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Project Risk Management



**“Risk belongs to projects as does air to
breath.”**

Roland Wanner

“Project Risk Management”

DISCUSSION

How do you think of risks?

What process do you use?



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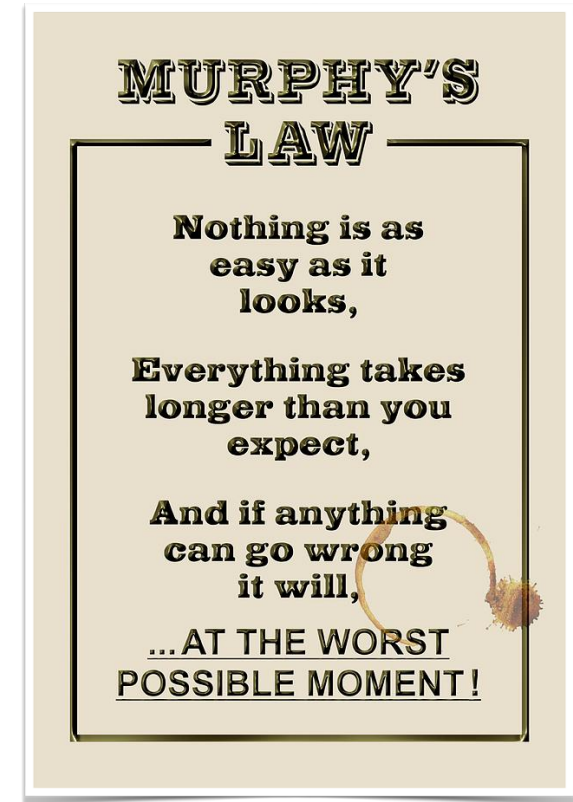
Murphy's Law

Murphy's Law

"Anything that can go wrong, will go wrong."

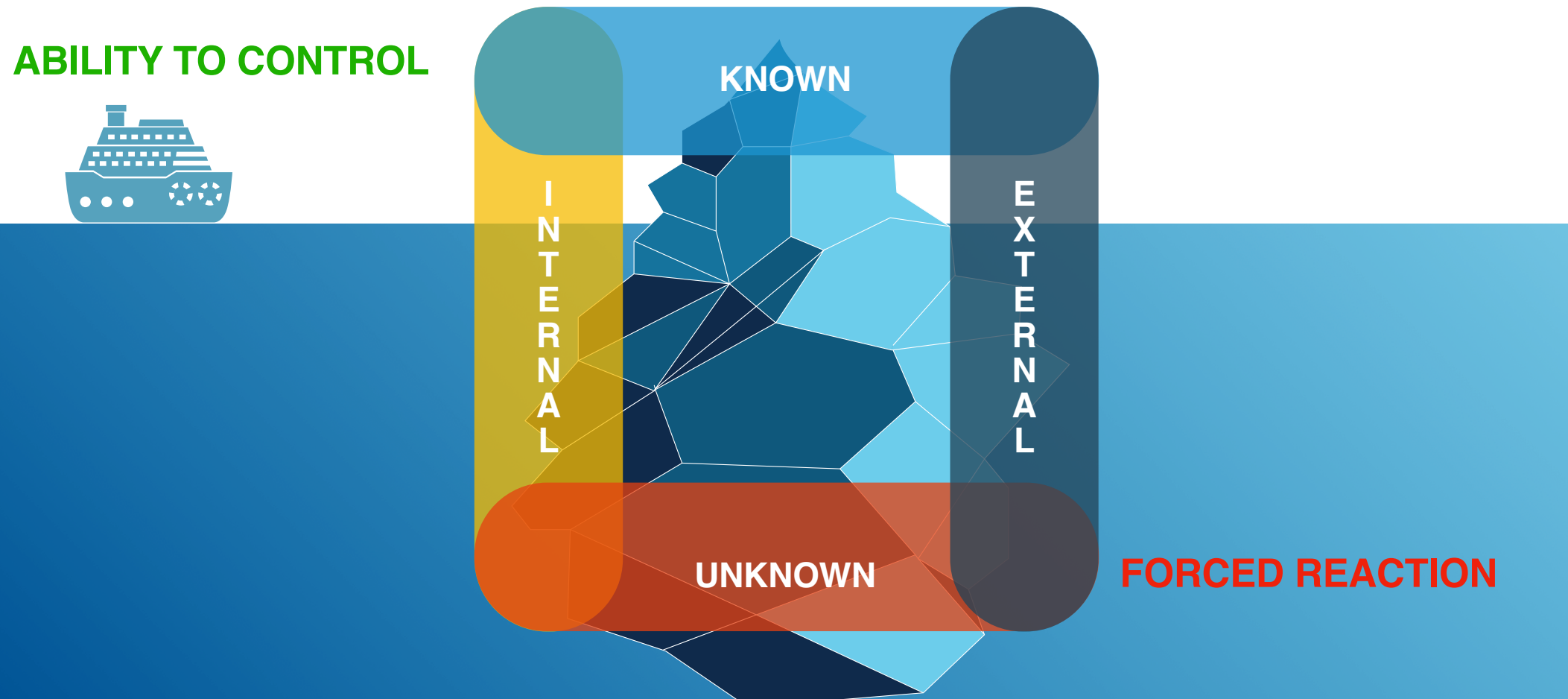
O'Toole's Law

"Murphy was an optimist."

