What risk management can do for you

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My risk management plan in delivering this Webinar

1. Define the context
   - Assumption: You are not seasoned risk practitioners, but you have conducted or exposed to some sort of risk management tasks before
   - Risk analysis has been conducted in various activities, ranging from spilling water to Mars landing mission
   - Common applications
     - Safety assurance and security assessment
     - Accident and loss prevention/control
     - Financial investment analysis
     - Asset management
     - Project management
     - Decision analysis
     - Cost-benefit analysis
     - Enterprise risk management
     - Assessment of risk appetite (risk appetite) and tolerance (risk tolerance).
     - …

$$B/C = \frac{Benefits}{Cost}$$

B/C > 1: cost effective

Would you select B/C <1 options?

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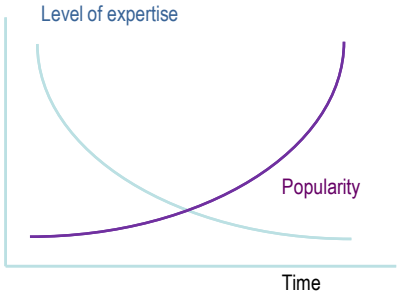
My risk management plan in delivering this Webinar

1. Define the context
   - Assumption: You are not seasoned risk practitioners, but you have conducted or exposed to some sort of risk management tasks before
   - Risk analysis has been conducted in various activities, ranging from spilling water to Mars landing mission
   - As risk analysis is gaining its popularity amongst industries, its application is also getting simpler and less quantitative



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Modern risk analysis – evolution in safety-related applications (my observation)

1950's-60's – Military and defense: fault tree, system safety, RAMS, MIL-STD-882, hazard register, risk matrix
deterministic, qualitative

1960's-70's – Nuclear and aviation: probabilistic risk assessment (PRA), fault tree/ event tree, Bayesian update, human error, expert opinion, fire, flood
very quantitative, uncertainty analysis

1980's – Petrochem, aerospace, offshore oil, high risk industries: quantitative risk assessment (QRA), HAZOP, IPE, ALARP
less quantitative, deterministic

1990's – Railway/transportation, environmental, project risk, risk matrix, financial risk, ERM, OSHAS 18001
more qualitative, more applications

2000's-now – almost all industries, OSH, ISO31000, ISO 45001, ISO 45003
very qualitative, most industries

Risk analysis is also blossomed in other areas: insurance risk, actuarial science, business strategy risk, financial investment risk, medical diagnosis, etc.

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Risk management – origin?

- The concept of risk assessment and management has a long history
- More than 2400 years ago the Athenians offered their capacity of assessing risks before making decisions
- From the Pericle's Funeral Oration in Thurcydidas 'History of the Peloponnesian War' (started in 431 BC):

We Athenians in our persons, take our decisions on policy and submit them to proper discussion. The worst thing is to rush into action before consequences have been properly debated. And this is another point where we differ from other people. We are capable at the same time of taking risks and assessing them beforehand…

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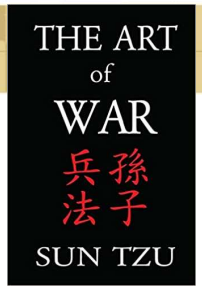
Sun Tzu's The Art of War, was written 2,500 years ago



"A wise man would consider both pros and cons in solving problems. Understand the pros to gain confidence and understand the cons to resolve conflicts."

是故智者之慮，必雜于利害，
雜于利而務可信也，
雜于害而患可解也。

故不盡知用兵之害者，
則不能盡知用兵之利也。

孫子兵法
作戰篇

"If one does not thoroughly understand the harms in raging a war, one cannot thoroughly understand the benefits in using one's army."

