# ENGR 301

## Engineering Management

### RISK MANAGEMENT



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# What is “Risk”?

RISK IS A RELATIVELY MODERN CONCEPT.

RISK IS *NOT JUST* UNCERTAINTY.

# What is “Risk”?

Risk is uncertainty *combined with* the gain or loss of something of value.

*Is ‘value’ a relative, or an absolute?*

# What is “Risk”?

**Statement:**

“Software projects have very few physical hazards, therefore software projects have very few risks.”

*Do you agree, or disagree, and why?*

# Did You Know?

1. Software Engineering textbooks cover risk in detail.
2. ENZ has a good practice guideline which covers risk detail.
3. The University has an entire site devoted to risk.

# Project Risk Management

Required to improve the chances of delivering the project!

Classical Outputs:

- Risk management plan
- Risk matrix
- Risk register

# Risk Management Plan

Documents procedures for managing risk and might contain:

- Statement of methodology/process
- Statement of project risk tolerance
- Roles and responsibilities
- Budget/schedule estimates
- Standard categories, protocols and policies
- A Risk Matrix
- Response plans

Small, low risk projects may not need a large, separate risk management plan.

# Project Risk Management

Risk management commences when the project begins.

Risk management continues throughout the duration of the project.

Project management aims to proactively deal with risk.

*But what do we mean by "risk" in relation to our projects?*

# Defining

A project risk is:

"any uncertainty that can have a negative or positive effect on meeting project objectives"

All projects are inherently risky, due to:

- Constraints
- Complexity
- Assumptions
- People
- Acts of god

# Project Risk Management

Risk includes threats *and* opportunities.

- Risk Management is a process and a tool for maximising the good stuff too.

Risk is managed to optimise project success.

Success is meeting project…

scope, cost and time constraints

*and often also*

meeting quality requirements

*and* primary stakeholder satisfaction.

# Project Risk Management

The risk management process:

1. Identification of risks.
2. Evaluation of each risk.
3. Planning of responses.
4. Implementation of responses (sometimes called “risk management”).

Sometimes called “risk analysis”

**Key Result:** risk should decrease with time.

[Aside: note the similarity to the engineering design process.]

# Risk Identification

Categories for identifying potential risks:

- Technical, operational and infrastructure risks
- Organizational, management and human
- Strategic and commercial
- Economic, financial and market.
- Legal and regulatory.
- Environmental – acts of god.

For inspiration see the PRINCE2 risk categories

http://www.project-management-basics.com/prince2005/PRINCE2_90_Risk_categories.shtml

# Risk Identification

**Communicate with project stakeholders!**

Stakeholders may:

- Identify risks otherwise overlooked.
- Have a risk tolerance which affects risk identification.

Remember:

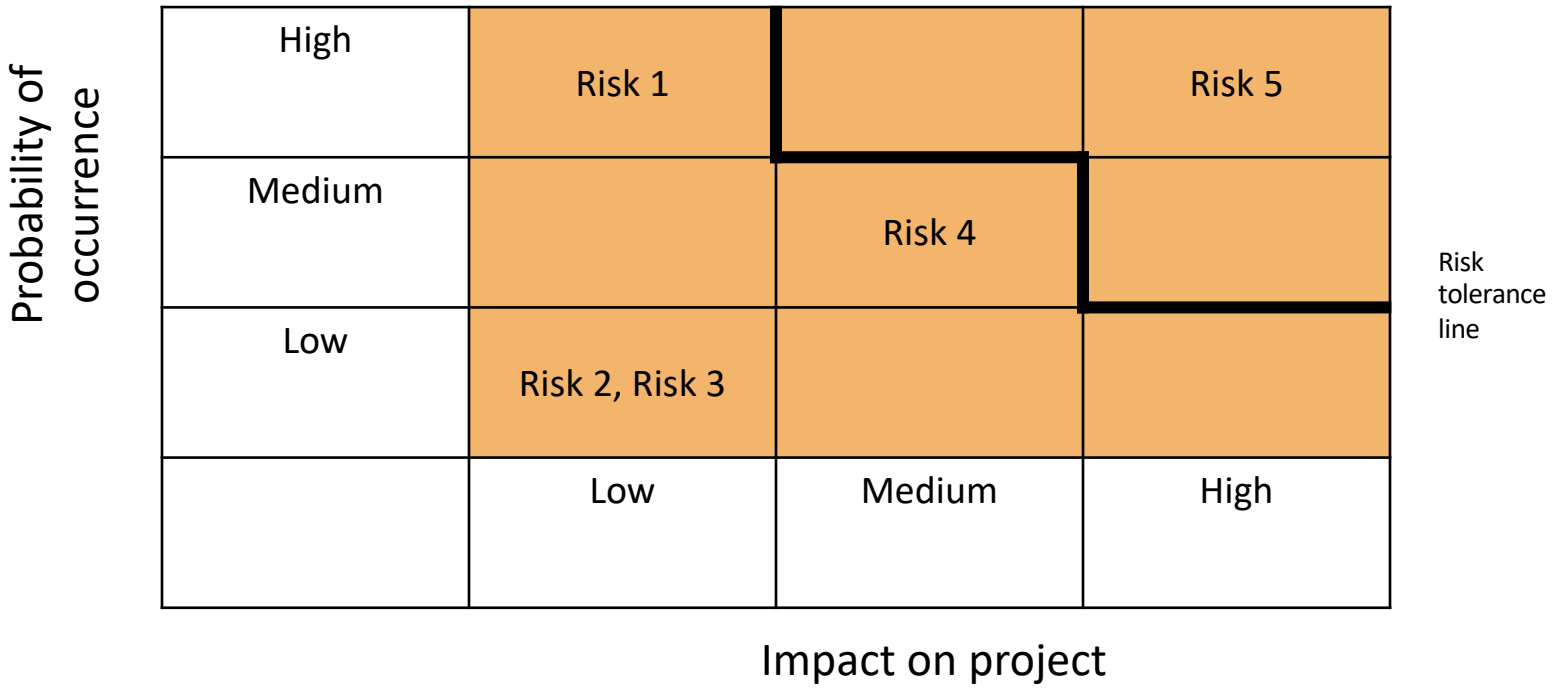
Risk includes threats *and* opportunities.

