Risk Management MN220: Seminar 8 Project Risk Management

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Project Risk Management

- Introduction
- What makes projects different?
- Project risk
- Project risk framework and context
- Project complexity and interdependency
- Project organisation
- Risk identification
- Project organisation, communication and stakeholders
- Risk identification and analysis
- Risk decisions
- Project risk management system
- Case study

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Engineering projects that have gone wrong

- https://www.youtube.com/watch?v=frMDjnYqcwc/

The passenger terminal at Charles de Gaulle airport collapsed 10 months after opening - left a 50 metre by 30 metre gap in the tunnel-like building – 4 die, 3 injured.

CNN News http://www.cnn.com/interactive/world/0405/gallery.paris.terminal/frameset.exclude.html

Slabs of concrete and metal came crashing down from the terminal ceiling onto the waiting area.

CNN News http://www.cnn.com/interactive/world/0405/gallery.paris.terminal/frameset.exclude.html

Projects can be quite complex in design and execution

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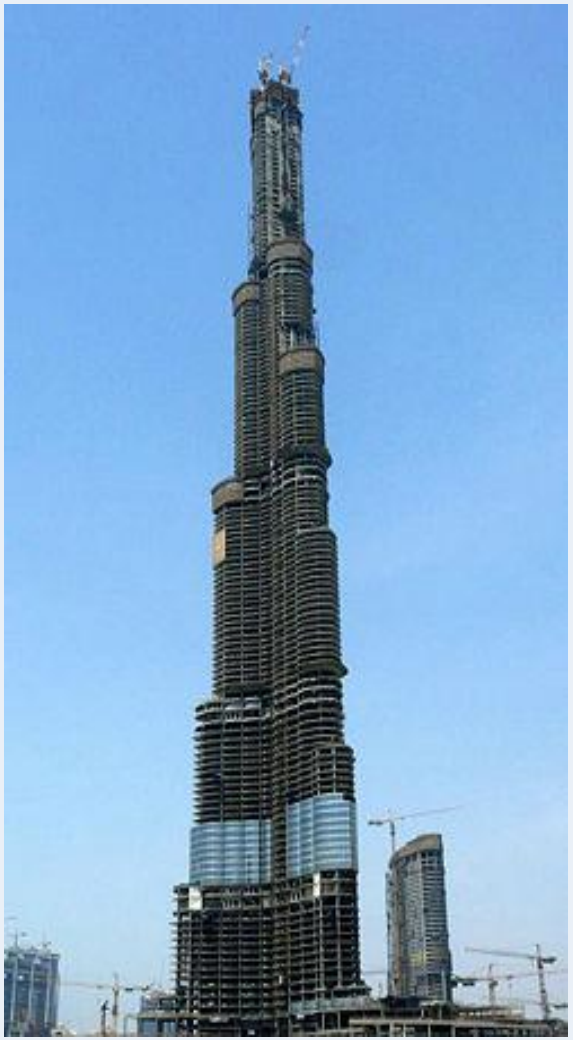
Construction of the Worlds tallest building in Dubai



