Risk Overview

Excerpted from Pfleeger and Atlee, 4e
3.4 Risk Management
What is a Risk?

• Risk is an unwanted event that has negative consequences

• Distinguish risks from other project events
  - Risk impact: the loss associated with the event
  - Risk probability: the likelihood that the event will occur

• Quantify the effect of risks
  - Risk exposure = (risk probability) x (risk impact)

• Risk sources: generic and project-specific
3.4 Risk Management

Risk Exposure

- Do regression testing?
  - Yes
    - Find critical fault: $P(UO) = 0.75$, $L(UO) = $0.5M
      - Risk Exposure: $0.375M$
    - Don't find critical fault: $P(UO) = 0.05$, $L(UO) = $30M
      - Risk Exposure: $1.50M$
  - No critical fault: $P(UO) = 0.20$, $L(UO) = $0M
    - Risk Exposure: $0M$

- No
  - Find critical fault: $P(UO) = 0.25$, $L(UO) = $0.5M
    - Risk Exposure: $0.125M$
  - Don't find critical fault: $P(UO) = 0.55$, $L(UO) = $30M
    - Risk Exposure: $16.50M$
  - No critical fault: $P(UO) = 0.20$, $L(UO) = $0M
    - Risk Exposure: $0M$

Combined Risk Exposure:

- Risk Exposures:
  - $0.375M$
  - $1.50M$
  - $16.625M$

- Combined Risk Exposure: $1.875M$
3.4 Risk Management
Quantifying Risk Impact

- The impact risk (severity) is an estimate of the impact to technical performance, cost, and schedule if the risk occurs.
- Impact can be quantitized to low, medium, and high.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Performance</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Minimal or no impact, unimportant</td>
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</tr>
<tr>
<td>Medium</td>
<td>Acceptable with reduction in margin</td>
<td>Additional resources required, Minor slip in key milestones (&lt;20% slip in total schedule)</td>
<td>Cost estimates exceed budget by &lt;7%</td>
</tr>
<tr>
<td>High</td>
<td>Acceptable with no remaining margin; Unacceptable</td>
<td>Major slip in key milestones or Critical Path impacted (&gt;20% slip in total schedule)</td>
<td>Cost estimates exceed budget by &gt;7%</td>
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3.4 Risk Management
Quantifying Risk Probability

- Risk Probability – likelihood an event will occur
- Risk Probability can be quantized to low, medium, and high.

<table>
<thead>
<tr>
<th>Likelihood of Occurrence</th>
<th>Description</th>
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<tbody>
<tr>
<td>Low</td>
<td>0 – 30% change this risk will occur</td>
</tr>
<tr>
<td>Medium</td>
<td>30% - 80% chance this risk will occur</td>
</tr>
<tr>
<td>High</td>
<td>80% - 100% change this risk will occur</td>
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3.4 Risk Management
Prioritizing Risk

- Focus on those items with the highest risk level

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Risk Level

- **HIGH** – unacceptable. Major disruptions to the project/program likely. Different approach dictated. Additional management attention required.

- **MEDIUM** – Some disruption to the project/program. Alternative approaches should be investigated to reduce risk. Additional management attention may be required.

- **LOW** – Minimum impact. Minimum oversight needed to ensure risk remains low.
3.4 Risk Management

Risk Management Activities

Risk assessment
- Risk identification
  - Checklist
  - Decomposition
  - Assumption analysis
  - Decision driver analysis
- Risk analysis
  - System dynamics
  - Performance models
  - Cost models
  - Network analysis
  - Decision analysis
  - Quality risk factor analysis
- Risk prioritization
  - Risk exposure
  - Compound risk reduction
  - Buying information
  - Risk avoidance
  - Risk transfer
  - Risk reduction leverage
  - Development process
  - Risk element planning
  - Risk plan integration
- Risk control
  - Risk management planning
    - Risk element planning
    - Risk plan integration
  - Risk mitigation
  - Risk monitoring and reporting
  - Risk reassessment
- Risk resolution
3.4 Risk Management
Risk Management Activities (continued)

- Three strategies for risk reduction (mitigation)
  - *Avoiding the risk*: change requirements for performance or functionality
  - *Transferring the risk*: transfer to other system, or buy insurance
  - *Assuming the risk*: accept and control it
3.4 Risk Management
Risk Management Activities (continued)

• What is the goal of risk mitigation?
  • Reduce both Likelihood AND Impact

• Cost of reducing risk
  ▪ *Risk leverage* = (risk exposure before reduction – risk exposure after reduction) / (cost of risk reduction)
Sidebar 3.4 Boehm’s Top Ten Risk Items

- Personnel shortfalls
- Unrealistic schedules and budgets
- Developing the wrong functions
- Developing the wrong user interfaces
- Gold-plating
- Continuing stream of requirements changes
- Shortfalls in externally-performed tasks
- Shortfalls in externally-furnished components
- Real-time performance shortfalls
- Straining computer science capabilities
### 3.4 Risk Management

#### Characterizing Risks

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
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</table>
| Personnel/Staffing | • Loss of institutional knowledge  
                      • Staff retention  
                      • Full staffing/Inadequate Staffing Levels  
                      • Security clearances  
                      • Lack of staff skills/qualifications |
| Technical          | • Security  
                      • Incomplete, missing or outdate information  
                      • Software  
                      • Hardware  
                      • Missing/Conflicting requirements |
| Management         | • Uncooperative customer  
                      • Prime/subcontractor relations  
                      • Task assignment processing |
Risks for your Project

- What risks do you have?
- What risks have already occurred?
  - Mitigation?
  - Impact on project?
  - Take home message?