



# Improving Risk Management for Agency-wide Application in Transportation Asset Management

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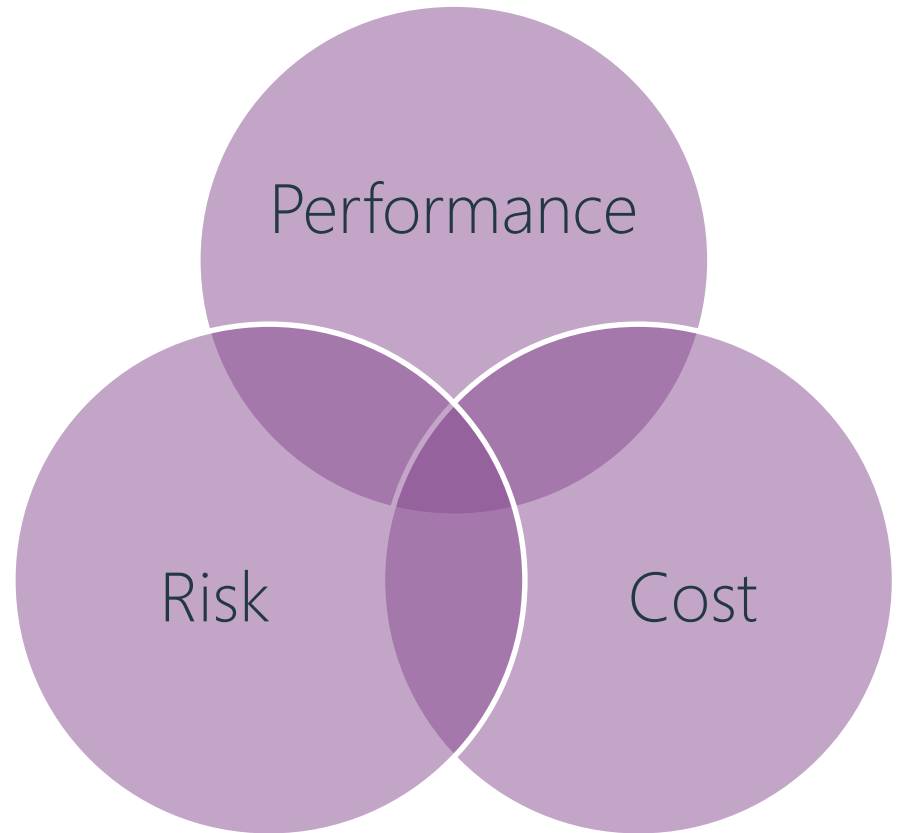
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# Problem Statement

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- Asset management and risk management have basically become inseparable due to federal regulations. How are practitioners responding in applying risk concepts across the enterprise/agency?



# Presentation Outline

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- Background
- State of the practice
- Future needs
- Summary



# Risk Management Background

# Risk Definition

Risk is the effect of uncertainty on expected outcomes (*ISO 31000*).



# Risk Management Definition and Levels

Risk management definition: processes and framework for managing potential risks, including identifying, analyzing, evaluating, and addressing the risks to assets and system performance. (23 CFR 515.5).



Source: FHWA



# State of the Practice

# Risk Measurement

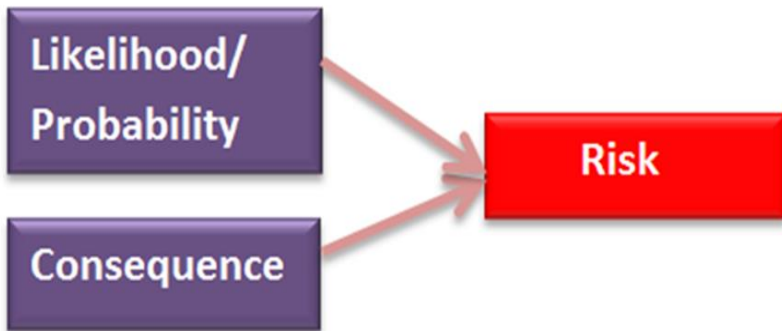
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# Common Practice

- Traditional approach



Likelihood	Consequence				
	Low	Medium	Moderate	High	Extreme
Extreme	M	H	H	E	E
High	M	M	H	H	E
Moderate	L	M	M	H	E
Medium	L	M	M	M	H
Low	L	L	M	M	H

Likelihood		Consequence (Level/Descriptor)				
		1	2	3	4	5
Level	Descriptor	Negligible	Minor	Major	Critical	Catastrophic
1	Low	1	2	3	4	5
2	Medium Low	2	4	6	8	10
3	Medium	3	6	9	12	15
4	Medium High	4	8	12	16	20
5	High*	5	10	15	20	25



# Application Maturity

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- Strong foundation at the project level
  - Concepts, capabilities, tools, training, etc.
  - Scope, cost overruns, schedule, etc.
  
