td>
</tr>
<tr>
<td>Low</td>
<td>0.3</td>
<td>0.1</td>
<td>B</td>
</tr>
<tr>
<td>Medium (or Moderate)</td>
<td>0.5</td>
<td>0.2</td>
<td>C</td>
</tr>
<tr>
<td>High</td>
<td>0.7</td>
<td>0.4</td>
<td>D</td>
</tr>
<tr>
<td>Very High</td>
<td>0.9</td>
<td>0.8</td>
<td>E</td>
</tr>
</tbody>
</table>

For the Ordinal Scale, usually there is some sort of guidance on what distinguishes each level – see next slide.

### RISK THRESHOLDS

**Defining Ordinal Impact Scale**

<table>
<thead>
<tr>
<th>Cost Impact</th>
<th>Schedule Impact</th>
<th>Technical Impact</th>
<th>Scale Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 10% (of project cost)</td>
<td>Can’t achieve key team or major program milestone</td>
<td>Unacceptable</td>
<td>E</td>
</tr>
<tr>
<td>7-10% (of project cost)</td>
<td>Major slip in key milestone or critical path impacted</td>
<td>Acceptable; no remaining margin</td>
<td>D</td>
</tr>
<tr>
<td>5-7% (of project cost)</td>
<td>Minor slip in key milestone or unable to meet “need date”</td>
<td>Acceptable; with significant reduction in margin</td>
<td>C</td>
</tr>
<tr>
<td>&lt;5% (of project cost)</td>
<td>Additional resources needed to keep on schedule – able to meet “need date”</td>
<td>Acceptable; with some reduction in margin</td>
<td>B</td>
</tr>
<tr>
<td>Minimal or no cost impact</td>
<td>Minimal or no schedule impact</td>
<td>Minimal or no technical impact</td>
<td>A</td>
</tr>
</tbody>
</table>

Source: Kerzner, Harold, PhD, Project Management: A Systems Approach to Planning, Scheduling and Controlling, 10th Edition, pg. 769
RISK THRESHOLDS

Impact (Based on Project Objectives)

<table>
<thead>
<tr>
<th>Project Objective</th>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Insignificant Cost Increase</td>
<td>&lt;5% Cost Increase</td>
<td>5%-10% Cost Increase</td>
<td>10%-20% Cost Increase</td>
<td>&gt;20% Cost Increase</td>
</tr>
<tr>
<td>Schedule</td>
<td>Insignificant Schedule Slippage</td>
<td>&lt;5% Schedule Slippage</td>
<td>5%-10% Schedule Slippage</td>
<td>10%-20% Schedule Slippage</td>
<td>&gt;20% Schedule Slippage</td>
</tr>
<tr>
<td>Technical: Scope</td>
<td>Scope Barely Affected</td>
<td>Minor Areas of Scope Affected</td>
<td>Major Areas of Scope Affected</td>
<td>Scope Difference Unacceptable</td>
<td>Project scope is now useless</td>
</tr>
<tr>
<td>Technical: Quality</td>
<td>Quality Degradation Barely Noticeable</td>
<td>Only Very Demanding Applications Are Affected</td>
<td>Quality Reduction Requires Client Approval</td>
<td>Quality Reduction Unacceptable to Client</td>
<td>Project is now useless</td>
</tr>
<tr>
<td>Safety</td>
<td>Assessment Required</td>
<td>May add to a hazard</td>
<td>Creates a hazard</td>
<td>Potential for injury or fatality</td>
<td>Likely to cause injury or fatality</td>
</tr>
</tbody>
</table>

This is just an example; threshold levels can be set based on organization’s risk attitudes.

QUICK DISCUSSION

Suppose your project’s risk register has a risk listed just as “poor productivity”.

Is this an effective risk statement? Why or why not?
**TIP #3: USE EFFECTIVE RISK STATEMENT**

What is an effective risk statement?

- Risk described in a statement (complete sentence) that clearly presents:
  - The **cause** of the risk
  - The **event** created by the risk
  - The **consequence** of the risk event

Why is this beneficial?

- Better communication of the risk:
  - Consider a risk statement of “poor productivity” – what does that really mean?
  - Recommended meta-language makes it easier to assess the impact of the risk – which is needed to prioritize risks.

**RISK DESCRIPTION**

*Use of Structured Risk Statement*

Should include *cause, event, and consequence.*

**Format:**

“Because of _______,
_________ may occur during _________, thereby causing
an impact to _________.”

