

University of Nottingham

MMME2049 Engineering Management 1

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Risk Management

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Risk and Hazard

- **Hazard** is a threat, a source of potential harm or danger.
 - **Risk** is the possibility that harm or injury might occur when someone or something is exposed to a hazard.
 - **Risks** can sometimes be opportunities
 - Risks and Hazards need not just be to safety, they can address all risks including financial ones.
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Responses to Risk

- **Avoid** – Find an approach that does not contain the risk?
 - **Retain** – Acceptable, no need to action and accepted as part of normal business
 - **Reduce** – through introduction of risk controls, or charging a premium to cover financial risks
 - **Transfer** – through insurance or using a supplier for part of the task / process
 - **Exploit** – no safety issue evident and possibility for greater return on investment, but needs full knowledge of costs and contingencies that might be needed? Risks may also be Opportunities.
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Exercise 1

You are setting up a company manufacturing components for attaching windscreens for use in aircraft. You know that you need to have a risk management strategy or plan. What should you include in this?

What is risk management?

Are there methods that you use to help you do this?

What might be involved in a risk management process? Write down some suggestions for steps in a risk management process.



Risk Management Frameworks and Processes

- Define the problem in its context
 - Analyse the risk associated with the problem
 - Examine options to address the risks
 - Take decisions about the options to implement
 - Implement decisions
 - Evaluate the results of the actions
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Risk Register

A qualitative safety risk analysis is performed in exactly the same manner as the project risk analysis

Update		Safety Risk Register Example							
ID	Cause and Effect		Risk Assessment				Categorisation Keywords		Expiry Date
	If...	Then...	P	I	Rank	Priority	Type	Area	
1	there is an unplanned release of dry steam from the supply line	the cell will be exposed to high temperature steam	M	H	18	HIGH	Safety	Utilities	Decommission of steam line
2	the rotor overspeeds	there may be a release of high speed high energy debris from the rig module	L	H	16	MEDIUM	Safety	Engineering	Decommission of rig
3	if there is an unplanned release of flammable hot oil from the rig module	it may come in contact with a spark and ignite.	M	H	18	HIGH	Safety	Engineering	Decommission of rig

Risk Register

Residual Risk (after mitigation)				
P	I	Rank	Priority	Mitigation
L	M	11	MEDIUM	Ensure no one is allowed into the cell when the steam supply valve is open
L	H	16	MEDIUM	Ensure that there is an emergency shutdown on overspeed. Ensure no one is allowed in the cell during operation.
M	M	13	MEDIUM	Ensure that there is a bund under the rig module to capture any oil released. Ensure all electrical cables are remote from likely areas of oil release and properly insulated. Ensure no one is allowed in the cell during operation. Ensure there is a fire detector and automatic alarm in the cell.

Risk Register

Summary tables (current risks)

Initial Risks

Probability	U						0
	VH	0	0	0	0	0	Impact
	H	0	0	0	0	0	
	M	0	0	0	2	0	
	L	0	0	0	1	0	
	VL	0	0	0	0	0	
	VL	L	M	H	VH	U	

Initial risk analysis

Residual Risks (after mitigation)

Probability	U						0
	VH	0	0	0	0	0	Impact
	H	0	0	0	0	0	
	M	0	0	1	0	0	
	L	0	0	1	1	0	
	VL	0	0	0	0	0	
	VL	L	M	H	VH	23	

Summary of risk analysis after mitigation

In this instance given the energies involved in some of the hazards a quantitative risk analysis might be performed too.

Exercise 2

Your business is going well, you are expanding, staff numbers are growing, orders are increasing. How might this affect your risk management strategy? What else do you need to consider?

Things to consider

- New relationships
 - Impact of more staff
 - Larger premises
 - New technology
 - New business processes
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Risk Appetite or Tolerance

- **Averse** – avoidance of any risk is an important objective
- **Minimal** – preference for ultra-safe options that are low risk and definitely only have potential for limited reward
- **Cautious** – preference for safe options with low risk and may have limited potential for reward
- **Open** – willing to consider potential options and choose one that is likely to be successful, with an acceptable level of reward and value for money
- **Hungry** – eager to be innovative and choose options with potentially higher rewards in spite of the greater risk.

Breakwell (2014)

Societal Factors Affecting Acceptance of Hazard and Risk

- Is exposure to the hazard and its associated risk **voluntary or involuntary**?
- Is the hazard under a person's **own control or someone else's**?:
- Is the hazard and its risk **familiar or unfamiliar**?
- Are the consequences **short or long-term**?
- Are there existing **alternatives** to accepting the hazard?
- What is the **nature of the consequences**
- Are there any **benefits** derived from accepting a hazard and risk?
- How is the hazard and its risk **presented in the media**?
- How are people **personal involved** with the hazard and its risks?
- Is **unbiased information** on the hazards and its risks readily available?
- How **abstract** is the hazard and risk?

Exercise 3

You have a problem. There has been an incident with a plane that has your windscreen components.

What are the potential impacts on your business?

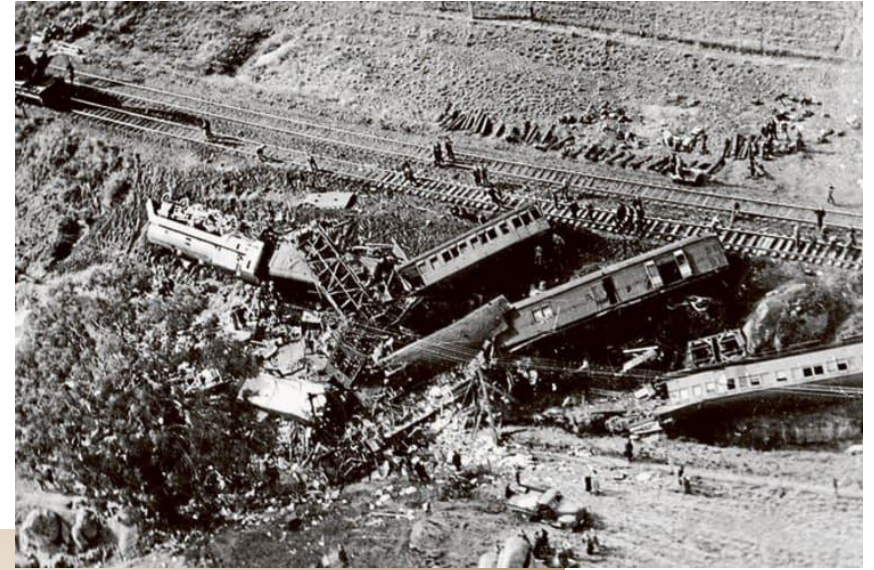
How should your organisation respond to this?

What do organisations do to plan / prepare for this type of problem (failure / incidents) in advance?

How do organisations do this in practice?

Cost of Failure

- Loss of life
- Increased injury rates
- Financial losses
- Prolonged litigation
- Reputational damage



Dealing with incidents

- Mitigation
- Exercises and scenario planning
- Business continuity management



Exercise 4

The business is recovering. You decide to strengthen your approach to risk management. What additional threats to your organisation might you consider?

Retrospective

Atypical events

- Complex systems, multiple organisations, changing circumstances, interactions
- Black Swans, outliers, extreme impacts, not always possible to predict what will happen
- Perfect storms, rare combinations of rare circumstances

Adversarial threats

- Internal
 - External
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Questions?
