Recognizing and Mitigating Risk in Acquisition Programs

Debra E. Hahn
Debbie.hahn@dau.mil
703-805-2830

• Specifies the Technology Maturation and Risk Reduction Phase

• “Risk Reduction Decision, called Milestone A by DoD, is an investment decision to pursue specific product or design concepts, and to commit resources required to mature technology and/or reduce any risks that must be mitigated prior to decisions committing the resources needed for development leading to production and fielding.”

• The PM is responsible for implementing effective risk management activities


• This guide “promotes the DoD process to identify, analyze, mitigate, and monitor risks, issues, and opportunities. Proactively addressing not only risks, but also issues and opportunities can help programs achieve cost, schedule, and performance objectives at every stage of the life cycle.”

• “The DoD risk management process is fundamental to acquisition program success”
Exercise 1

In the context of the DoD acquisition environment;

1. Define risk
2. Explain the components of risk
3. Explain how risk is measured
4. Outline the relationship between risk and opportunity
What is Risk?

The potential for a negative consequence due to a future undesirable event that may or may not occur.

The measure of potential consequence or impact of a specific event on a program’s/weapon system’s ability to meet cost, schedule and/or technical objectives

- Risk has three primary components:
  - **Probability** of the activity/event occurring or not occurring
  - **Consequence or effect** resulting from the activity/event occurring or not occurring
  - **Root Cause** the future event which if eliminated will prevent occurrence/non-occurrence
Identification of Root Causes

• List WBS product or process elements
• Examine each in terms of risk sources or areas
• Determine “what could go wrong?”
• Ask “why” until the source(s) is/are discovered
• Apply approach early & continuously
Risk and Issue Relationships

- Program Definition
- System Design
- Production

- Options to Handle
- Risk and Opportunity Management
- Issue Management

- Cost to Handle
- Highest Number of Risks
- Highest Risk Impact
- Dollar Value

Note: Modified from “Risk Management for Software by Tom DeMarco and Tim Lister”
Risks, Opportunities, and Issues

WHAT CAN GO WRONG?

WHAT HAS GONE WRONG?

WHAT CAN BE IMPROVED?

Risks, Opportunities, and Issues

Consequences: Cost, Schedule, and Performance

Risk Identification

**Technical:** Those risks that may prevent the end item from performing as intended or failing to meet performance expectations

**Programmatic:** Those risks that are generally within the control or influence of the PM or PEO

**Business:** Those risks that generally originate outside the program office or are not within the control or influence of the PM or PEO

Risk Identification

**Technical**
- Requirements
- Technology
- Engineering
- Integration
- Test
- Manufacturing
- Quality
- Logistics
- Training

**Programmatic**
- Estimates
- Program Planning
- Program Execution
- Communication
- Contract Structure / Provisions

**Business**
- Dependencies
- Resources
- Priorities
- Regulations / Laws
- Market
- Customer
- Weather

Internal Sources of Risk

- Funding Instability -- Funding Execution
- Planned Contractor Performance (EVMS)
- PMO and Contractor Communications
- Acquisition Strategy
- Joint and International Program
- Design Instability
- Optimistic Technology Transition -- Technology Maturity Levels
- Aggressive Schedule -- Success Driven Planning
- Concurrency in Design & Test, Test & Production, and Long Lead
- Multiple Program Integration
- Logistics Planning
- Cost Estimating Methods and Confidence
- Modeling and Simulation
- Concurrent Development and Operational Test and Evaluation
- Software Development
External Sources of Risk

- Threat Changes
- Requirements Instability
- Funding Availability – Affordability Issues
- Technology Maturity and Insertion
- Contractor Capability and Performance
- New Manufacturing Process
- Test Facility Availability
- Defense Industrial Base
- Unplanned Obsolescence
- Environmental Law Changes
- Labor, Material, or Overhead Rate Increases
- Interoperability
- Personnel Turnover and Staffing
- Poor Subcontractor/Vendor Management
- Political Support from Warfighter, Service, Congress
Interdependencies

- Schedule
- Technical
- Cost
Interdependencies

Program Management is Managing Risk
Program Management is Managing Risk
Inter-relationships
Risk Management Process

Risk Identification
*What can go wrong?*

Risk Monitoring
*How has the risk changed?*

Risk Mitigation
*Should the risk be accepted, avoided, transferred, or controlled?*

