



How to Manage Risks during Project Development and Design Part 3: Analysis and Management

MDT Preconstruction Conference
February 15, 2018

Lead in story – house construction, highway project in Montana, mega project in another state

What does risk management mean to you>

Nothing new – something that you’ve learned to do in approaching all projects.

Risk management is fundamental to project and program management.

Understanding project risks will better enable project teams to make informed decisions regarding project development and delivery.

Self introduction

Logistics

SESSION GOALS

- ▶ Introduce you to Risk Analysis
- ▶ Familiarize you with MDT Risk Analysis tools
- ▶ Explain appropriate Risk Management strategies
- ▶ Show you proper Risk documentation



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Appreciation for their time

Anyone not in Session 2?

Part 3:

Learn how to analyze risk and determine appropriate management strategies. Adjust project cost and schedule estimates using risk analysis information and contingencies.

Definitions

- ▶ Risk is the effect of uncertainty on objectives (ISO; 2011)
- ▶ Risk is an uncertain event or condition that, if occurs, has a positive or negative effect on a project objective (PMBOK)
- ▶ Risk is the event
- ▶ Uncertainty is the variability of an occurrence



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International Organization for Standardization: The [ISO 31000](#) (2009) / ISO Guide 73:2002 definition of risk is the 'effect of uncertainty on objectives'. In this definition, uncertainties include events (which may or may not happen) and uncertainties caused by ambiguity or a lack of information. It also includes both negative and positive impacts on objectives. Many definitions of risk exist in common usage, however this definition was developed by an international committee representing over 30 countries and is based on the input of several thousand subject matter experts. (Wikipedia, March 11, 2014)

RISK MANAGEMENT

- ▶ Identification and Analysis
 - ▶ Plan
 - ▶ Identify
 - ▶ Analyze
- ▶ Management
 - ▶ Respond
 - ▶ Monitor and control
 - ▶ Communicate
- ▶ Documentation
 - ▶ Risk Management Plan



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Risk management is a continual process throughout the life of a project
Plan for risk appropriate to the project complexity and unique characteristics
Identify the potential significant risk events – positive and negative – to budget and schedule
Analyze the risk events to determine the potential fiscal or time impacts
Respond to the risk events in the best way possible to meet the project needs
Monitor and control all of the major risk events continually
Communicate to the team and to management (the good, the bad, and the ugly)
And always document! Track actions and outcomes, assumptions, changes, etc.

RISK IDENTIFICATION AND ANALYSIS

- ▶ Plan
- ▶ Identify
- ▶ **Analyze**



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How do we determine risk/contingency?

I'm going to present a standardized process that can be adapted to any type of project to help better quantify the risk or contingency component.

1st part is identification and analysis:

Plan for risk

Identify potential risk events

Analyze the potential impacts

ANALYZE INDIVIDUAL RISKS

- ▶ Qualitative or quantitative
- ▶ Probability of occurrence
- ▶ Cost impacts
- ▶ Schedule impacts
- ▶ Opportunities (decrease cost or time)
- ▶ Threats (increase cost or time)
- ▶ Overall significance



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Qualitative or quantitative

Probability of occurrence

Cost impacts

Schedule impacts

Opportunities (decrease cost or time)

Threats (increase cost or time)

Overall significance – Probability of occurring x potential impact = risk impact

RISK IMPACT MATRIX

Probability of Occurrence	Very High	Green	Yellow	Red	Red	Red
	High	Green	Yellow	Red	Red	Red
	Medium	Green	Green	Yellow	Red	Red
	Low	Green	Green	Yellow	Red	Red
	Very Low	Green	Green	Green	Yellow	Red
		Very Low	Low	Medium	High	Very High
		Potential Impact				



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Quantitative or qualitative

Risk averse matrix – MDT has adopted a more risk averse model that weights the impact more than the probability of occurrence. If impact and probability had equal weight, the green area would shift to the right and there would be less red.

This model encourages us to manage more potential risk events.

Important to remember that managing risk can lead to expending more resources than may have been necessary – there is always a chance that a risk wouldn't have occurred even if you didn't account for it.