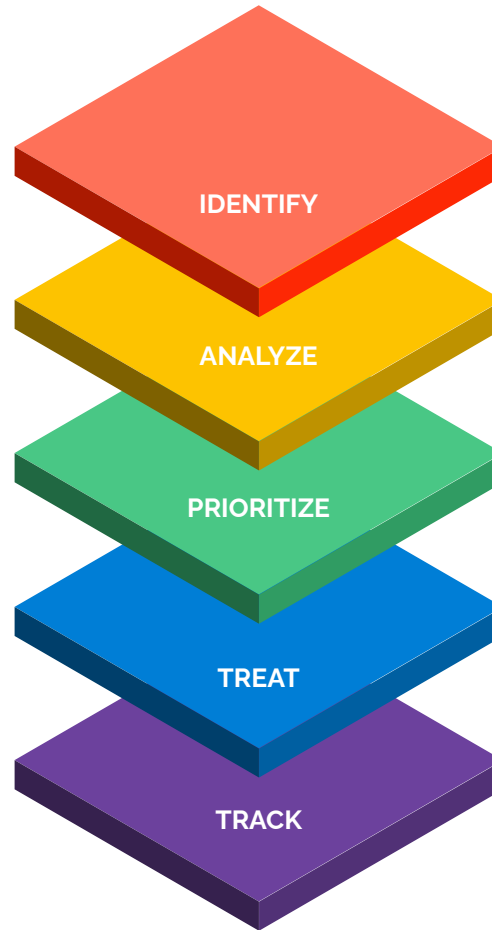


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PROACTIVE VS REACTIVE RISK IDENTIFICATION



The Risk Management Process

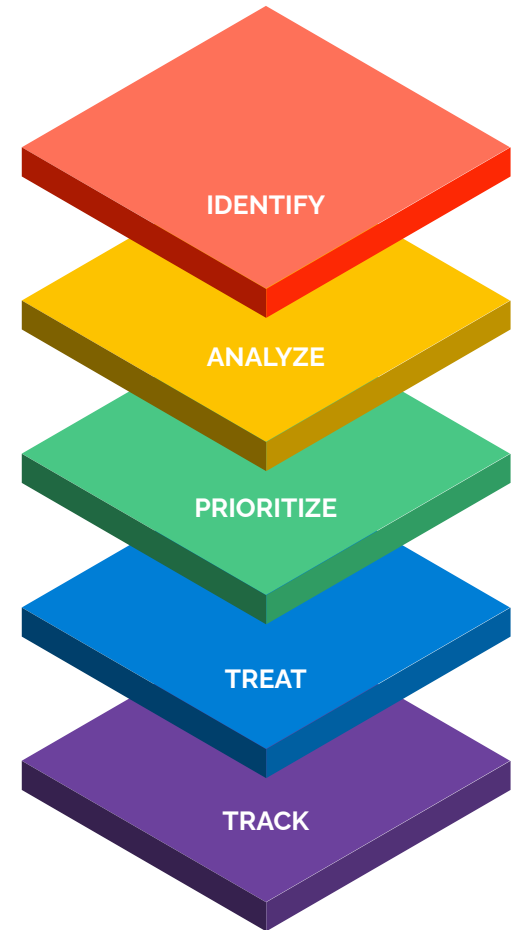


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The Risk Management Process

Effective Stakeholder Engagement is
crucial for proper Risk Management



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Risk Definitions

Risk Definitions

Risk

An uncertain event or condition
If it occurs, it will impact **at least** one project
output / outcome

Issue

A risk (known or unknown) that has **materialized**

Trigger

An **event** that causes a risk to become an issue.



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Risk Definitions

Risks become **issues** after a **trigger** event occurs.



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Typical Sources of Project Risk