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Bridge Collapses Since 2000

1. Interstate 794 Hoan Bridge,Wisconsin, 2000 - Partial failure, no injuries
2. Hintze-Ribeiro Bridge, Portugal, 2001 - 59 killed in three cars and one bus after the collapse of the bridge.
3. Kadalundi River rail disaster, India, 2001 - 57 drowned when 140-year old rail bridge collapsed.
4. Asagiri footbridge disaster, 2001 - Progressing to summer firework festival, when people are stampede and panic at Akashi, Japan, at least 11 killed, 247 injured.
5. Rafiganj rail disaster, India, 2002 - 130 died when terrorists sabotaged rail bridge, causing crash.
6. The I-40 Bridge Disaster, 2002 - 14 killed in barge strike.
7. Interstate 95 bridge over Howard Avenue in Bridgeport, Connecticut, March 2003 - Fire resulting from fuel truck crash melted the bridge superstructure, resulting in partial collapse. No fatalities; driver of the truck escaped with minor injuries.
8. Sgt. Aubrey Cosens VC Memorial Bridge, Latchford, Ontario, 2003 - Partial failure, no one hurt.
9. Veligonda rail disaster, India, 2005 - 114 killed when flood washed rail bridge away.
10. De la Concorde Overpass collapse Overpass Collapse, Laval, Quebec,Canada, 2006 - Five dead, six injured
11. Run Pathani Bridge Collapse, 80 km east of Karachi, Pakistan - Bridge collapsed during the 2006 monsoons.
12. Guinea - Bridge collapses in March, 2007 under a weight of a truck packed with passengers and merchandise in southeastern Guinea - killing 65 people.[5]
13. Oakland, California - Tanker explosion melts sections of the MacArthur Maze, causing them to collapse on April 29, 2007. The damaged sections are repaired and reopened by May 24, 2007.
14. Guangdong, China Ship hits section of 1.600 m bridge crossing the Xijiang River near Foshan, Guangdong on June 15, 2007. 200 meters of the bridge. 9 people reported missing.
15. Minneapolis, Minnesota - I-35W Mississippi River bridge over the Mississippi River, connecting downtown Minneapolis and North Minneapolis collapsed on August 1, 2007.
16. Chhinchu suspension bridge - Overcrowded suspension bridge collapsed at Nepalgunj, Birendranagar, Nepal on December 25, 2007. Killing at least 19, missing another 15.

Introduction

- *"All projects have starting points and finishing points. This distinguishes them from other undertakings, such as manufacturing or retail commerce, where the starting point may be known but the finishing point may be theoretically indeterminate "*[1]

[1]Edwards, P., Bowen, P., Risk Management in Project Organisations pp 3

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What Makes Projects Different?

Projects...

- are deliberate undertakings;
- have a finite life;
- project risks tend to change over the life of the project;
- project risks tend to be dynamic rather than static; and
- the context for decision making is different.

Project Risk

- *"Another distinctive feature about projects is that they demand the acquisition and application of resources over and above those normally required for purely operational purposes[2]"*

[2]Edwards, P., Bowen, P., Risk Management in Project Organisations pp3

Examples of Projects

- Long term, e.g.: mining operation: often operate for long periods of time (30 years or more);
- Medium term, e.g. construction of a bridge, building or other infrastructure; usually months or several years;
- Short time frame: e.g., simple office relocation; time frame is in days or weeks.

Project Charter

- An important document created by the Project Manager outlining the project's preliminary scope and objectives, identifying the project participants and defining their roles and responsibilities in a project.

- The charter serves as a formal written and signed agreement between the project's stakeholders (sponsor) regarding the details of the project and validating its existence.

- Ensuring that all the project stakeholders are on the same page and minimises the emergence and impact of miscommunication, role confusion, and conflicting stakeholders interests

What to include in a Project Charter ?