The importance of considering the positive and negative effects of activities or actions

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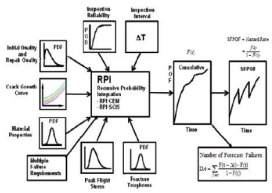
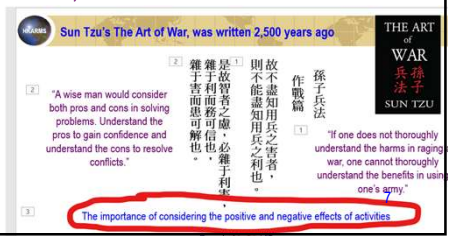
Defining risk…

- On the Quantitative Definition of Risk, *Kaplan and Garrick, Risk Analysis, Volume 1, Issue 1,1981*
  - In general, risk is used to answer
    - What can go wrong?
    - What are the damage effects?
    - How likely is it that this will happen?
    - What are the uncertainties?
  - Uncertainties are reflected by the probability of frequency
  - Commonly applied in nuclear and complex engineering systems



- **ISO 31000:2009** Risk Management- Principles and Guidelines on Implementation; ISO 73-2009: Risk Management – Vocabulary
  - Risk is defined as the "effect of uncertainty on objectives"
  - The "effect" can be positive and/or negative
  - Popular in enterprise risk management
  - Updated to **ISO 31000:2018**



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More definitions of risk

- The chance of something happening that will have an impact upon objectives (AS/NZS4360: 2004 - Risk Management)
- Combination of probability of an event and its consequence (ISO/IEC Guide 73: 2002 – Risk Management Vocabulary – Guidelines for Use in Standards)
- The combination of the probability of an event occurring and its consequence for project objectives (BS IEC 62198: 2001 Project Risk Management – Application Guidelines).
- Uncertainty inherent in plans and the possibility of something happening that can affect the prospects of achieving business or project goals (BS6079-3: 2000: Guide to the Management of Business-Related Project Risk)
- The chance of injury or loss as defined as a measure of the probability and severity of an adverse effect to health, property, the environment, or other things of value (CAN/CSAQ850- 97: Risk Management Guideline for Decision Makers)
- And many more… try Google

Even the top experts are not agreeing with each other

Most people would just use *Risk = Likelihood x Consequence*

Why do we assess risk?

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Why do we assess risk – my interpretation

$$B/Ci = \frac{Benefits_i}{Cost_i}$$

- Am I making the right decision? What actions are needed to assure project success or minimise failure?
- We want to attend to all decision options or actions, but that can be impractical

Select an optimal decision option(s)

Do everything
$$$$$$

Sliding scale to score these options

Do nothing
$$$$$$$$$

- Which decision option(s) should we take? How much should we spend?
- We should put resources on options that reward us more, and more often
- We need a sliding scale with a unit to score the outcome or consequence (and its likelihood) of each option so that we can compare and rank-order them
- If a decision option has a high score, you want to attend to it first with more resources

One of the practical scales is "RISK"
For safety applications, we can replace "decision option" with "undesirable event"

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Risk as a measure

Select an optimal decision option(s)

Do everything
$$$$$$

Sliding scale to score these options

Do nothing
$$$$$$$$$

- Resources applied should be commensurate with the consequence and likelihood of the events - risk
- Spend more resources in managing events with higher impact and more often
- Unfortunately, risk cannot be measured directly
- Typically, we use Risk = Likelihood x Consequence; many other forms exist

Risk is used to assess the benefits (or level of "unsafe")
Risk is a measurement, it itself is neither good nor bad

$$B/Ci = \frac{Benefits_i}{Cost_i} \rightarrow B/Ci = \frac{\Sigma Risk\ Benefits_i}{Cost_i}$$

Risk benefits can be positive or negative

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My risk management plan in delivering this Webinar

1. Define the context
2. What can go wrong – the problem space

	Knowns	Unknowns
Known	Things we are aware of and understand	Things we are aware of but don't understand
Unknown	Things we understand but are not aware of	Things we are neither aware of nor understand

Source: US Secretary of Defense Donald Rumsfeld during a Pentagon news briefing in February 2002

No clear cut between these boxes, don't try to find a black and white boundary

Which one worries you the most?

Which one you want to explore more?

They present uncertainties in making decisions

What do you want to know from a risk assessment and what can affect your decision?