Unknown stakeholders

Fuzzy scope / requirements

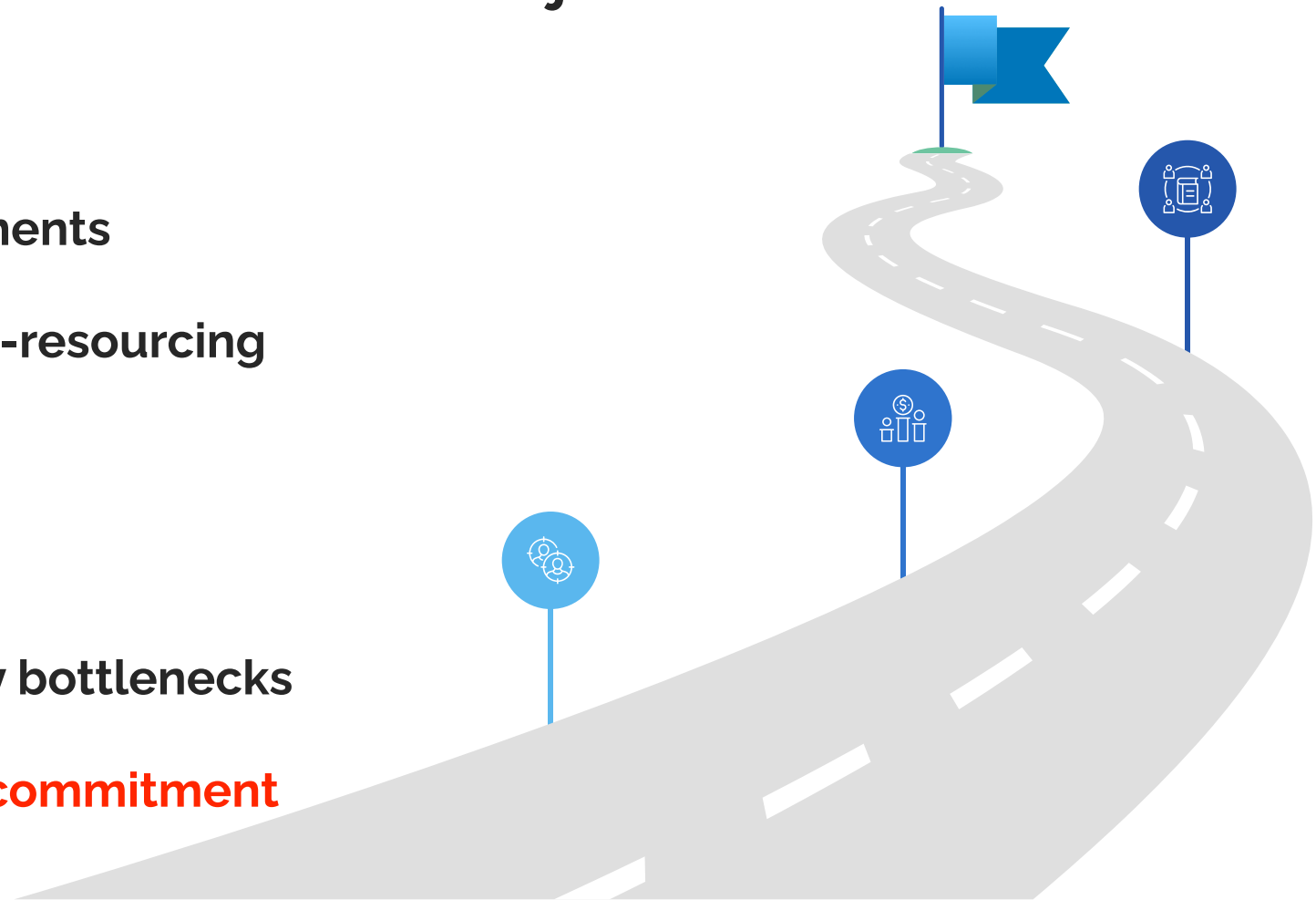
Poor estimates / under-resourcing

Project team capability

External dependencies

Decision / dependency bottlenecks

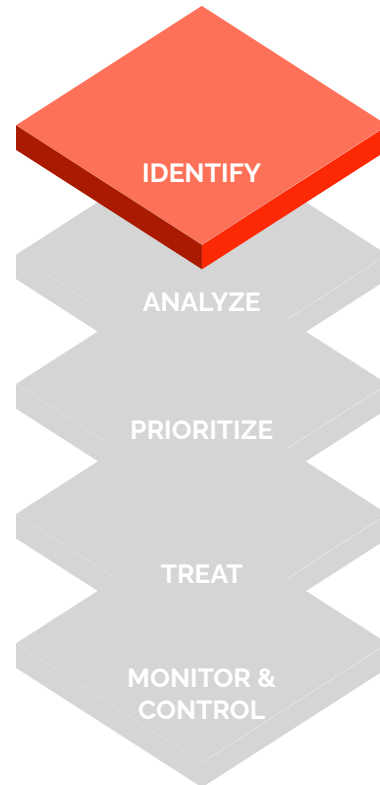
Lack of organizational commitment



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The Risk Management Process

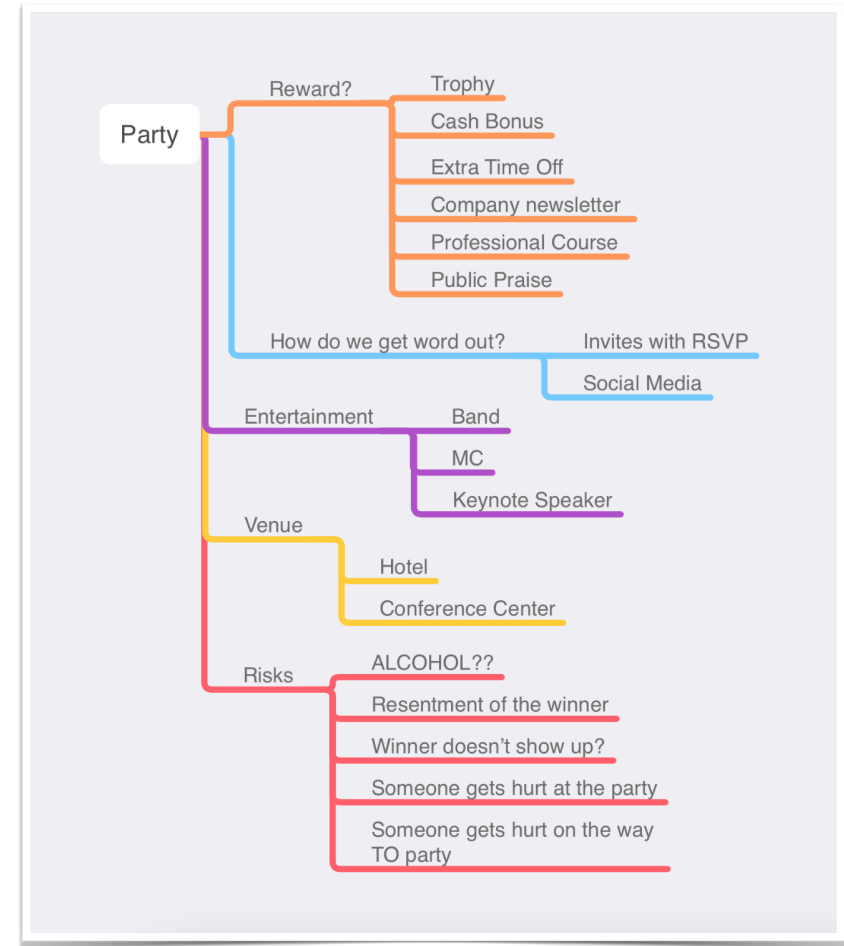


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A Risk may have multiple **Triggers**

An Issue may have multiple **Impacts**



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DISCUSSION

What are some of the risks for the upcoming awards night project?



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Critical Success Factors for Risk Management

Early, **recurrent**, and comprehensive identification

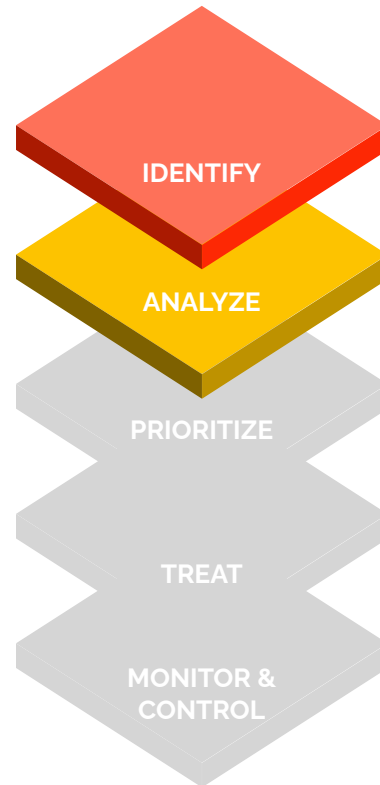
Multiple, **diverse** perspectives (objectivity)

Recognize the **limitations of your sources** & data



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The Risk Management Process



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Qualitative and Quantitative Risk Analysis

Two Ways To Identify Risks



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Qualitative Risk

Relating to, measuring, or measured by the **QUALITY** of something rather than its QUANTITY



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Qualitative Risk

The **IMPACT** the risk will have on the project.



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Quantitative Risk

Relating to, measuring, or measured by the **QUANTITY** of something rather than its **QUALITY**.



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Quantitative Risk

The **NUMBER** of times the risk is expected to occur within the project.



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Risk: Probability

ALMOST CERTAIN (5)	Expected to occur at least once in the project
Likely (4)	Expected to occur only once in every 3 projects
Possible (3)	Expected to occur on only in every 10 projects
Unlikely (2)	Expected to occur only once in every 25 projects
Rare (1)	Expected to occur less than once in every 100 projects



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Probability/Likelihood of a Trigger Event

QUANTITATIVE

(Statistical) Methods

Mean, Median, Mode

Three point estimates (PERT)

Expected Value

Monte Carlo Analysis



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Probability/Likelihood of a Trigger Event

QUANTITATIVE (STATISTICAL)

Mean, Median, Mode

Three point estimates (PERT)

Expected Value

Monte Carlo Analysis



QUALITATIVE (SUBJECTIVE)

Almost Certain

Likely

Possible

Unlikely

Rare



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Putting the numbers to work in the organization



56% Chance of Rain = POSSIBLE



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Ways to determine Risk Probability

Mean, median, mode

Three-point estimates (**PERT**)

Expected value

Monte Carlo analysis



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Risk: Using the Numbers

46%

34%

40%

39%

34%

Our party is to be held 15 November.

Over the past 5 years the chances of inclement weather striking on that date are:



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Risk: Using the Numbers

Historic Data Percentages of Rain:

46%

34%

40%

39%

34%

Mean (Average): 38.6

Median: 40

Mode: 34

Highest Historical #: 46

Lowest Historical #: 34

PERT = Optimistic + (4x Most Likely) + Pessimistic / 6

$$\text{PERT} = 34 + (4 \times 34) + 46 / 6$$

$$\text{PERT} = 34 + (136) + 46 / 6$$

$$\text{PERT} = 216 / 6$$

$$\text{PERT} = 36$$



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Risk: Expected Value

A quantitative technique used to evaluate and prioritize risks based on their likelihood and impact.

It gives you a single numerical estimate of the risks potential cost (or opportunity) helping you make informed decisions about how much a risk truly matters.

It lets you treat risk like MATH - not FEAR



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Risk: Expected Value

Expected Value = **Probability** (as a decimal between 0-1) * **Impact** (typically in dollars or other measurable units)

Risk: A critical supplier may delay shipment by 3 weeks.