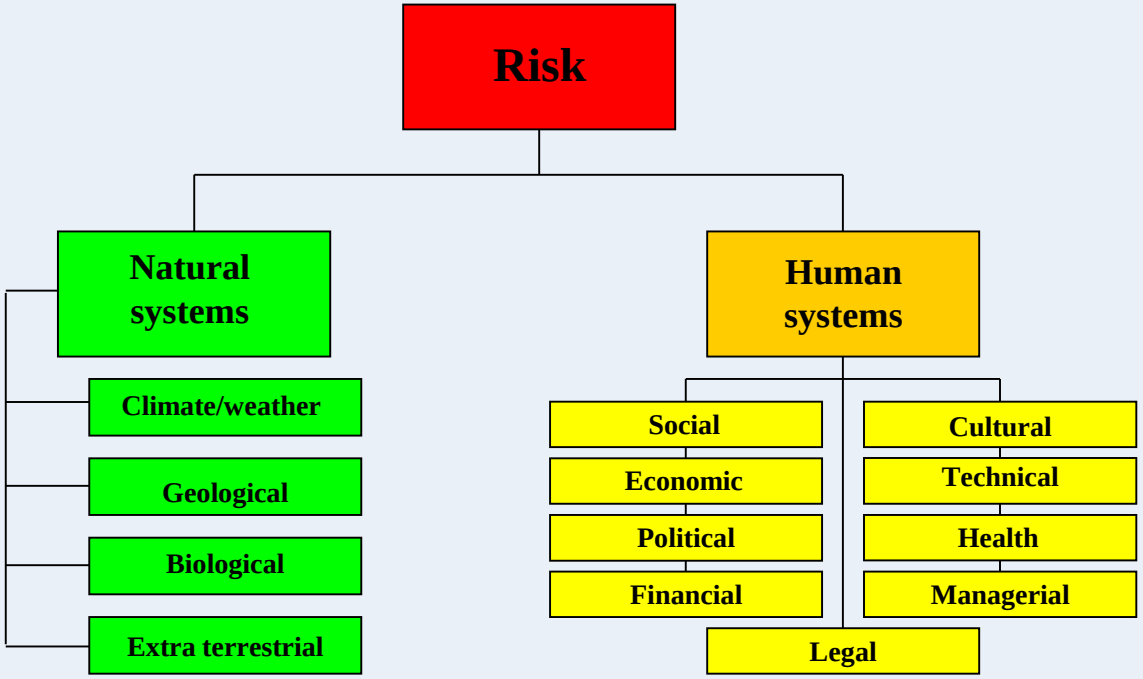
Project charters will vary depending on the specific details of each project, all project charters generally include the following elements...

- Project Authorisation. A concise statement identifying the authorized project by name, code, or number.
- Project Manager Authorisation. Identify the project manager and define his/her responsibilities.
- Key Stakeholders. A list of all the major project stakeholders, including a brief description of their roles and responsibilities.
- Project Goals. The goal statements in the project charter must be identical to the goals established in the approved project proposal.
- Project Priorities. List any project priorities in terms of time needed for completion, the cost of the project, the level of quality or performance of the finished product(s), etc, in order of importance.
- Product Requirements. List any product expectations- i.e. what the finished product is expected to look like or do.

What to include in a Project Charter? (cont'd)

- Project Assumptions. List and describe the assumptions related to the project. These are any variables, such as the availability of specific resources, information, and funding that must be in place for the project to be completed within the given budget and time frame.
- Project Constraints. Any project limits (restrictions) in terms of time, budget, or quality and performance standards should be clearly described.
- Project Risks. List any possible obstacles and risks that might hinder project implementation and include a plan of action for how to contain and minimise these risks.
- Project Deliverables. List the project "deliverables." These are the products, information, reports, etc that will be delivered to the client at the end and throughout the duration of the project.
- Cost Estimates. Any estimated costs included in the project proposal should be referred to in the project charter.
- Schedule Estimates. List the major project time estimates and milestones as described in the project proposal.
- Change Control. Define the process of introducing changes to the project charter or the approved project management plan.
- Success Criteria. Define the measurements and other criteria that will determine the success of the project.
- Example Project Charter

Project risk classification – framework



[3]Edwards, P., Bowen, P., Risk Management in Project Organisations (adapted) pp27

Risk – Four Components [4]

1. The probability that an (adverse) event will occur;
2. The event and its nature;
3. The consequences of the event;
4. The period of exposure to the event.