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My risk management plan in delivering this Webinar

1. Define the context√
2. What can go wrong – the problem space
   - Can we measure what can go right?

$$B/Ci = \frac{\Sigma Risk\ Benefits_i}{Cost_i} \rightarrow B/Ci = \frac{\Sigma(Risk_{i,Existing} - Riski_{,Residual})}{Cost_i}$$

Depends on whether $Risk\ Existing_i$ _ $Risk\ residuali$ is a positive or negative item, and how do we assess the Δrisk (differential risk)

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Most decisions are multi-criteria

- Financial objectives
- Customer demands
- Shareholder satisfaction
- Regulatory compliance
- Health & safety
- Public liability
- Social responsibility
- Environmental concerns
- Operational impact
- Good will and public perception
- Management resources…..

$$B/C_i = \frac{\Sigma\, Risk_{i,Existing} - Riski_{,Residual}}{Cost_i}$$

Changes of impact under each criterion can be represented by $\Delta Risk$
$Benefit_i$ and converted to $; hence, B/C > 1: cost effective

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Decision analysis example

- Objectives
  - Give advice on the upgrade strategy on which building services system(s) to upgrade with a fixed initial budget
  - Assist management to build up a business case if further funding is required
- Multiple-alternatives, each with options
  - Passenger lift system
  - Air-conditioning (A/C) system
  - Lighting system
- Issues
  - Not enough money to upgrade all systems
  - Which system is more attractive to tenants
  - Additional options – overhaul instead of buying new?
  - How do I ask for more funding?
- Different systems with different functions

What do you want to know from a risk assessment and what can affect your decision?

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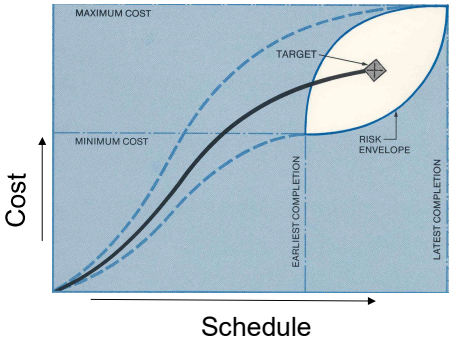
Let's look at project risk as an example

- Elements of a Project
  - Deliverables
  - Delivery dates
  - Budget
  - Acceptance criteria
  - Authority to accept
- What can go wrong – the problems, that can affect the ability to deliver the project



What doesn't get measured doesn't get managed

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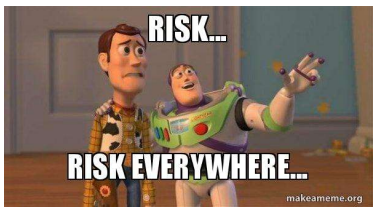
Are you confused yet?

- Which one is correct?

Risk is a scale registering the benefits (or ability to meet the objectives) of an option, activity, operation, or business, it itself is neutral

- So, is this OK?



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When to do a risk assessment

We should proactively risk assess undesirable events and embed risk management into procedures and work culture

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My risk management plan in delivering this Webinar

1. Define the context√
2. What can go wrong – the problem space √
3. How do I mitigate the problems

   Principles or risk control
   - Risk Elimination
   - Risk Avoidance
   - Risk Transfer
   - Risk Reduction
   - Risk Absorption

How would you apply the risk control principles here?

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Hierarchy of risk control – in descending order of priority

- Elimination – remove the hazards all together
- Substitution – e.g., substituting with a less hazardous substance
- Isolation – e.g., isolate the hazards from any person exposed to it
- Engineering control – e.g., guard around machinery
- Administration control – e.g., training and work process
- Personal protective equipment (PPE)

Do not jump into issuing PPE until you have thought of other control measures

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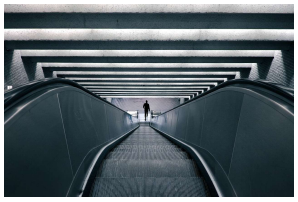
My lessons learned in applying B/C analysis

$$B/C_i = \frac{\Sigma\, Risk_{i,Existing} - Riski_{,Residual}}{Cost_i}$$



Need to understand the resistance in managing risks and the need of a shared risk culture

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Develop a shared risk informed culture

"An effective risk culture is one that enables and rewards individuals and groups for taking the right risks in an informed manner."