Probability: 30% (.3)

Impact: \$80,000 in lost time and rework

$$EV = .3 * 80,000 = \$24,000$$



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Expected Value: How it's used

- 1: Risk Prioritization:** sort risks by expected value to focus on what matters most. Helps move beyond “gut feelings”
- 2: Cost-Benefit of Mitigation:** Compare the cost of risk responses to the EV of the risk. Only spend \$10k to mitigate a \$50k risk (not the other way around)
- 3: Contingency Planning:** Use total expected value of all risks to estimate needed budget and schedule buffers
- 4: Opportunity Evaluation:** EV works for opportunities as well.



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Expected Value: Example

Risk	Probability	Impact (\$)	EV (\$)
Data Breach	0.05	500,000	\$25,000
Vendor Delivery Delay	0.3	80,000	\$24,000
Scope change request	0.2	40,000	\$8,000
Missed milestone payment	0.1	150,000	\$15,000



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Risk: Monte Carlo Analysis

Calculates the range of possible outcomes and the probabilities they will occur for any choice of action.

Developed by scientists working on the Atom Bomb and was named for the city.

Common Distributions include:

Normal: Bell Curve

Lognormal: Positively skewed outcomes

Uniform: All values have equal chance of occurring

Triangular: User defined Minimum, Most Likely and Maximum values of occurrence

PERT: Optimistic, Most Likely and Pessimistic

Discrete: User defined thresholds



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How Monte Carlo Analysis Works

- 1: **Define the inputs** that are uncertain (e.g. task durations, cost estimates, risk impacts)
- 2: **Assign probability** distributions to those inputs (e.g. Task X will take between 5-10 days, most likely 7)
- 3: Runs **thousands of simulations** where the model randomly picks values from those distributions
- 4: Analyze the **range of outcomes** and their probabilities



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Monte Carlo Analysis Example

You have a 3 task project:

Task A: 3-6 days

Task B: 5-10 days

Task C: 2-4 days

Each task is modeled with a distribution (triangular, PERT, normal, etc).

Monte Carlo runs 10,000 simulations and shows

90% chance will finish in < 19 days

50% chance it finishes in 15 days

10% chance it finishes in < 13 days



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Defining Probability

Risk Probability (defined)

Almost Certain (5)	Greater than 90% chance this opportunity / risk will happen
Likely (4)	Greater than 70% chance this opportunity / risk will happen
Possible (3)	Greater than 50% chance this opportunity / risk will happen
Unlikely (2)	Greater than 30% chance this opportunity / risk will happen
Rare (1)	Less than 30% chance this opportunity / risk will happen



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Risk: Putting it all together

A 36% chance means it is **UNLIKELY** we will experience inclement weather for the date of the party

(Greater than **30%** but less than **50%**)



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Risk: Prize Winners Don't Attend the Party

REMEMBER THE SCORES:

Almost Certain (5)

Likely (4)

Possible (3)

Unlikely (2)

Rare (1)



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Risk: Prize Winners Don't Attend the Party

Almost Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

Triggers:

Probability Score

1: Not enough notice given. Invites currently scheduled to go out two weeks before the party. **(Likely)**

1: Likely **(4)**

2: They are too busy working to attend. **(Unlikely)**

2: Unlikely **(2)**

3: Accident / Injury / Illness **(Rare)**

3: Rare **(1)**



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Risk: Prize Winners Don't Attend the Party

Almost Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

Probability Score

1: Likely (4)

2: Unlikely (2)

3: Rare (1)

Overall Risk Probability: ???



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Risk: Prize Winners Don't Attend the Party

Almost Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

Overall Risk Probability:

(4) LIKELY



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IMPACT / CONSEQUENCES IF A RISK BECOMES AN ISSUE

WHAT IS IMPACTED

Time / Cost / Scope

Health and Safety

Business as usual

Natural Environment

Brand and Reputation

QUALITATIVE (SUBJECTIVE) PRIORITY

Massive

Major

Moderate

Minor

Insignificant



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DISCUSSION

Can opportunities and hazards co-exist in a single risk?



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Risk Impacts

Risk Impact: Time and Cost

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	Increase greater than 50%	Reduce greater than 50%
Major (4)	Increase less than 50%	Reduce less than 50%
Moderate (3)	Increase less than 25%	Reduce less than 25%
Minor (2)	Increase less than 10%	Reduce less than 10%
Insignificant (1)	Increase less than 5%	Reduce less than 5%



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Risk Impact: Project Scope and Outcomes

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	The project will not realize most or all of its intended outcomes	The project will realize a number of new (unplanned) benefits
Major (4)	The project will not realize some of its intended outcomes	Changes benefit entirely new groups of stakeholders
Moderate (3)	Changes will no longer benefit some stakeholder groups	Changes benefit a larger group of existing stakeholders
Minor (2)	The project's intended outcomes are now noticeably overstated	The intended outcomes are now noticeably understated
Insignificant (1)	The project's outcomes will fall short on a small number of measures	Changes to scope that slightly enhance the projects benefits



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Risk Impact: Business as Usual

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	Catastrophic failure in operations with considerable time to restore (Could be on-going)	Operational disruption is avoided entirely
Major (4)	Widespread disruption to operations with an uncertain timeframe for resolution	The need for operational disruption is significantly reduced
Moderate (3)	Disruption to operations and/or priority customers demanding major intervention	Operational outages can significantly reduced in frequency duration or impact
Minor (2)	Localized disruption that demands minor corrective action	Operational outages can be reduced in frequency, duration or impact
Insignificant (1)	Negligible impact on operations - no discernible disruption	Operational outages can be better planned for and anticipated



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Risk Impact: Health and Safety

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	Permanent disability or fatality	Reduce instances of permanent disability or fatality
Major (4)	Extensive injuries or widespread illness	Reduction of extensive injuries or widespread illness
Moderate (3)	Hospital admission/ongoing medical treatment	Reduced instances of Hospital admission/ongoing medical treatment
Minor (2)	Minor injury/illness requiring out-patient care	Reduced instances of minor injury/illness requiring out-patient care
Insignificant (1)	Superficial injuries with little or no treatment required	Reduced instances of superficial injuries



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Risk Impact: The Natural Environment

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	Widespread and irreversible environmental damage	Environmental benefits that are wide-spread and self-sustaining
Major (4)	Environmental damage that will continue beyond the life of the project	Environmental benefits that are sustainable beyond the life of the project
Moderate (3)	Environmental damage that extends beyond the location of the project - but no impacts	Environmental benefits that are sustainable beyond the location of the project
Minor (2)	Damage within the projects boundaries that can be easily remedied	Environment benefits that are specific to the location of the project
Insignificant (1)	Small-scale or localized damage that will quickly self repair	Environmental benefits that are specific to the location of the project