[4]Edwards, P., Bowen, P., Risk Management in Project Organisations pp11

Project Contexts

Projects contain three essential elements[5];

1. **Tasks** – project activities (what);
2. **Technologies** – processes (how);
3. **Resources** – means of carrying out the tasks & applying the technologies and staffing the endeavour (means);

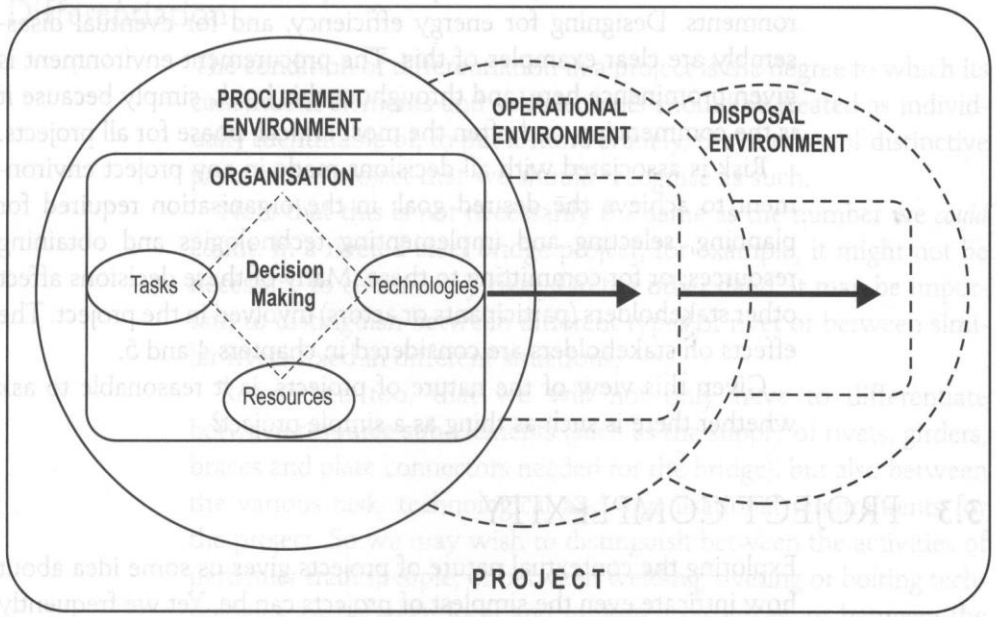
Organisation – final element that integrates and controls the other three elements and determines who will be involved, when and where.

Decisions are made within and about each of the elements and decisions will be susceptible to risk to a greater of lesser extent.

[5]Edwards, P., Bowen, P., Risk Management in Project Organisations pp30

Project Decision Contexts[6]

Figure 3.1 Decision contexts for project risk and risk management



[6]Edwards, P., Bowen, P., Risk Management in Project Organisations pp 31

Dilbert – Project Failure

https://www.youtube.com/watch?v=52yjQEEdnso

Project Complexity and Interdependency

- Projects differ in their requirement of tasks, technologies and resources;
- Projects differ in their level of differentiation and dependency.

Project Differentiation

- How many components exist in the project?
- How many tasks are involved in the execution of the project?
- How many different technologies are deployed in the execution of the project?
- How many resources (people, $, infrastructure) are required to complete the project?

Project Dependency

- Interdependency (Systems Thinking):
  - What is the relationship between all the parts in the project?
  - Is one task dependent upon the completion of another task before it can commence?
  - How does the performance of one element of the project influence another element within the project?[7]
- Pooled interdependency ;
- Sequential interdependency; and
- Reciprocal interdependency.

[7]Edwards, P., Bowen, P., Risk Management in Project Organisations pp34

Pooled Interdependency

- Elements in the project can be dealt with one after the other but in no specific order;
- Critical path is less important than resource scheduling and allocation, e.g. departments packing independently in an office relocation project.

Sequential Interdependency

- One element or sub-element must be completed before the next one can commence;
- Involves critical path planning to ensure the project proceeds as planned;
- Timeframe for the project is set by the *critical path*, e.g. laying the foundations of a building prior to the commencement of constructing the walls and not by the pooled completion times for each element.

Reciprocal Interdependency

- When a change to one element of the project has a direct influence on another element of the project, for example:

  - fixing a software fault or bug in one routine (or area of the program) requires software to be changed in other areas of the software.

Project Risk

- Uncertainty is often one of the key areas of risk in projects;
- Using new techniques, technologies and processes introduces levels of uncertainty, hence risk;
- Levels of uncertainty, hence risk, change over the duration of the project.