Risk Analysis
*What is the likelihood and consequence of the risk?*

Communication and Feedback

- Avoid
- Transfer
- Control
- Accept
Systemic Areas of Risk (DASD (SE))

- Program Schedule – 42% are not realistic & 28% are not likely to achieve planned schedule
- Budget – 38% are not sufficient for required efforts
- Acquisition Strategy – 32% need restructuring
- Design Verification – 26% have incomplete or inadequate testing
- Reliability Performance – 26% have not established a reliability growth plan
- Risk Management -25% do not have sufficient tools or do not use appropriate methodologies
- Requirements Development – 25% are vague, poorly stated, or not defined
## Risk Identification

<table>
<thead>
<tr>
<th>Material Solution Analysis</th>
<th>Technology Maturation &amp; Risk Reduction</th>
<th>Engineering and Manufacturing Development</th>
<th>Production and Deployment</th>
<th>Operations and Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable requirements</td>
<td>Stable requirements</td>
<td>Stable requirements</td>
<td></td>
<td>Stable Funding</td>
</tr>
<tr>
<td>Stable Funding</td>
<td>Stable Funding</td>
<td>Stable Funding</td>
<td>Stable Funding</td>
<td>Stable Funding</td>
</tr>
<tr>
<td>Alternatives</td>
<td>Technical maturity</td>
<td>Technical maturity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Obsolescence</td>
<td>Technology Obsolescence</td>
<td></td>
<td>Reliability</td>
<td></td>
</tr>
<tr>
<td>Subcontractor/Partners</td>
<td>Subcontractor/Partners</td>
<td></td>
<td>Logistics Support</td>
<td></td>
</tr>
<tr>
<td>Industrial Base</td>
<td>Industrial Base</td>
<td></td>
<td>Industrial Base</td>
<td></td>
</tr>
<tr>
<td>Adequate skills/people</td>
<td>Adequate skills/people</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specifications adequate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting KPPs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GFE / NDI &amp; COS</td>
<td>GFE / NDI &amp; COS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Purpose:** to determine a concise description of risk

A risk statement must capture the activity or event that is causing concern for a potential negative impact to the program, followed by a description of the expected consequence to the program.

If **Condition** then **Consequence** will occur **Timing**

**Condition:** a phrase briefly describing the “root cause” of the risk; the activity that is causing concern, doubt, or uncertainty

**Consequence:** a phrase that describes the negative program impact

**Timing:** a phrase that identifies when the consequence will occur
If, Then Statement - Examples

IF my car runs out of gas,
THEN I won’t be able to drive home tonight.

IF the widget doesn’t pass IOT&E testing,
THEN the program will not conduct Full Rate Production Decision Review on June 27th.

IF new the stealth technology doesn’t reach Maturity Level 7,
THEN the aircraft will have a visible radar signature at MS-C.
Exercise 2

You’ve agreed to plan, organize and host a Surprise 50th Birthday Party for your best friend.

Write three “IF - THEN” statements for risks associated with the party being a success.

1.
2.
3.
Weapon System Acquisition and DoD program management is a dynamic environment where cost, schedule and technical performance frequently change based on internal and external factors resulting in known and unknown risks.

**Program Team’s Mission:**

To maintain an effective balance between risk and the cost, schedule and technical baselines/objectives to assure the program requirements are met.
Debra E Hahn, DAU

Risk Reporting / Risk Matrix

Debra E Hahn, DAU
# Program Impacts

<table>
<thead>
<tr>
<th>Level</th>
<th>Technical Performance</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimal or no impact</td>
<td>Minimal or no Impact</td>
<td>Minimal or no Impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RDT&amp;E</td>
</tr>
<tr>
<td>2</td>
<td>Minor reduction in performance/supportability</td>
<td>Able to meet key dates Slip &lt; months</td>
<td>Budget or UPC increase $A&lt;$B or _% of Budget</td>
</tr>
<tr>
<td></td>
<td>Tolerated with little or no impact on program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Moderate reduction in performance/supportability</td>
<td>Minor slip, able to meet key milestones with no schedule float Slip &lt; months</td>
<td>Budget or UPC increase $B&lt;$C or _% of Budget</td>
</tr>
<tr>
<td></td>
<td>Limited impact on program objectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Significant degradation in performance/supportability</td>
<td>Program critical path affected Slip &lt; months</td>
<td>Budget or UPC increase $C&lt;$D or _% of Budget</td>
</tr>
<tr>
<td></td>
<td>May jeopardize program success</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Severe degradation in performance/supportability</td>
<td>Cannot meet key program milestones Slip &lt; months</td>
<td>Exceeds APB threshold &gt;$D or _% of Budget</td>
</tr>
<tr>
<td></td>
<td>Will jeopardize program success</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Risk Exposure Matrix