**Example statement:**

Because of *excessive wet weather, inefﬁciency* may occur during civil work, thereby causing an impact (delay) to *the construction schedule.*
RISK STATEMENTS

Poor vs. Better

<table>
<thead>
<tr>
<th>Poorly Written Statement</th>
<th>Better Version Using Structured Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piping installation rework</td>
<td>Due to incomplete information to the pipe fabricator, pipe spools may be fabricated to wrong revision, thereby creating pipe installation rework in the field when they do not fit properly.</td>
</tr>
<tr>
<td>Bad Weather</td>
<td>High speed winds may occur during heavy lift operations, thereby causing an impact on the project schedule.</td>
</tr>
<tr>
<td>Currency Rates</td>
<td>Foreign currency exchange rates may fluctuate against the basis in the budget, thereby causing an impact on project costs.</td>
</tr>
<tr>
<td>Late Training Materials</td>
<td>Limited availability of technical writers may cause training manuals not to be ready by planned training date; this delay may impact the schedule.</td>
</tr>
</tbody>
</table>

TIP #4: EFFECTIVE PRIORITIZING OF RISKS

Why is prioritizing of risks important?
- If there are 50 risks, which one would you deal with first? Especially with limited project resources.
- Need ways to assess

How are risks prioritized?
- First view is by the P-I rating (probability-impact rating)
- Second view is use a Perceptual Factor, examples:
  - Familiarity – past experience of dealing with risk
  - Manageability – view of degree of control of the risk
  - Proximity or Urgency – how soon the risk could occur
  - Propinquity – how risk can affect members of the project organization
EXAMPLE RISK FOR EVALUATION

Background:
Construction of LNG storage tank requires high-strength concrete that can resist very low operating temperatures.

- **Risk Statement:** Due to inadequate aggregate strength, concrete mix does not meet technical specifications and is rejected, thereby causing a schedule delay until a compliant batch is achieved.

- **Assessment of Probability:** Low (20% - 1 in 5 chance)

- **Assessment of Impact:** Very High (80%) as it can delay construction on the critical path by months.

QUALITATIVE RISK ANALYSIS PRIORITIZATION

*Mapping on Probability-Impact Matrix*

Risk is assigned to “cell” in matrix where probability is “low” and impact is “very high”. This risk is in the red zone of the matrix and is one that will require some sort of mitigation strategy to move it to a better position in the matrix.

**Risk:** Due to improper aggregate strength, concrete mix does not meet technical specifications and is rejected, thereby causing a schedule delay until a compliant batch is achieved.

**Probability:** Low (20%)

**Impact:** Very High (80%) as it can delay construction by months.
PRIORITIZATION OF RISK USING P-I RATING

P-I Rating

An alternate method of ranking risk is to determine its P-I Rating: multiplication of probability and impact values.

- **Risk**: Due to inadequate aggregate strength, concrete mix does not meet technical specifications and is rejected, thereby causing a schedule delay until a compliant batch is achieved
- **Probability**: Low (20%)
- **Impact**: Very High (80%) as it can delay construction by months
- **P-I Rating**: \(0.16 = (80\% \times 20\%)\)

RISK PRIORITIZATION USING PERCEPTUAL FACTOR

Advanced Consideration: Urgency

- Risks requiring near-term responses may be considered more urgent to address.
- In Risk Urgency Assessment, a final “risk severity ranking” is determined by adjusting the basic risk ranking (P-I score) by considering other urgency-based factors, such as:
  - Probability of detecting the risk
  - Time to affect a risk response, symptoms and warning signs

Urgency Evaluation of Example Risk:

**Risk**: Due to inadequate aggregate strength, concrete mix does not meet technical specifications and is rejected, thereby causing a schedule delay until a compliant batch is achieved.

**Basic Risk Ranking**:
- Probability: Low (20%)
- Impact: Very High (80%) as it can delay construction by months
- P-I Rating: \(0.16 = (80\% \times 20\%)\)

**Risk Severity Ranking**:
- P-I Rating: \(0.16 = (80\% \times 20\%)\)
- Near-Term Risk: Risk could occur within next 6 months – High Urgency (80%)
- Risk Severity Rating: \(12.8 = (80\% \times 20\% \times 80\%) \times 100\)
TIP #5: UNDERSTAND YOUR OPTIONS

**Threat**
- Avoidance: Taking actions to avoid the risk
- Acceptance: Moving forward, recognizing the risk and its consequences
- Mitigate: Taking actions to reduce probability of risk and/or impact of risk
- Transfer: Being able to shift risk to another party (e.g., insurance)

**Opportunity**
- Exploit: Taking actions to ensure opportunity happens
- Ignore: Prepare to seize opportunity at a later time
- Enhance: Take steps to seize a bigger “prize”
- Share: Engage another party to assist in capturing opportunity

TIP #6: SELECT RISK IDENTIFICATION TECHNIQUES TO GET EVERYONE ENGAGED

- Many options are available to identify risks:
- Apply techniques that cover these three (3) perspectives of risk identification:
  - **Current Project Risk Identification**
    - **Past**
      - Historical Review:
        - Based on what has occurred on past projects
        - Need to filter experiences to match what is really relevant to current project
        - Once filtered, assess if these past risks could arise in current project
    - **Present**
      - Current Assessment:
        - Based on current state of project
    - **Future**
      - Creativity Techniques:
        - Encourages stakeholders to use their imagination to find risks that may affect the project
        - Multiple techniques for this interaction are available
        - Need combination of techniques to get participants to think creatively, without suppression of good or bad ideas
TIP #7: NOMINATE EFFECTIVE “RISK CHAMPION”