- Informal application in other business functions
  - Lack of documentation
  - Mitigation challenges
  - Need to apply standardized methods
  - Need to strengthen enterprise/agency risk



# Asset Management Application

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- What risk?
  - Mobility
  - Safety
  - Physical asset – performance risk
  - Financial resource
  - Human resource
  - Political
  - Regulatory
  - Legal



# Risk Register

Risk ID	Risk Event	Risk Score	Risk Impact on Business Processes	Mitigation Strategy	Responsible Division	Mitigation Actions
14	Inability to procure qualified contractors in a reasonable amount of time to support program delivery	20	<ul style="list-style-type: none"> <li>Delays in project delivery</li> <li>Unmet program and performance goals</li> <li>Increased customer complaints</li> <li>Negative impacts on the Department's reputation</li> </ul>	Treat	Office of Contracting and Procurement (OCP)	<ul style="list-style-type: none"> <li>Communicate the impact of project delays on program goals to stakeholders</li> <li>Review existing standard operating procedures, procurement timeline, identify improvement areas, and implement actions to expedite the procurement process</li> </ul>
23	Inability to meet performance goals due to a potential drop in performance of large, critical bridges	20	<ul style="list-style-type: none"> <li>Loss of flexibility in using federal funds</li> <li>Unmet federal minimum requirements</li> <li>Increased deterioration in bridges causing safety concerns</li> </ul>	Treat	Bridge group	<ul style="list-style-type: none"> <li>Implement a bridge management system capable of analyzing bridge performance and budget</li> <li>Prioritize bridge preservation and investments based on performance, criticality, and risk</li> </ul>
2	Local politics impact local funding appropriation	19	<ul style="list-style-type: none"> <li>Unmet department and program goals and performance targets</li> <li>Unfunded local projects</li> <li>Increased customer complaints</li> </ul>	Treat	Asset management	<ul style="list-style-type: none"> <li>Use performance measures to communicate and inform decision makers</li> <li>Communicate the impact of resource reallocation on the overall performance of the network</li> </ul>
9	Program delivery is impacted by funding high-profile and politically-motivated projects	18	<ul style="list-style-type: none"> <li>Delayed projects due to the lack of funding</li> <li>Unmet performance targets and goals</li> <li>Inefficient use of limited resources</li> </ul>	Treat	Project delivery/asset management	<ul style="list-style-type: none"> <li>Use performance measures to inform decision makers</li> <li>Communicate the impact of resource reallocation on the overall performance of the network</li> </ul>
20	Loss of performance or damage to assets due to the failure of utility assets or buried pipes	18	<ul style="list-style-type: none"> <li>Premature failure of transportation assets</li> <li>Increased cost due to emergency repairs</li> </ul>	Transfer	Asset management	<ul style="list-style-type: none"> <li>Establish a working understanding with utility agencies</li> <li>Require performance-based repairs from utility agencies</li> </ul>



# Implementation

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## TAMP Elements

**Investment strategies and asset performance**

**Financial planning**

**Alternative assessment**

## Inputs to TAMP

- ❖ Focus on critical and high-risk bridges.
- ❖ Focus on high-risk corridors.
- ❖ Ensure minimum conditions are met.
  
- ❖ Financial gaps and associated impact or risk on performance.
- ❖ Inflation and funding uncertainty risks.
  
- ❖ Critical assets repeatedly impacted by extreme weather or emergency events.
- ❖ Cost efficient alternatives and improved design.