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Certainty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability: Highly Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability: Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability: Low Likelihood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability: Not Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Use this matrix as a template for categorizing risk in terms of its probability of occurring and the associated consequences**
Mitigation Actions

1. Reduce the Probability of Occurring
2. Reduce the Impact
3. Reduce the Probability of Occurring and the Impact

Remember: There are three potential impact areas:
- Cost
- Schedule
- Performance

Note: The Risk Matrix Values are AFTER your mitigation actions
You’ve agreed to plan, organize and host a Surprise 50th Birthday Party for your best friend.

Identify two Risk Mitigation Actions for each IF – THEN statement from Exercise 2:

1-1.
1-2.
2-1.
2-2.
3-1.
3-2.
Net Factored Risk is a method of identifying and quantifying the potential financial impact of programmatic risk.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Probability</th>
<th>Impact</th>
<th>Factored</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90%</td>
<td>$1,000</td>
<td>$900</td>
</tr>
<tr>
<td>2</td>
<td>75%</td>
<td>$50,000</td>
<td>$37,500</td>
</tr>
<tr>
<td>3</td>
<td>50%</td>
<td>$50,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>4</td>
<td>25%</td>
<td>$50,000</td>
<td>$12,500</td>
</tr>
<tr>
<td>5</td>
<td>10%</td>
<td>$100,000</td>
<td>$10,000</td>
</tr>
</tbody>
</table>

Net Factored Risk = $251,000

Factored Risk = Probability multiplied by Impact

\[ \text{Factored Risk} = \text{Probability} \times \text{Impact} \]
## Net Factored Risk and Opportunity

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact</th>
<th>Factored</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk 1</td>
<td>90%</td>
<td>$1,000</td>
<td>$900</td>
</tr>
<tr>
<td>Risk 2</td>
<td>75%</td>
<td>$50,000</td>
<td>$37,500</td>
</tr>
<tr>
<td>Risk 3</td>
<td>50%</td>
<td>$50,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Risk 4</td>
<td>25%</td>
<td>$50,000</td>
<td>$12,500</td>
</tr>
<tr>
<td>Risk 5</td>
<td>10%</td>
<td>$100,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Net Factored Risk</td>
<td></td>
<td>$251,000</td>
<td>$85,900</td>
</tr>
<tr>
<td>Opportunity 1</td>
<td>90%</td>
<td>$1,500</td>
<td>$1,350</td>
</tr>
<tr>
<td>Opportunity 2</td>
<td>50%</td>
<td>$25,000</td>
<td>$12,500</td>
</tr>
<tr>
<td>Opportunity 3</td>
<td>10%</td>
<td>$50,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Net Factored Opportunity</td>
<td></td>
<td>$76,500</td>
<td>$18,850</td>
</tr>
<tr>
<td>Net Factored Risk and Opportunity</td>
<td></td>
<td>$174,500</td>
<td>$67,050</td>
</tr>
</tbody>
</table>

Net Factored Risk and Opportunity = Factored Risk Less Factored Opportunity
Risk and Earned Value

- Undocumented Contractor’s Risk; cost and schedule
  - Control Account Manager
- Management Reserve
  - Not just a Risk Reserve
  - Account for Risk in determining level
  - Control Account share based on Risk (Net Factored Risk)
- Estimate to Complete
  - Cost Performance
  - Schedule Performance
  - Risk Performance

Fixed Price Contracts attempt to transfer cost risk to the contractor
Risk and Cost Estimating

• Sensitivity Analysis
• Cost Drivers
• Parametric Estimating Methods
  • CER Confidence Levels
  • “Black-Box” Models
  • Age, number, and Similarity of data points
  • Coincidence Correlation
• Risk Estimate
  • Identify Risk within Work Breakdown Structure (WBS)
  • Assign Risk Factor to WBS Elements
  • Revise WBS elements cost based on Risk Factor
  • Identify and consider Schedule Risk

An estimate that doesn’t account for risk is deficient
In today’s fiscal environment, a program can be executing perfectly; be on plan, on schedule and on cost and still lose funding – there just isn’t enough to go around