- Need someone in project organization to be focal point to ‘manage the process’ – not the risk owner
- Nominated individual must:
  - Be able to interact with entire project organization
  - In many cases, be able to “bird dog” other team members to complete actions related to risk management
  - Routinely facilitate sessions to update the risk register
  - Keep everyone informed
- Small projects – often is project manager
- Large projects – may be part of project controls organization or separate entity in organization chart

EXECUTING EFFECTIVE RISK MANAGEMENT:

3 THINGS TO AVOID
AVOIDANCE TIP #1:
AVOID BIAS: USE INDEPENDENT FACILITATOR

- Risk management is most successful when inputs into various processes is free from bias and covers the project comprehensively.
- Experience from engaging with many project teams, is that there is more optimism, then pessimism:
  - “We can get it done” attitude
  - “This risk won’t exist” or “We have a way to work around this problem”
  - “This won’t happen to our project”.
- Use of independent facilitator for key risk management activities can help to reduce effect of biases:
  - Challenges input constructively
  - In group settings, lets the “quietest voice” speak up
  - Asks probing questions to ensure thinking is comprehensive
- Use independent facilitator for: risk identification sessions, evaluating probability & impact ratings, input to quantitative risk models for cost & schedule analyses

AVOIDANCE TIP #2:
AVOID SURPRISES – UPDATE RISK REGISTER REGULARLY

- Over life of project, risks can transform:
  - Risks initially thought to be big problems, aren’t
  - Risks initially thought to be trivial become big deals
- Avoid the common trap of creating a risk register at the beginning of the project and then don’t use it for the rest of the project.
- Find a frequency of discussions to update the risk register that works for the team (once a month, once a quarter, etc.).
- Cover the following:
  - Review status of all “open” risks – are the probability and impact ratings appropriate?
  - Review possible triggers of risks where risk responses may to be actioned
  - Identify whether new risks have emerged
AVOIDANCE TIP #3:
AVOID COMPLACENCY & ACCEPTANCE OF ABNORMALITIES

Review of root causes for these events leads to following observations:

- Beware of shift in risk acceptance, especially as it relates to an acceptance of an abnormal situation
- Made decisions to carry on despite warning signs:
  - Placed reliance on past success rather than applying sound engineering practices – often caused by schedule pressures coupled with breakdown of effective communications
  - To become complacent is a very human trait, but it can have dire consequences when it involves risky activities.

SELECTED CASE STUDIES
CASE STUDY #1

Minneapolis-St. Paul Airport: Terminal 1 Parking Garage Expansion

Background:
- Expansion of existing parking garage at Terminal 1 – 5,000 spaces to be created.
- Project site congested and part of project “foot print” is right over existing light rail transit station.
- Required specialized construction for building load transferring foundations (minimizing load over transit station) and new vent shaft for transit station.

Key Concerns (Geo-Technical):
- Maintain integrity of rock strata that is essentially the “roof” of light rail transit station
- No disruption of normal light rail transit service from vibration or noise
- Unexpected subsurface conditions
  - Discontinuity of known rock conditions (sandstone & limestone)
  - Unknown obstructions

PMA conducted a qualitative and quantitative risk analysis for this focused part of the project over a 5-week period. Participants from Owner, consulting engineering firms and construction management were active in this effort.

CASE STUDY #1

- Nearly 50 risks evaluated
- Initially all risks were plotted in an “unmitigated state” – without any risk responses
- For each risk in the ‘yellow zone’, possible risk responses were discussed and evaluated. [There were no risks in the “red zones.”]
- This graphic shows the effect of agreed-upon risk responses on several of the risks.
- Cost and schedule risk analysis were performed based on the mitigated state of the project.
CASE STUDY #2
Washington State Refinery Project (Clean Diesel Fuel)

**Background:**
- Design & construction of new diesel hydrotreater unit, hydrogen plant and assorted refinery modifications to meet new U.S. standards for sulfur content in diesel fuel.
- Schedule of project was affected by capital funds available each calendar year.

**Key Concerns:**
- Timely delivery of key process equipment – fabricated overseas
- Delivery of major vessel at site – avoid salmon spawning season
- Performing construction work in an operating refinery
- Delays and labor productivity performance due to weather conditions in the Bellingham, WA area.

PMA conducted several schedule risk analysis over the project’s life-cycle. PMA’s early forecasts for completion of the project were very accurate.

**CASE STUDY #2**
View of Risk-Weighted Projections

Review in mid-2010 very accurately predicted the completion of the project (nearly 3 years later)
CASE STUDY #2

Risk Not Evaluated

- Strange things do happen
- This risk was deemed to be an extraordinary random event and was excluded from the quantitative risk analysis
- Very tough morning for the project manager as he watched the event from shore early that morning.

CASE STUDY #3

Transportation Authority Project (Rail Signaling)

- PMA engaged to provide cost and schedule risk analysis to support critical stage gate decision.
- Project team provided base cost estimates and schedules for PMA to create simulation models.
- As part of our risk analysis process, PMA was validating models with project team.
- During review, it became apparent that this base estimate and schedule was inconsistent with current planning.
- What do we now?

Options for risk analyst:
- Stop the process
- Move forward but “change models on the fly” – i.e., work with the team
- Carry on with flawed models (not recommended)
THANK YOU & QUESTIONS