(Institute of Risk Management)

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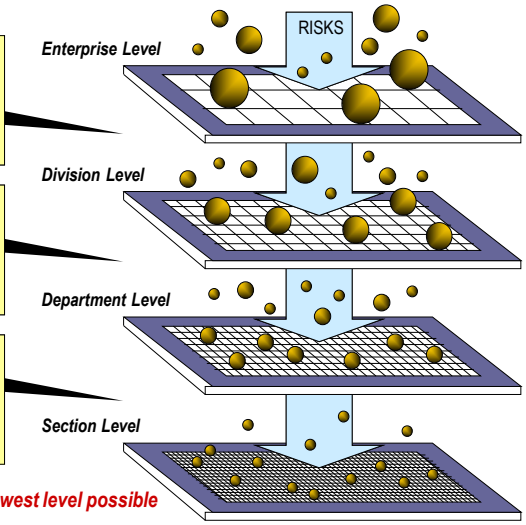
Different organisational levels face and manage different types of risks

- *How does a risk to one business affect the delivery of other related business?*
- *Which external stakeholders have the ability to influence the success of one or more businesses?*
- *How can a successful risk mitigation strategy for one business be leveraged by other businesses?*

- *Is the business on track to meet or exceed its threshold requirements?*
- *How do current risk levels impact the ability to meet KPI and requirements?*
- *Which solution provides the optimal balance between capital, operating and maintenance costs?*

- *What are the technical risks associated with delivering a given requirement or capability?*
- *How will customers, operation, and performance be impacted by a given risk event?*
- *What are the impacts by sub-standard contractor or parts?*



Risks ultimately should be filtered to the lowest level possible for ownership and mitigation

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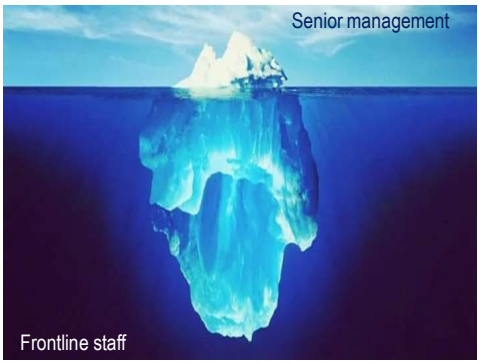
Who is best to lead the efforts in establishing a sustainable, shared positive risk culture?

- Company risk culture has to start at the top, ultimately, employees follow behavior modeled by senior leadership

Knowledge about problems



Power to change

Try the 7C thinking
- Compliance
- Consequence
- Competence
- Collaboration
- Communication
- Culture
- CYA

We need to realise the importance of developing a sustainable, shared positive risk culture but everyone has a role to play

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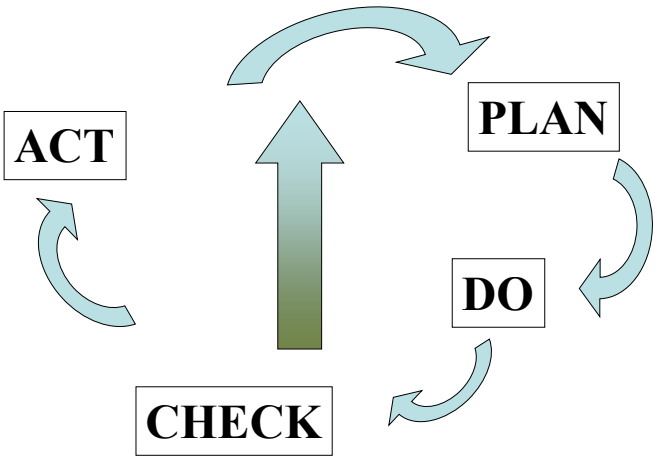
My risk management plan in delivering this Webinar

1. Define the context√
2. What can go wrong – the problem space √
3. How do I mitigate the problems√
4. How do I communicate my findings
5. How do I monitor progress and adjust actions



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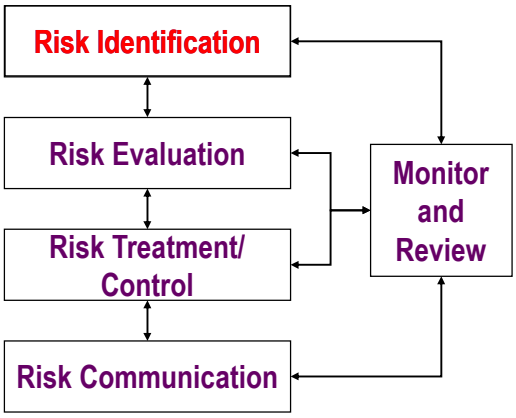
Steps in a risk management programme – how to do it?