# Risk Evaluation

1. Estimate  the probability of the event.
2. Estimate the impact or effect on:
   - Scope
   - Cost
   - Time
   - Quality
   - People and resources
3. Document in the risk management plan and/or risk matrix.

# Risk Matrix

A graphical method for evaluating risk.



# Plan Responses

**The 5 typical responses to risk**

Threats:

- Elimination
- Reduction
- Transference
- Acceptance
- Contingency

Opportunities:

- Exploitation
- Enhancement
- Sharing
- Acceptance
- Contingency

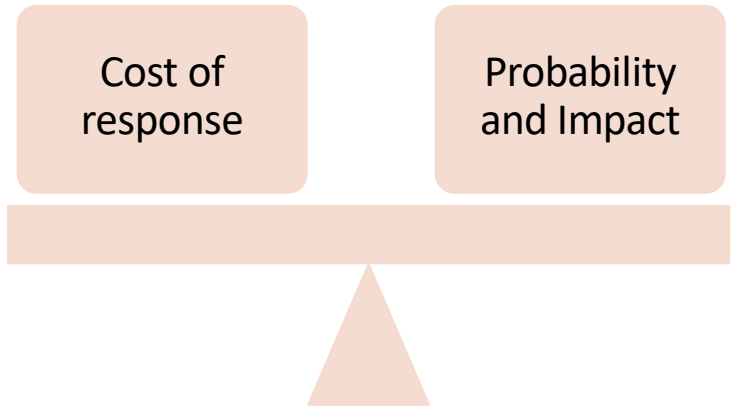
# Plan Responses

Which response is most appropriate?

- Balance response cost against risk.
- Consider project risk tolerance.

Often one clear best response.

Sometimes may need more responses and/or fallback responses.



# Risk Responsibilities

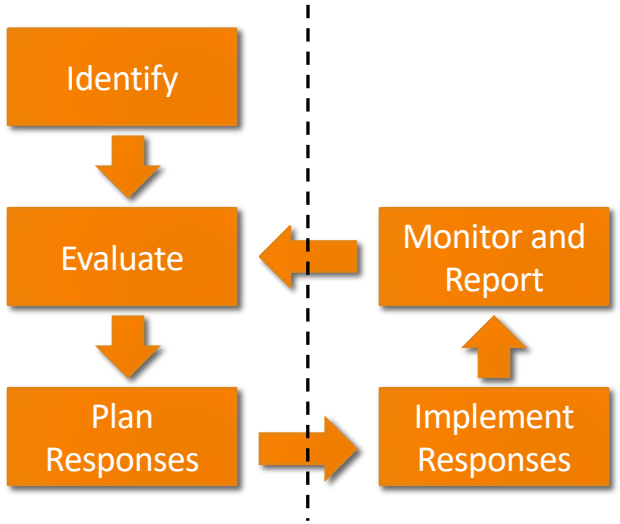
**It’s not enough to identify, evaluate and plan!**

Each significant risk should have an owner:

- Owners can be any member of the team
- Should be “the person best situated to keep an eye on it”
- Rarely, owned by people external to the project team (e.g. organisational risks).

# From Risk Analysis to Risk Management

At this point the process transitions from
**risk analysis** to **risk management**.



# Implement Responses

Implementation typically involves:

- Planning – the specifics of the response.
- Resourcing – money, time, equipment.
- Contingency planning and resourcing.
- Monitoring and reporting.
- Corrective action - if necessary.

Monitoring, reporting and corrective action are ongoing activities.