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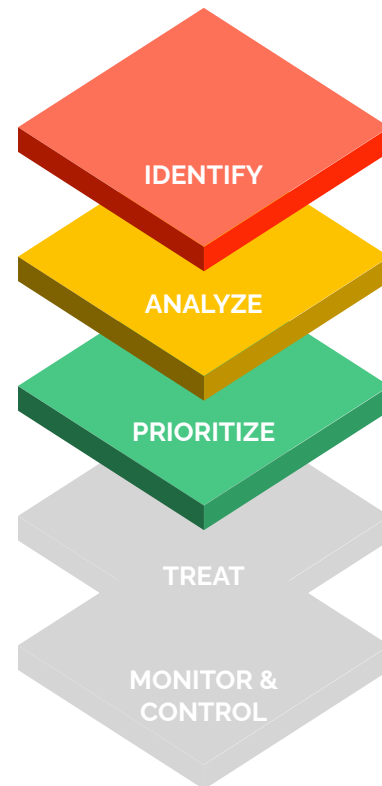
Risk Impact: Brand and Reputation

	NEGATIVE IMPACT (-)	POSITIVE IMPACT (+)
Massive (5)	Will cause a fundamental loss of community/stakeholder confidence in our project or org	Will generate whole of community enthusiasm for our project or org
Major (4)	Cause alarm among stakeholders - likely that regulators or owners will take action	Will generate excitement for the project among new and existing stakeholders
Moderate (3)	Will cause stakeholders to actively express their dissatisfaction	Will encourage stakeholders to actively express support for the project
Minor (2)	Will register with stakeholders and cause them concern	Will register with stakeholders and heighten their interest
Insignificant (1)	Will only be of interest to the project team	Will only be of interest to the project team



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The Risk Management Process



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Overall Risk Priority

PROBABILITY x IMPACT



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Risk Matrix

IMPACT

INSIGNIFICANT
(+/- 1)

MINOR
(+/- 2)

MODERATE
(+/- 3)

MAJOR
(+/- 4)

MASSIVE
(+/- 5)

PROBABILITY

ALMOST
CERTAIN
(5)

+/- 5

+/- 10

+/- 15

+/- 20

+/- 25

LIKELY
(4)

+/- 4

+/- 8

+/- 12

+/- 16

+/- 20

POSSIBLE
(3)

+/- 3

+/- 6

+/- 9

+/- 12

+/- 15

UNLIKELY
(2)

+/- 2

+/- 4

+/- 6

+/- 8

+/- 10

RARE
(1)

+/- 1

+/- 2

+/- 3

+/- 4

+/- 5

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Risk Matrix

IMPACT

INSIGNIFICANT
(+/- 1)

MINOR
(+/- 2)

MODERATE
(+/- 3)

MAJOR
(+/- 4)

MASSIVE
(+/- 5)

PROBABILITY

ALMOST
CERTAIN
(5)

LIKELY
(4)

POSSIBLE
(3)

UNLIKELY
(2)

RARE
(1)



-16



Risk: Prize winners do not attend the party

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Risk Matrix

IMPACT

INSIGNIFICANT
(+/- 1)

MINOR
(+/- 2)

MODERATE
(+/- 3)

MAJOR
(+/- 4)

MASSIVE
(+/- 5)

PROBABILITY

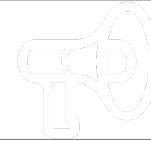
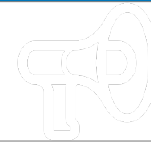
ALMOST
CERTAIN
(5)

LIKELY
(4)

POSSIBLE
(3)

UNLIKELY
(2)

RARE
(1)



-10



Risk: Only 20 people attend (instead of the 200 planned for)

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Risk Matrix

IMPACT

INSIGNIFICANT
(+/- 1)

MINOR
(+/- 2)

MODERATE
(+/- 3)

MAJOR
(+/- 4)

MASSIVE
(+/- 5)

PROBABILITY

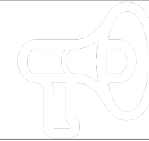
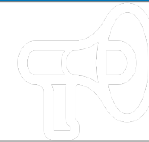
ALMOST
CERTAIN
(5)

LIKELY
(4)

POSSIBLE
(3)

UNLIKELY
(2)

RARE
(1)



-2

Risk: Bad weather hits the area

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Risk Matrix

IMPACT

INSIGNIFICANT
(+/- 1)

MINOR
(+/- 2)

MODERATE
(+/- 3)

MAJOR
(+/- 4)

MASSIVE
(+/- 5)

PROBABILITY

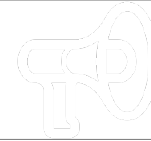
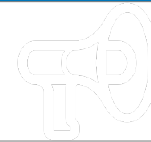
ALMOST
CERTAIN
(5)

LIKELY
(4)

POSSIBLE
(3)

UNLIKELY
(2)

RARE
(1)



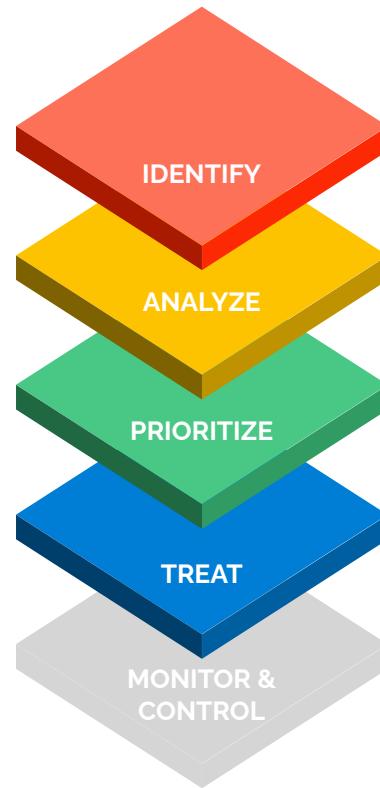
1

Risk: Staff too busy working to attend the party

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The Risk Management Process



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IMPACT (NOTE: POSITIVE OR NEGATIVE)

**P
R
O
B
A
B
I
L
I
T
Y**

RISK MATRIX	+/- 1 INSIGNIFICANT	+/- 2 MINOR	+/- 3 MODERATE	+/- 4 MAJOR	+/- 5 MASSIVE
5 ALMOST CERTAIN	+/- 5	+/- 10	+/- 15	+/- 20	+/- 25
4 LIKELY	+/- 4	+/- 8	+/- 12	+/- 16	+/- 20
3 POSSIBLE	+/- 3	+/- 6	+/- 9	+/- 12	+/- 15
2 UNLIKELY	+/- 2	+/- 4	+/- 6	+/- 8	+/- 10
1 RARE	+/- 1	+/- 2	+/- 3	+/- 4	+/- 5

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Treating Risks

DISCUSSION

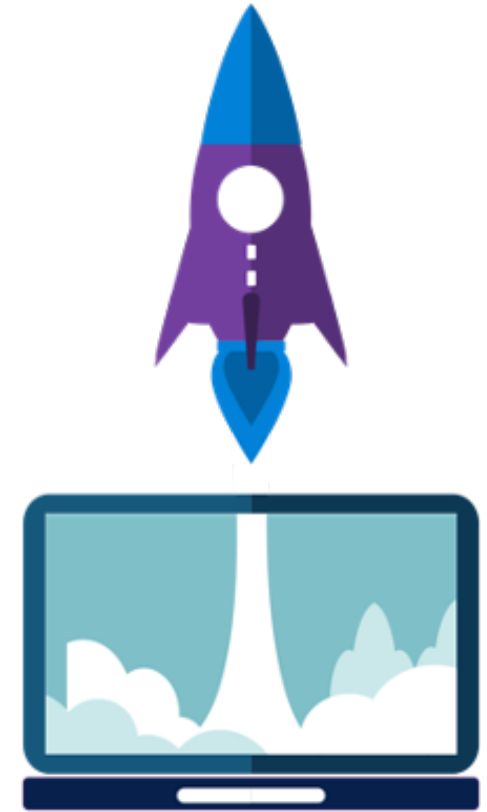
How do we know how much risk is too much?