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Project Risk Assessment

https://www.youtube.com/watch?v=D3S6kpBlDbk

IMPORTANT PROJECT RISK ELEMENTS

Elements of Risky Projects

- Very large projects (rail, road, bridges, mining operations);
- Highly complex projects (NASA moon mission);
- Large capital outlays involved ($1b);
- Unbalanced cash flows (establishing a new mine);
- Application of new technology or processes (carbon fibre in aircraft construction);
- New or different procurement methods (JIT procurement process.

IMPORTANT PROJECT RISK ELEMENTS

Elements of Risky Projects (cont'd)

- Tight time constraints (construction prior to wet season)
- Inexperienced stakeholders (designers/engineers/constructors not done this type of work before)
- Changing regulatory environment (uranium mining in Australia)
- Environmental impacts (pollution from operations)
- Unstable political environment (operating in foreign jurisdictions)

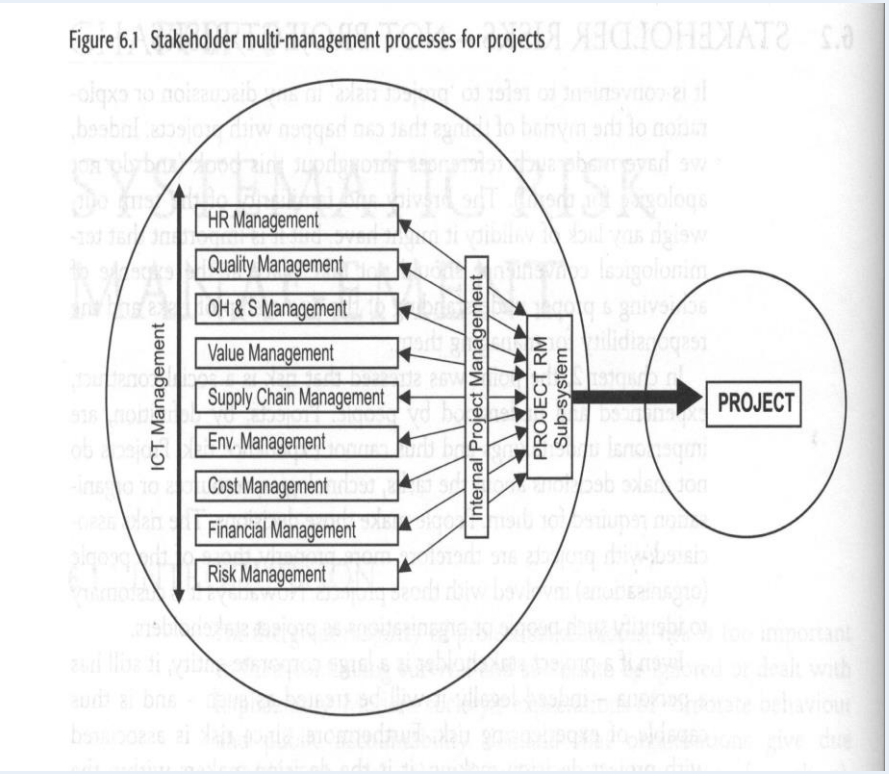
Project Organisation

- Organisations are like systems:
  - Internal processes
  - External interfaces
- Decision-making is an integral component of the system:
  - Identification of problems, issues, risks;
  - Evaluation of options for best fit;
  - Decision.