RISK MANAGEMENT PLAN

Project No. and Name				RISK-MANAGEMENT SUMMARY FEEDBACKS								RELATIVE RISK	Proactive Risk Management		Risk Breakdown Structure (functional assignees)				
BAR 15-41110112 Capital Intsch/Cedar Intsch - Helena				Planned and Actual								MIN	MAX	LIKELY	RD/VS	Develop an action response strategy, assign risk owners to implement action, monitor and record effectiveness of the risk response action.		Right-of-Way Environment Engineering Traffic	
Estimate Date		ED04/13		Target writing date		01/01/18		Planned Cost to Respond		10,000		Est. \$ of Cost Avoided (via risk mgmt)		0.0		0.0		0.0	
Project VPR		04/7/02		Estimated Const. Duration		18,000		Actual Cost to Respond		0.0		Est. \$ of Cost Avoided (via risk mgmt)		0.0		0.0		0.0	
Last Review Date		01/01/12		Estimated PE Cost		\$4.5		Actual Cost to Respond		0.0		Est. \$ of Cost Avoided (via risk mgmt)		0.0		0.0		0.0	
Project Manager		Preston Carr		Estimated RW Cost		\$1.0		Actual Cost to Respond		0.0		Est. \$ of Cost Avoided (via risk mgmt)		0.0		0.0		0.0	
NOTE: All costs in \$ M				Estimated CH Cost		\$29.9		Actual Cost to Respond		0.0		Est. \$ of Cost Avoided (via risk mgmt)		0.0		0.0		0.0	
Risk Identification				Quantitative Analysis				Qualitative Display of Most Likely Impact				Response							
Risk #	Status	Project Phase Date Identified	Functional Assignment	Summary Description Threat and/or Opportunity	Description of Risk Event (Cause-Risk-Impact) Clearly state the cause, the risk, and the impact.	Risk Trigger	Type	Probability	Risk Impact (\$K or M) (Month)	Expected Impact (\$K) [most likely X probability]	Probability	Impact	Risk Matrix	Priority Strategy	Response Actions ACTION TO BE TAKEN including advantages and disadvantages include date				
(1)	(2)	(3)	(3a)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(11a)	(12)	(13)	(14)	(15)	(16)	(17)	
EXAMPLE	Active	ROW	Design	Threat	Because the mitigation ratio has not been finalized and there could be additional impacts to wetlands, the amount of ROW needed for the mitigation area may significantly increase, resulting in additional ROW costs and potential acquisition delays.	if wetland impact is larger than 1/2 acre and ratio exceeds 4:1.	Cost	70%	MIN \$1.0 MAX \$12.0 Most Likely \$7.0	\$4.8	High	Very High	VH H M L VL	Finalize design to identify all wetlands that are impacted. Early coordination with the outside agencies to determine mitigation ratio.					
1	Active	Energy	Design	Threat			Cost	MIN MAX Most Likely	0.000 4.000 3.000	0.00	NO RISK	Very Low	VH H M L VL						

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Plan – implies action!

Proactive Risk Management:

Develop an action response strategy;

assign risk owners to implement action;

monitor and record effectiveness of the risk response action.

Assumed risk tolerance levels in the model: Probability 1-5/Impact 1-2-4-8-16

Formula used for calculating risk impact: (PERT – Program Evaluation Review Technique)

$$EXPECTED\ IMPACT = \left(\frac{MIN + 4 \times MOST\ LIKELY + MAX}{6} \right) \times PROBABILITY$$

GROUP EXERCISE #1 – RISK ANALYSIS

- A. Qualitative Risk Analysis
- B. Quantitative Risk Analysis



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Open RMP

Look at less risky event for qualitative

More risky for quantitative

Analyze several risk events

RISK MANAGEMENT

- ▶ **Respond**
- ▶ Monitor and Control
- ▶ Communicate



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Identifying the risk and determining the potential impacts to cost and schedule is the first step.

Proper project management involves active risk management.

This can also help the costs and schedule stay on track.

Respond

Monitor/control

Communicate

RESPOND

- ▶ Develop strategies
- ▶ Avoid or Exploit (adjust scope, schedule, or budget)
- ▶ Mitigate or Enhance (adjust PE and/or tasks)
- ▶ Accept (adjust contingency or costs/schedule)
- ▶ Assign tasks to responsible party with deadlines