# Future Needs

# Organizational Culture

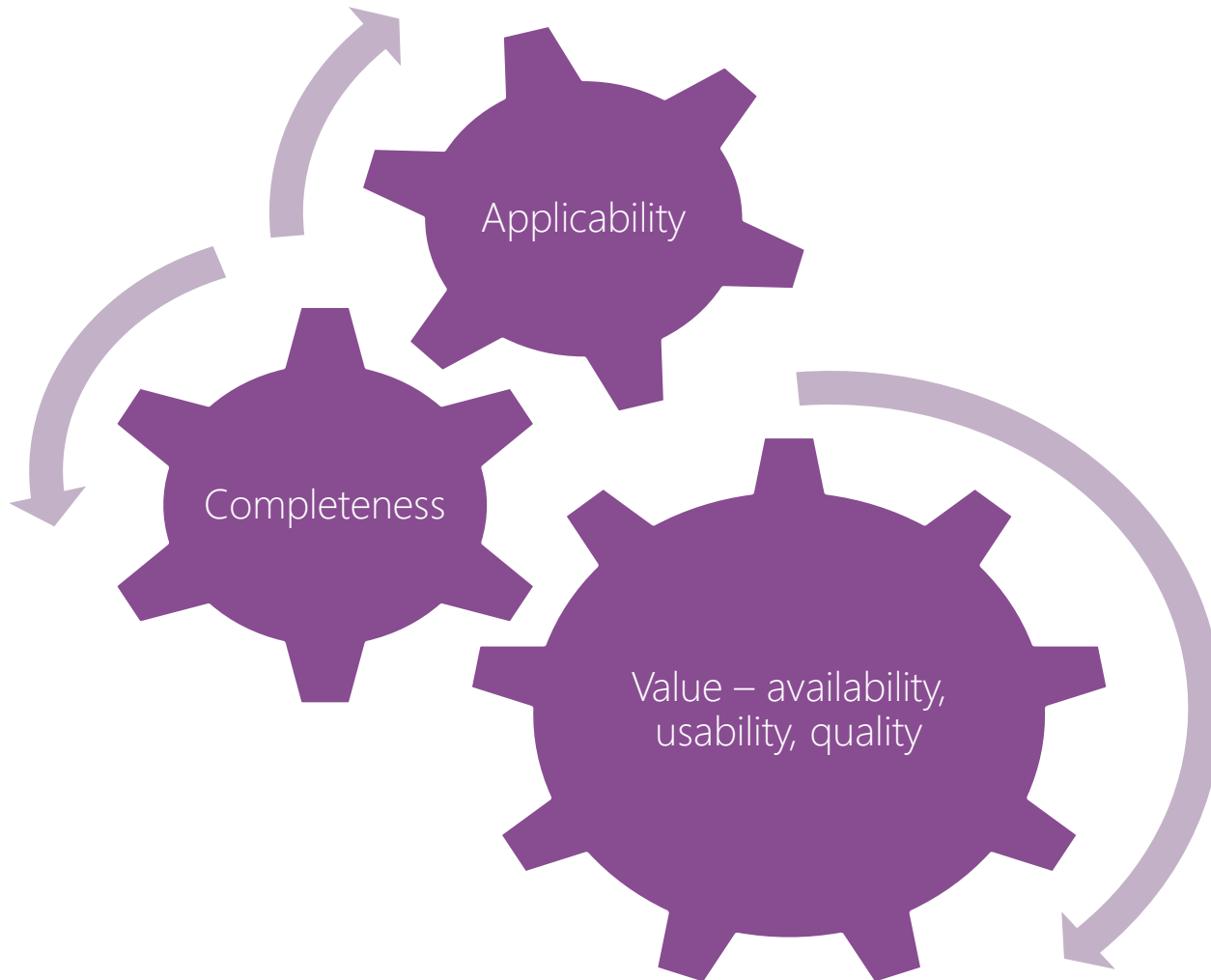
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- Formal governance
  - Overarching strategy, including mitigation approach
  - Roles and responsibilities
- Commitment
  - Lack of bandwidth
  - Liability concerns
- Other important resources to support implementation
  - Formal training
  - Risk communication



# Data

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# Risk Measures

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Need for additional/explicit risk measures

- Perceived consequence – event outcome
- Perceived desirability – risk tolerance

$$D_{ij} = \frac{P_{ij} - P_i^{\text{worst}}}{P_i^{\text{best}} - P_i^{\text{worst}}} \dots \dots \dots \text{Equation 1}$$

*where,  $D_{ij}$  = relative desirability of program  $i$  for investment level  $j$ ,*

*$P_{ij}$  = Performance outcome of program  $i$  for investment level  $j$ ,*

*$P_i^{\text{best}}$  and  $P_i^{\text{worst}}$  = best and worst projected performance outcome of program  $i$ , and  
 $i$  and  $j = 1, 2, 3, \dots \dots \dots, n$*



# Resource Guides



**Risk-Based Transportation Asset Management:**  
Evaluating Threats, Capitalizing on Opportunities

REPORT 1: OVERVIEW OF RISK MANAGEMENT



U.S. Department of Transportation  
Federal Highway Administration  
JUNE 2012

**Risk-Based Asset Management:**  
Examining Risk-based Approaches to Transportation Asset Management

REPORT 2: MANAGING ASSET RISKS AT MULTIPLE LEVELS IN A TRANSPORTATION AGENCY



U.S. Department of Transportation  
Federal Highway Administration  
AUGUST 2012

**Risk-Based Transportation Asset Management:**  
Achieving Policy Objectives by Managing Risks

REPORT 3: RISKS TO ASSET MANAGEMENT POLICIES



U.S. Department of Transportation  
Federal Highway Administration  
SEPTEMBER 2012

**Risk-Based Transportation Asset Management:**  
Managing Risks to Networks, Corridors, and Critical Structures

REPORT 4: MANAGING RISKS TO CRITICAL ASSETS



U.S. Department of Transportation  
Federal Highway Administration  
MARCH 2013

**Risk-Based Transportation Asset Management:**  
Building Resilience into Transportation Assets

REPORT 5: MANAGING EXTERNAL THREATS THROUGH RISK-BASED ASSET MANAGEMENT



U.S. Department of Transportation  
Federal Highway Administration  
MARCH 2013

**Transportation Risk Management:**  
International Practices for Program Development and Project Delivery



Sponsored by:  
U.S. Department of Transportation  
Federal Highway Administration  
In cooperation with:  
American Association of State Highway and Transportation Officials  
National Cooperative Highway Research Program  
August 2012  
International Technology Screening Program



# Summary

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## Application Maturity

- Strong foundation at the project level
- Requires standardized methods
- Lack of capabilities and tools
- Implementation of mitigation strategies

## Organizational Culture

- Lack of buy-in
- Lack of commitment
- Resources for change

## Data

- Data quality
- Data appropriateness and completeness
- Risk measures



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