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Risk Tolerance / Appetite / Threshold

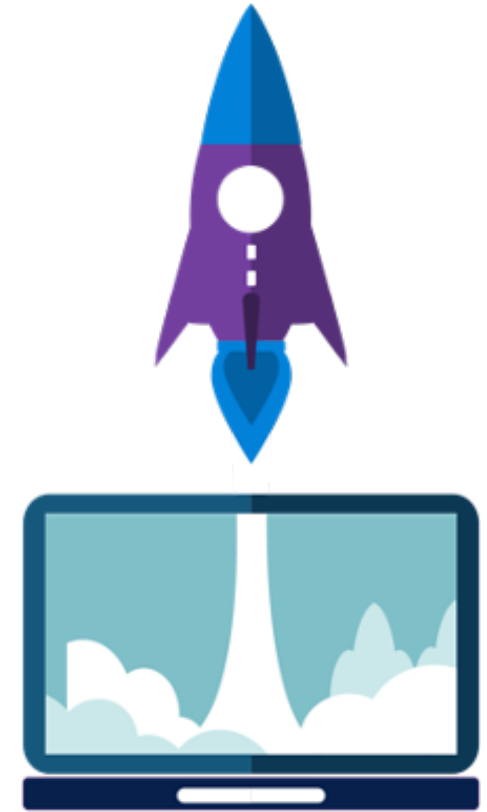
The **degree, amount, or volume** of risk that an organization or individual will withstand



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Risk Tolerance / Appetite / Threshold

ALL people/organizations/elements have varying degrees of risk tolerance.



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The background of the slide is a solid orange color with a pattern of overlapping, semi-transparent, wavy shapes in various shades of orange and yellow, creating a dynamic, fluid effect.

“When the stakes are high, preparation is everything.”

Chris Hadfield

“An Astronauts Guide To Life On Earth”

Risk Treatment Strategy: **High Risk**

High Risk requires **IMMEDIATE** action.

Project Profile Tool	
Project name:	
	<i>Use the dropdown menus to select the relevant risks</i>
Project cost	Greater than 15% of program budget Greater than 25% margin of error assumed in cost estimate Expected costs are neither allowed for in the annual budget nor externally financed
Project time	The project will take more than 6 months to deliver Greater than 25% margin of error assumed in time estimate The project must be delivered on or by a fixed date
Project scope	We have never successfully delivered a project like this
Project impact	Project delivery will noticeably impact most or all of our organization, including core service delivery The project has several major precedent or subsequent dependencies Employees and/or the public may be at risk of serious injury, illness or loss of life during project delivery Project outcomes will fulfil most or all of the strategic objectives of our organization
Project stakeholders	The project will depend on collaboration with new and/or unknown partners The project and/or its outcomes will be highly visible in the community
THIS PROJECT IS:	HIGH RISK



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Risk Treatment Strategy: **High Risk**

Act immediately by adding tasks to (or removing tasks from) the project plan until the residual risk is **LOW**

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Risk Treatment Strategy: **High Risk**

You can:

Change probability (**Transfer or outsource**)

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THIS PROJECT IS:	HIGH RISK



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Risk Treatment Strategy: **High Risk**

You can:

Change probability (**Transfer or outsource**)

Change impact (**Share ie insurance**)

Project Profile Tool	
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THIS PROJECT IS:	HIGH RISK



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Risk Treatment Strategy: **High Risk**

You can:

Change probability (**Transfer or outsource**)

Change impact (**Share ie insurance**)

Avoid (**Remove the risk source**)

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THIS PROJECT IS:	HIGH RISK



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Risk Treatment Strategy: **High Risk**

TO UPDATE: Scope Document
(WBS or other), Project Schedule
and Project Budget

Project Profile Tool	
Project name:	
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THIS PROJECT IS:	HIGH RISK



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Risk Treatment Strategy: **MEDIUM Risk**

A Medium Risk requires us to establish a **contingency**.

Project Profile Tool	
Project name:	
Use the dropdown menus to select the relevant risks	
Project cost	Between 5-15% of program budget ±25% confidence in cost estimate Expected costs are partially allowed for in the annual budget or financed by the client
Project time	The project can be delivered in less than 6 months ±25% confidence in time estimate The project has a preferred (but not mandated) delivery window
Project scope	We have successfully delivered this project at least once before
Project impact	Project delivery will noticeably impact several departments in our organization The project has some major precedent or subsequent dependencies Employees and/or the public may be at risk of minor injury or illness during project delivery Project outcomes will fulfil several strategic objectives of our organization
Project stakeholders	Some project work will need to be shared with proven, existing partners There is likely to be some community interest in the project and/or its outcomes
THIS PROJECT IS:	MEDIUM RISK



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Risk Treatment Strategy: **MEDIUM Risk**

Introduce **TIME / COST** Contingencies
that respond to the risk and **identify**
TRIGGERS for their activation.

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THIS PROJECT IS:	MEDIUM RISK



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Risk Treatment Strategy: **MEDIUM Risk**

A contingency is an action that is **only** exercised if the risk triggers and becomes an issue.

Project Profile Tool	
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THIS PROJECT IS:	MEDIUM RISK



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Risk Treatment Strategy: **MEDIUM Risk**

TO UPDATE: Risk Register, Project Schedule and Project Budget

Project Profile Tool	
Project name:	
	<i>Use the dropdown menus to select the relevant risks</i>
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THIS PROJECT IS:	MEDIUM RISK



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DISCUSSION

What do we do if a prize winner doesn't attend?

How do we proactively address this risk?