Project Communication

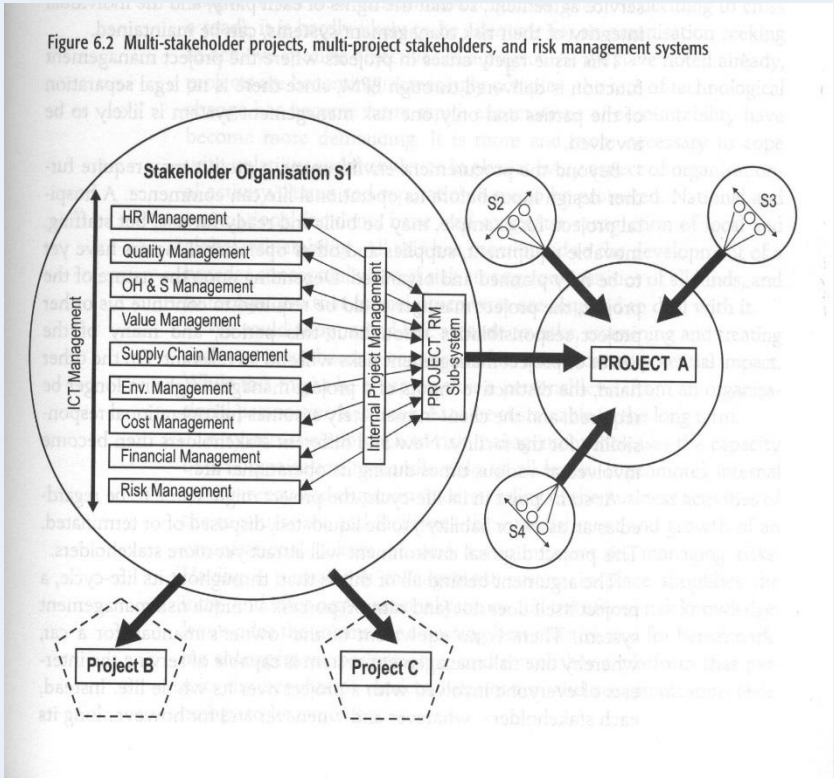
- Internal:
  - Project sub-groups and project management.
- External:
  - Stakeholder interfaces (client, financiers, insurers, regulators).

Project Stakeholders – Single Project[8]



[8]Edwards, P., Bowen, P., Risk Management in Project Organisations pp92

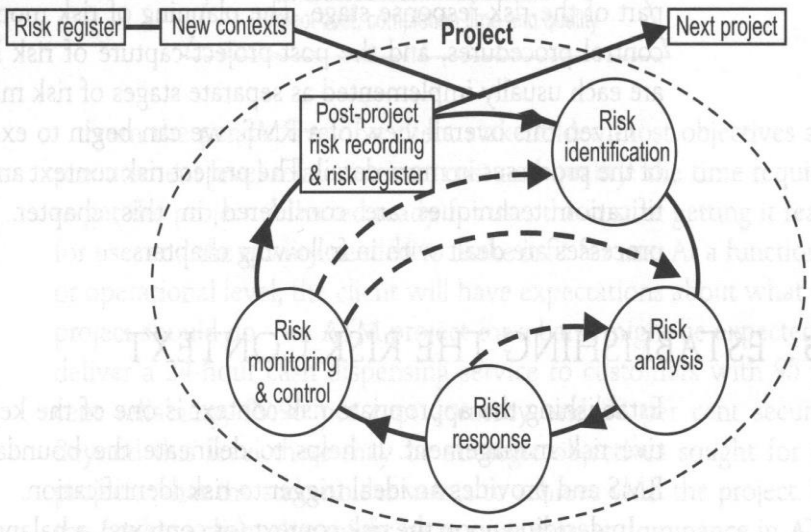
Project Stakeholders – Multiple Projects[9]



[9]Edwards, P., Bowen, P., Risk Management in Project Organisations pp 93

Project Risk Management System (RMS) [10]