- Risk management programme is not a one-off activity
- These steps are often iteratively applied in phases
- These generic steps are applicable to ALL businesses/ disciplines/ industries continually

Which one is the most important step?

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Why do we need risk management – the purpose

- Identify risk exposure/ levels/ profile
  – to see what big the bag is
- Rank hazards and risk control measures
  – to optimise resources, decide what to do and their cost-effectiveness
- Document decisions and due process
  – to address liability, what you have done to prevent the accident
- And do the above systematically
  – to minimise uncertainty and surprises

Making the right decision can assure project success,
risk management helps you to choose the optimal decision

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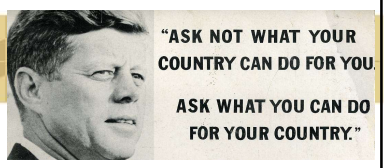

Ask not What risk management can do for you

Ask What you can do with risk management

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Something to remember

Build a positive risk culture as the foundation of your risk management program

Understand why you implement a risk management program

Use risk as a scale and apply the risk control principles

Understand the resistance

Build a positive risk-informed culture

Review and monitor

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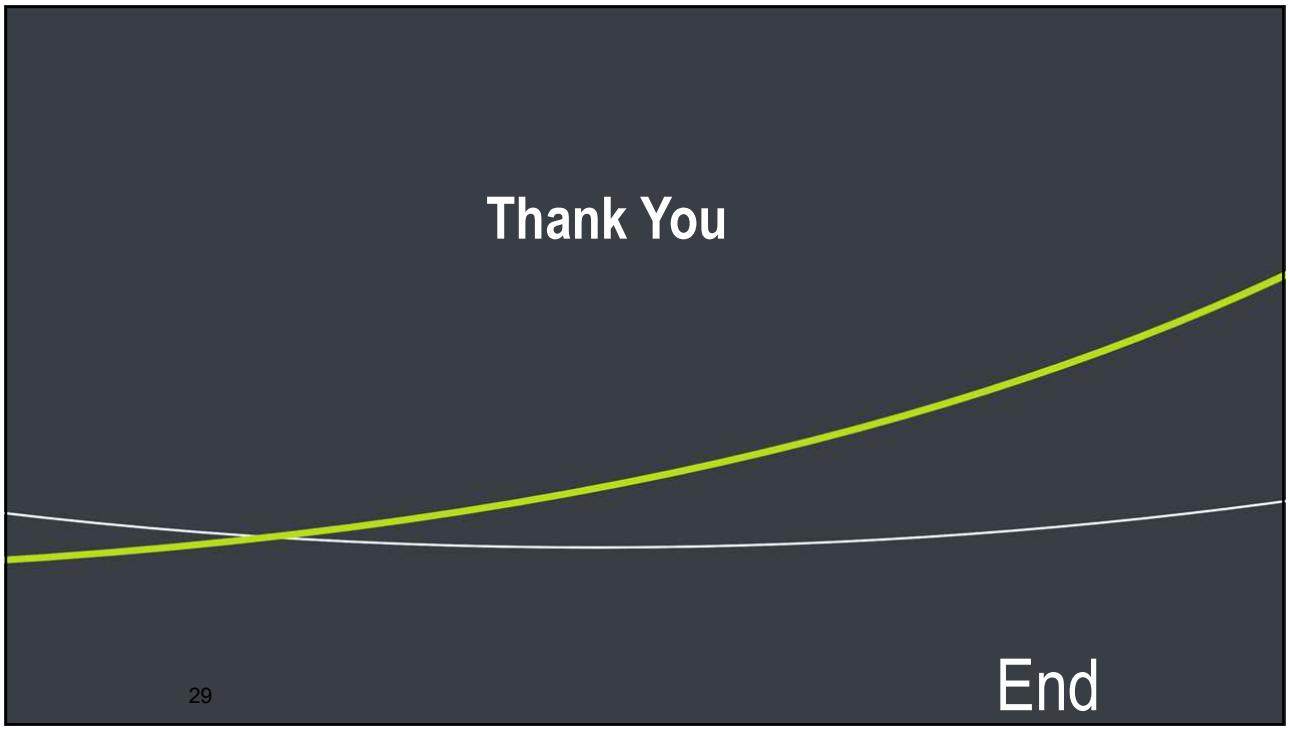

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