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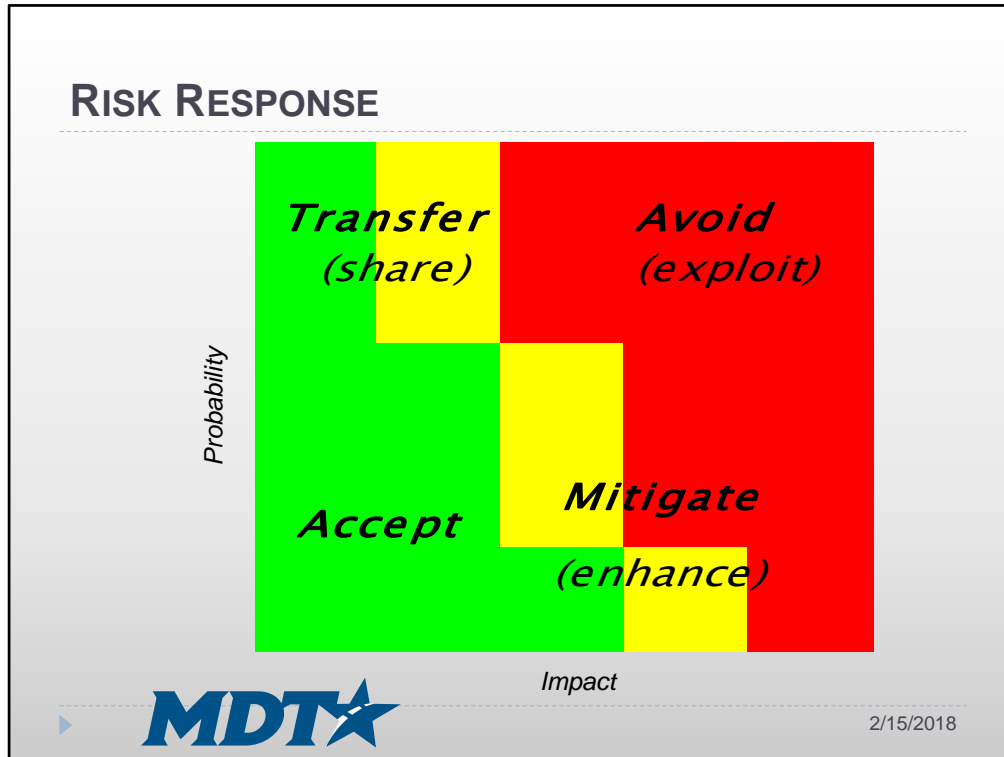
Develop strategies – p. 43 resource

Avoid or Exploit (adjust scope, schedule, or budget, change delivery method)

Mitigate or Enhance (adjust PE and/or tasks)

Accept (adjust contingency or costs/schedule)

Assign tasks to responsible party with deadlines



High impact and high probability risks require aggressive responses; threats should be avoided and opportunities exploited if possible. Risks with lower impacts or probabilities can be handled less aggressively.

For threats:

- If a risk has an extremely high probability of occurrence, it may be best to assume the condition as part of the base conditions. The decision to assume the condition will depend on the cost and/or time involved to avoid or mitigate the risk.
- Risks with high impacts (over a given limit) can compromise the success of a project; these risks must be avoided. The team may decide to change the project plan to eliminate the risk or to protect the project objectives from its impact. The team might achieve this by changing scope, adding time, or adding resources (thus relaxing the so-called “triple constraint”).
- Mitigation is an option for risks with lower probabilities. The team may seek to reduce the probability or consequences of a risk event to an acceptable threshold. They accomplish this via many different means that are specific to the project and the risk. Mitigation steps, although costly and time-consuming, may still be preferable to going forward with the unmitigated risk.
- Insignificant risks can be accepted; passive response. The project manager and the project team will decide to accept certain risks. They do not change the project plan to deal with a risk, or identify any response strategy other than agreeing to address the risk if it occurs.
- Transferring is an option for risks with higher probabilities. The team may transfer the

financial impact of the risk event by contracting out some aspect of the work. Transference reduces the risk only if the contractor is more able to take steps to reduce the risk and does so.

- For risks with higher impact, the team may choose to accept actively by mitigating and/or preparing contingency plans in the event of its occurrence.
- All negative risks should be mitigated where practical and be cost-effective.

For opportunities:

- If a risk has an extremely high probability of occurrence, it may be best to assume the condition as part of the base. In such a case, the base cost estimate would be lowered to assume the condition will occur.
- Risks with high impacts should be exploited whenever possible.
- Enhance is a viable response for risks with lower probability. The project team may be able to change the plans or do additional design work to improve the odds of the opportunity arising.
- Insignificant risks can be accepted; passive response. There may not be enough of a benefit to the project cost or schedule to try to make opportunities with low impacts and probabilities occur.
- Sharing opportunity is an option for higher probability risks. Value Engineering is one way that MDT shares opportunities with contractors. Another method of sharing may be to involve the local government or stakeholders.
- For risks with higher impact, we accept actively by preparing plans in the event of its occurrence – how will we take advantage of a fortunate occurrence?
- All positive risks should be enhanced where practical and cost-effective.