Figure 6.3 A systematic cycle of risk management



[10]Edwards, P., Bowen, P., Risk Management in Project Organisations pp 97

IMPORTANT PROJECT RISK ELEMENTS

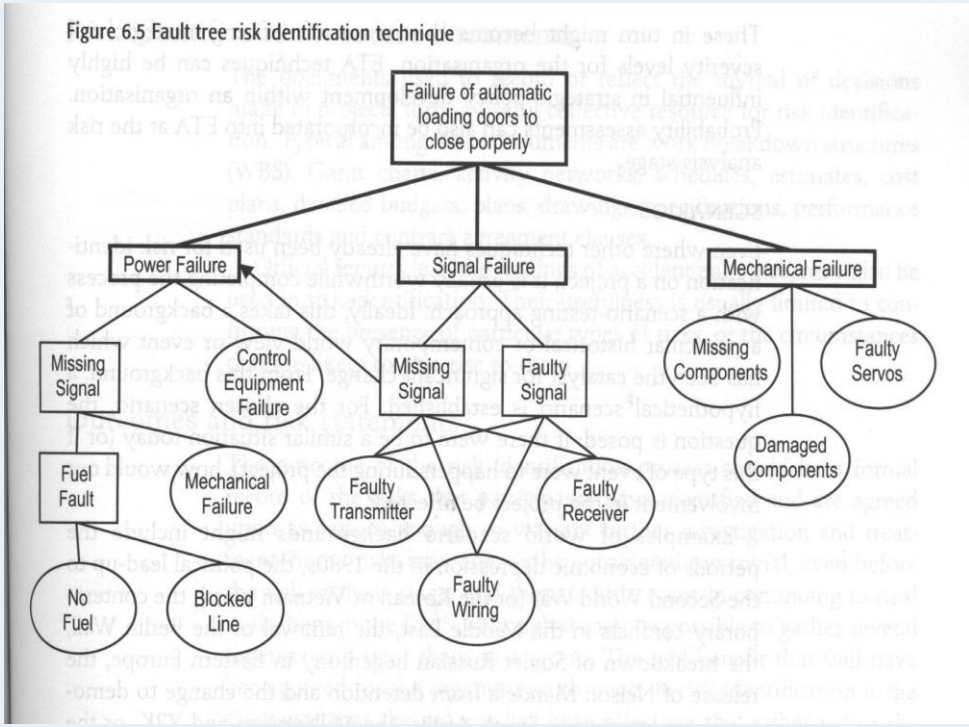
Project Risk Management Context

- What are the strategic objectives of the project?
- What is the client trying to achieve through this project?
- What are the functional objectives of the project?
- What is the project required to do (deliver)?
- What are the procurement objectives of the project?
  - Cost, completion time, quality standards?

Risk Identification

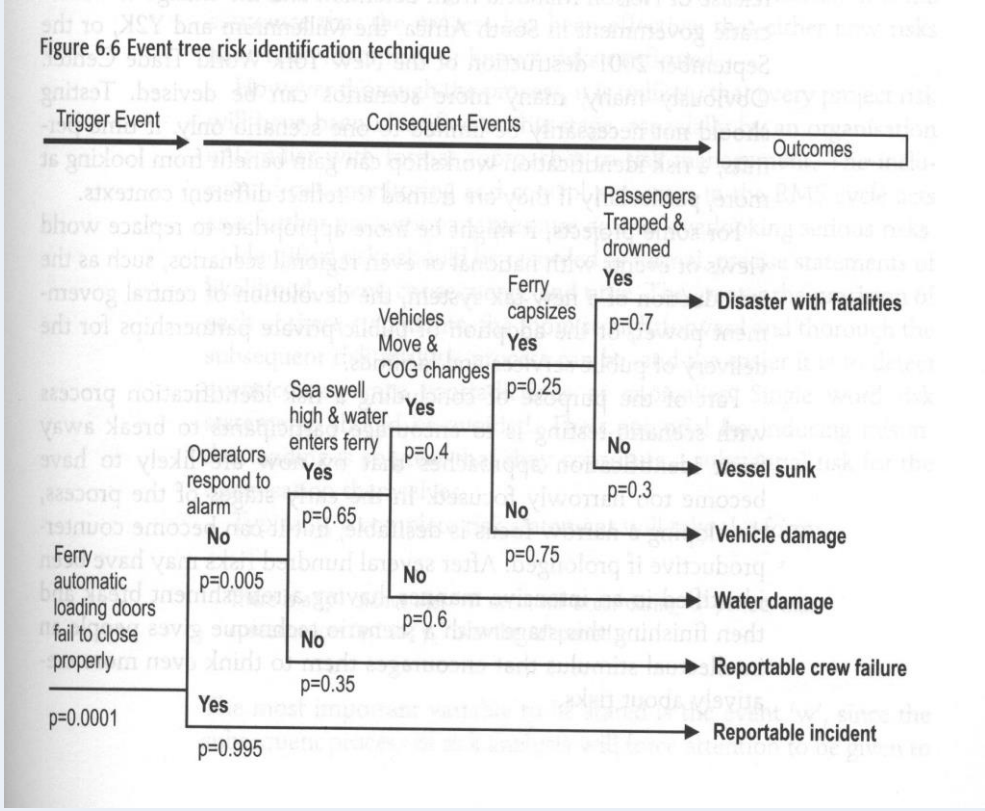
- Brainstorming
- Checklists
- HAZOPS (hazard and operability studies)
- FMECA (failure mode and effects criticality analysis)
- Fault Tree Analysis
- Event Tree Analysis
- Scenario development
- Work Breakdown Structures (WBC)
- Job Safety Analysis (JSA)