# The Risk Register

Tabulates the risks and the responses.

- Is part of risk management, not risk analysis.
- Can be as simple as a spreadsheet…
  … or as complex as a software package.
- More formal methods (e.g. PRINCE2) seek to  quantify estimates of risk.
- But: numerical data is not often available…
  … so estimates based on perception must be used.

# Example Risk Register

| ID # | Rank | Risk | Description | Response | Owner | Probability & Impact | Status |
|---|---|---|---|---|---|---|---|
| R6 | 1 | | | | | | |
| R2 | 2 | | | | | | |
| R1 | 3 | | | | | | |
| | | | | | | | |
| | | | | | | | |

There is no one correct Risk Register format.

Add or remove columns as appropriate.

Response implementation detail held separately (e.g. with risk owner).

# Monitoring and Reporting

This is an activity centred on the Risk Register.

- At minimum, risk will be considered each project reporting period
  (fortnightly, monthly,…).
- The Risk Register is updated as circumstances change.
- Risk analysis is part of the update process.

Monitoring and reporting completes the
Risk Management process cycle.

# Risk Management and Agile Projects

One approach:

1. Disregard formal risk management until risks become issues.
2. Deal with the newly arisen issues in the usual manner (e.g. sprints).

“We’re so Agile, no risk can touch us”.

- Works great for some kinds of risk.
- Is, inevitably, vulnerable to other kinds of risk.

Examples of the latter:

- Technical: sudden loss of expertise.
- Infrastructure: hardware failure.

# Risk Management and Agile Projects

Another approach:

1. Manage project risk, adapting the techniques as appropriate.

"We're so Agile we learn from the mistakes of others"

- Works for as many risks as possible.
- Risk exposure reduced.

See: **Risk Management in Agile,** Scrum Alliance.

https://www.scrumalliance.org/community/articles/2013/2013-may/risk-management-in-agile

# Scenario

**Real Scenario:** You work for a passenger line company as project manager for the commissioning of a new luxury ship. You have contracted overseas construction by tender and specified certain requirements, one of which is a contracted minimum top speed of 22 knots.

The original shipbuilder files for bankruptcy before completion of the ship. Before you can conclude negotiations with another ship builder, the receivers of the bankrupt company form a new company which assumes the contract.

During sea trials, engine and electrical problems reduce top speed to 21.7 knots.

# Scenario

Completion of the new ship is nearly eight months behind schedule and delivery for the summer season is in jeopardy. Your engineers *may* be able to fix the problems after delivery. **Do you:**

a) delay and insist the shipbuilder complete to specifications.

b) accept delivery under spec and hope your engineers can fix the problem.

c) something else?

# Scenario

This was the real scenario facing the Union Steamship Company in December 1965 through to June 1966.

They decided to accept delivery under specifications. Their engineers fixed most problems with the ship, although the top speed never exceeded 21.7 knots.

The ship began operations in August 1966, and was praised for its luxury and handling.

# Scenario

The name of the ship was the T.E.V. Wahine and on the morning of 10 April 1968 it foundered in a storm at the entrance to Wellington harbour. 51 lives were lost on the day of the sinking and it is one of the most well-known maritime disasters in NZ's modern history.

**Wahine Memorials** http://wildbaynz.blogspot.co.nz/2013/02/out-there-in-wellington-wahine-memorials.html

**The Wahine:** http://www.thewahine.co.nz/Wahine.html

**Wellington City Libraries** http://www.wcl.govt.nz/heritage/wahine.html

**Wahine - The Untold Story - TV3 - 1993**

# Monitoring and Controlling Project Risk

A **risk** is a specific, uncertain event that may occur to the detriment or benefit of the project.

Monitoring and controlling risks involves:

- executing the risk management processes
- to respond to risk events

# Monitoring and Controlling Project Risk

Outputs of risk control include:

- The “Standard Five” [work performance information, change requests, project documents updates, project management plan updates and organizational process assets updates]

*What does this look like for your projects?*

# Monitoring and Controlling Project Risk

Carrying out individual risk management plans involves:

- monitoring risks
- based on defined milestones and
- making decisions regarding risks and their response strategies

Project Risk Management is carried out iteratively and should be part of every iteration review.

# Monitoring and Controlling Project Risk

Project teams sometimes use **workarounds**—unplanned responses to risk events—when they do not have contingency plans in place.

**Contingency plans** are predefined actions that the project team will take if an identified risk occurs

**Fallback plans** are developed for risks which have a high impact on meeting project goals.

**Risk Management**

1. Avoidance
2. Reduction
3. Sharing
4. Retention

# Monitoring and Controlling Project Risk

*Will I be excused if I choose to not manage risk and something foreseeable occurs?*

# Risk Management References

[1] Ian Sommerville, *Software Engineering* 10th Ed. (2016) Ch. 22, pp. 644-652.

[2] Allan Kelley, *Xanpan* (2018)