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Reserves

Contingency Reserves

Pre-authorized reserve of time or money

Best maintained at the **task level**

Returned to the business when risk retired

Enables speedy response in a crisis

*For:
KNOWN
UNKNOWN*



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Contingency Reserves

Encourages more **comprehensive** risk identification and management



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Management Reserves

General cash reserve maintained for “**surprises**”

Best maintained at the **program / portfolio level**

Usually a **fixed percentage** of the program's total time and budget

For:
**UNKNOWN
UNKNOWN**



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Management Reserves

For:
**UNKNOWN
UNKNOWN**

Distributes risk across multiple projects

Gives greater flexibility in a crisis



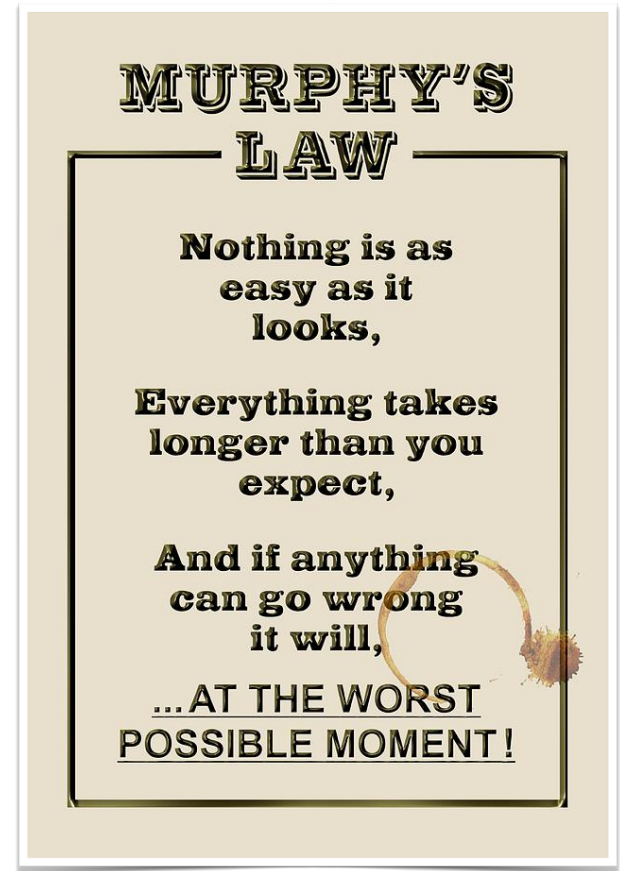
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Risk: What if Prize Winners Do Not Attend?

Contingency plan

Announce the first runner-up as the winner
(Update schedule, budget and risk register
to reflect this)

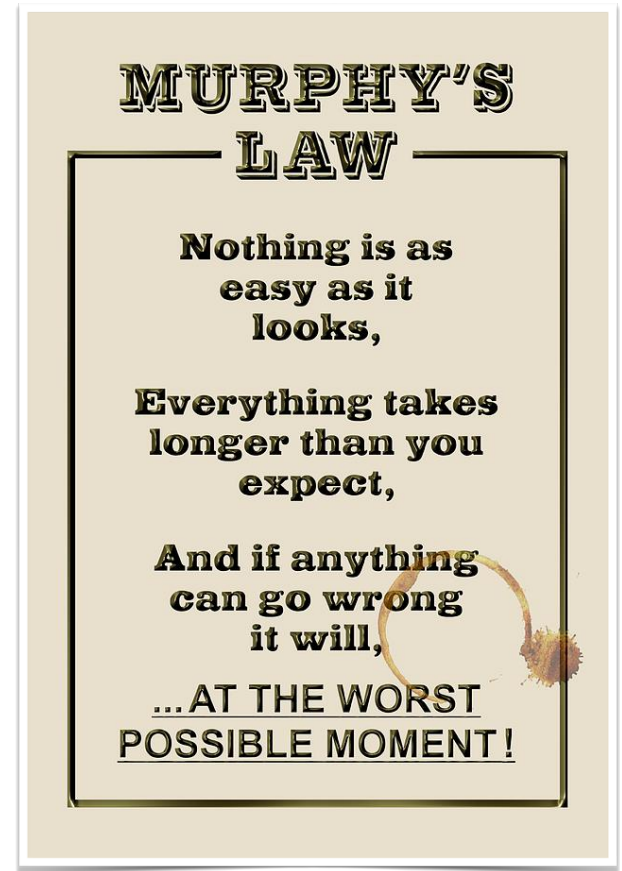


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Risk: What if Prize Winners Do Not Attend?

Secondary risks

Prize winners names engraved on awards



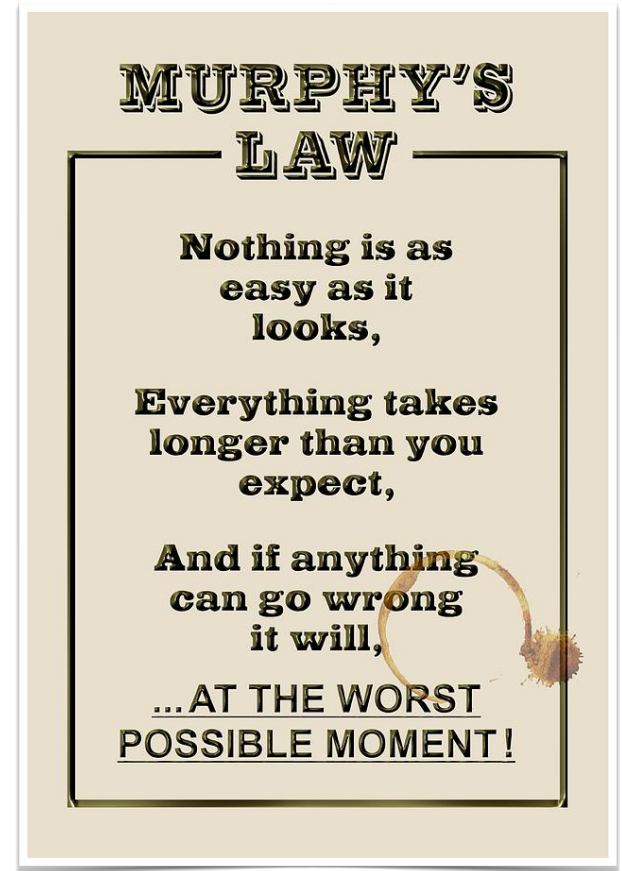
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Risk: What if Prize Winners Do Not Attend?

Residual Risks

Backlash if people find out the real winner



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Risk Treatment Strategy: **LOW Risk**

Stakeholders should be notified any time an identified risk will impact operations or introduce a risk into other areas of the business.

Project Profile Tool	
Project name:	
	<i>Use the dropdown menus to select the relevant risks</i>
Project cost	Less than 5% of program budget ±10% confidence in cost estimate Expected costs are fully allowed for in the annual budget or financed by the client
Project time	The project can be delivered in less than 3 months ±10% confidence in time estimate The project has no fixed deadline for delivery
Project scope	We have successfully delivered this project five (5) or more times
Project impact	Project delivery will noticeably impact one (1) department in our organization The project has no major precedent or subsequent dependencies Project delivery presents no employee or public health and/or safety risks Project outcomes will fulfil one (1) strategic objective of our organization
Project stakeholders	The project can be fully delivered by our current staff The project is only of internal interest to our organization
THIS PROJECT IS:	LOW RISK



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Risk Treatment Strategy: **LOW Risk**

Accept the risk by maintaining current actions, resources and strategies to prevent the risk escalating into an issue.