GROUP EXERCISE #2 – RISK RESPONSE

- A. Develop Response Strategies
- B. Assign Responsibilities



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Open RMP
Determine highest relative risk
Develop response strategies
Use information from manual

MONITOR AND CONTROL

- ▶ Follow through on strategies
- ▶ Retire risks that have been taken care of
- ▶ Determine if additional risks have surfaced
- ▶ Revise risk management plan as needed



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Most important part of the process
Numbers aren't the goal
The process and the results are the key

Are issues still occurring?
Is schedule slipping?
Review risks
COMMUNICATE!
Trigger event happen?
Review risks

Put risk on the agenda for every team meeting

GROUP EXERCISE #3 – RISK MANAGEMENT

Question:

Are we done with risk management after filling out the response section of the RMP?

Explain



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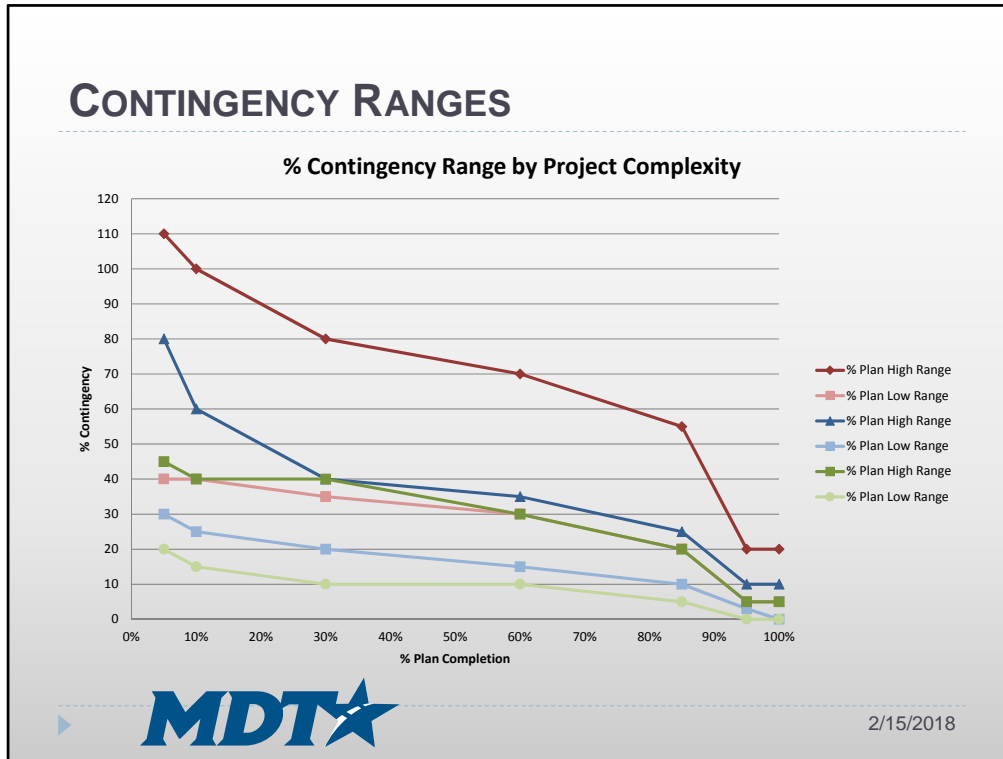
Dynamic process
Life of project

DOCUMENT AND COMMUNICATE

- ▶ Add risk impact to cost and schedule estimates
- ▶ Keep all stakeholders informed of status
- ▶ Reconvene risk management team as necessary
- ▶ Communicate positive and negative changes
- ▶ Document appropriately in milestone reports



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How do we translate these potential risk impacts into budget and schedule terms?
Starting with contingencies at MDT

Complexity level + project development stage (from TTI – Delphi Technique used to survey experts)

Factor in the relative risk determined from risk analysis

Make an educated selection

Apply to CN

Adjust schedules by looking at individual tasks related to the identified risks

Document decisions (flip)

CONCLUSION

- ▶ Risk Analysis
- ▶ MDT Risk Analysis tools
- ▶ Appropriate Risk Management strategies
- ▶ Risk documentation and communication



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Review goals
Check comfort level

That's all there is to risk management!



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Contact Information

Lesly Tribelhorn

ltribelhorn@mt.gov

(406) 444-6242

<http://www.mdt.mt.gov/business/contracting/cost.shtml>



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