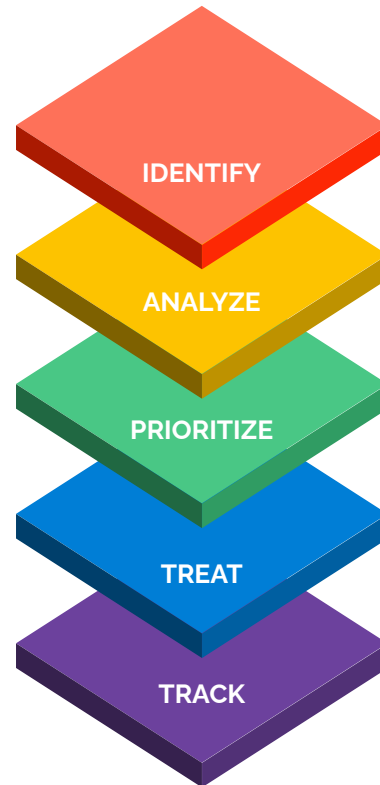
TO UPDATE: Risk Register

Project Profile Tool	
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THIS PROJECT IS:	LOW RISK



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The Risk Management Process



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The Risk Register

Risk Register Components

Identification number

Risk description

A risk owner

Probability / impact ratings

Risk treatment

Probability and impact detail

Action and contingency plans

Residual and secondary risks

Last / next review date



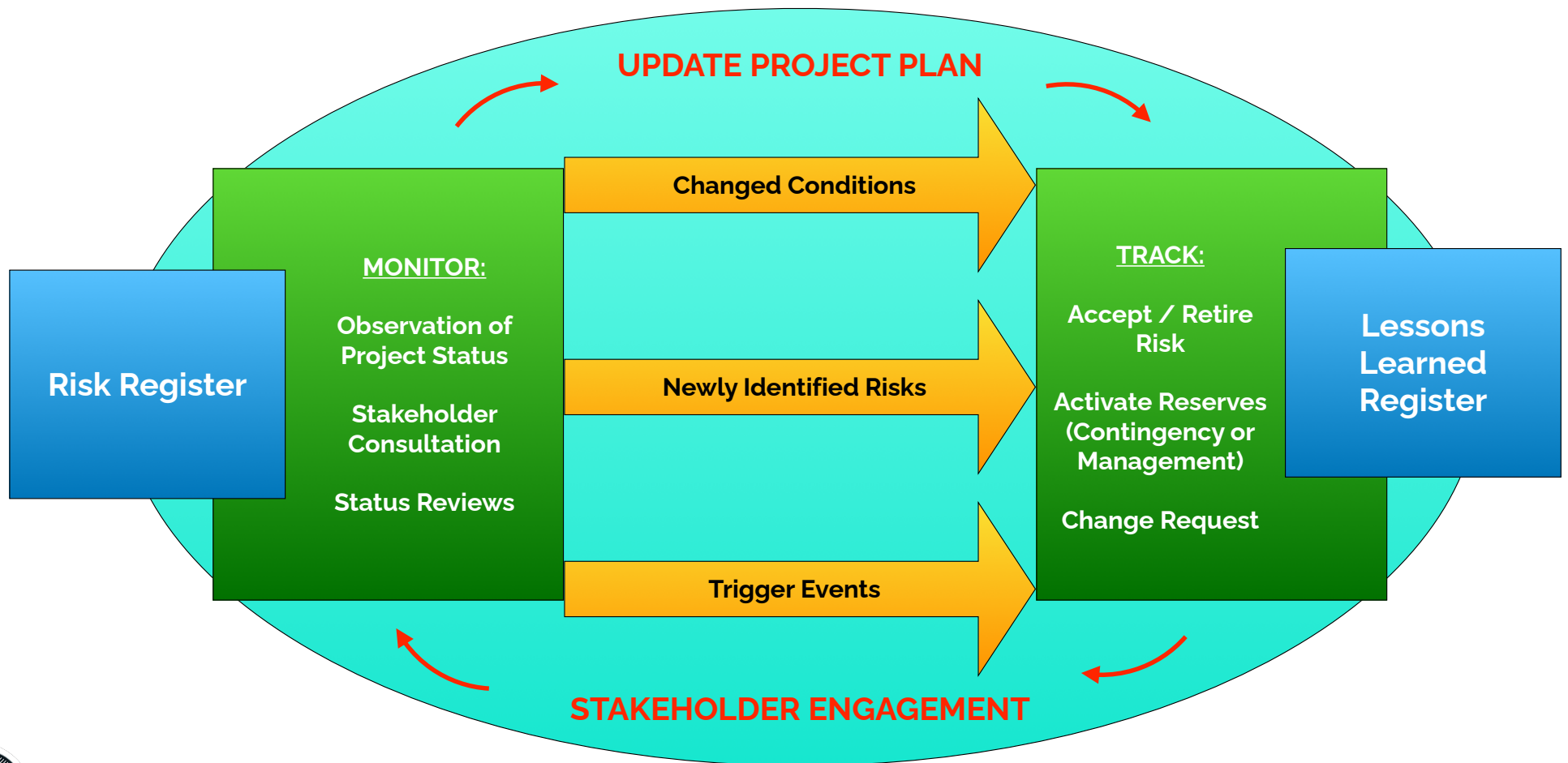
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<< Back to Register		Prize winners don't attend the party				Next Risk >>	
Ref	RISK / OPPORTUNITY	OWNER	PROBABILITY	IMPACT	PRIORITY	LAST REVIEW	NEXT REVIEW
3	Prize winners don't attend the party	Angus P	Likely	Major	High		
RISK DETAIL							
PROBABILITY							
TRIGGER EVENT		NOTES		PROBABILITY		RATING	
Not enough notice given (invites only going out 2 weeks prior to party)				There is a greater than 70% chance this opportunity / risk will happen		Likely	
Too busy working to attend				There is a greater than 30% chance this opportunity / risk will happen		Unlikely	
Accident / Injury / Illness				There is a greater than 30% chance this opportunity / risk will happen		Unlikely	
IMPACT							
FACTOR		NOTES		IMPACT		RATING	
TIME				The opportunity / risk will have no impact on project time		None	
COST				The opportunity / risk will have no impact on project cost		None	
SCOPE				The risk will demand changes to scope that mean the project's intended outcomes are now noticeably overstated		Minor negative	
OPERATIONS				The opportunity will mean that operational outages can be better anticipated and planned for		Insignificant positive	
HEALTH & SAFETY				The opportunity / risk will not impact people's health and/or safety		None	
BRAND / REPUTATION				The risk will cause alarm among stakeholders - it is likely that regulators and/or owners will take intervening action		Major negative	
NATURAL ENVIRONMENT				The opportunity / risk will not impact the natural environment		None	



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Risk Management Overview



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Key Points: Risk



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Issues materialize after identified or unidentified **trigger** events occur.

Following the process will help alleviate pains from risks and issues.

Knowing how to strategically address risk will make your projects more successful.