Fault Tree Analysis[11]



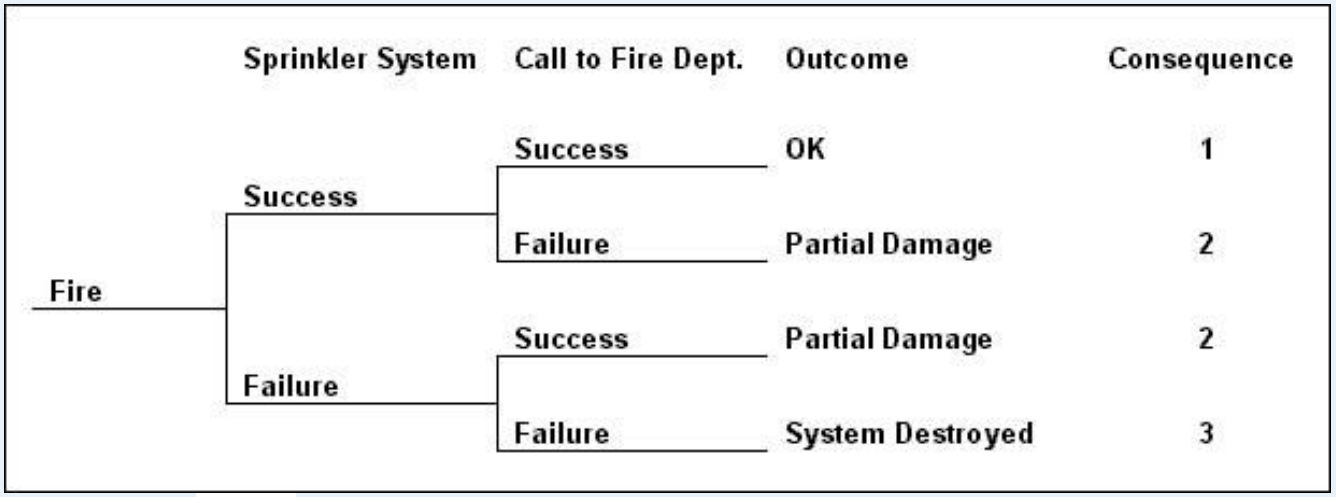
[11]Edwards, P., Bowen, P., Risk Management in Project Organisations pp105

Event Tree Analysis[12]



[12]Edwards, P., Bowen, P., Risk Management in Project Organisations pp109

Event Tree Analysis[12]



[12] http://www.event-tree.com/

Risk Analysis

Likelihood

- As per AS/NZS 4360

Consequence

- As per AS/NZS 4360

Duration[13]

- Short term
- Medium-short term
- Medium term
- Medium-long term
- Long term

[13]Edwards, P., Bowen, P., Risk Management in Project Organisations

IMPORTANT PROJECT RISK ELEMENTS

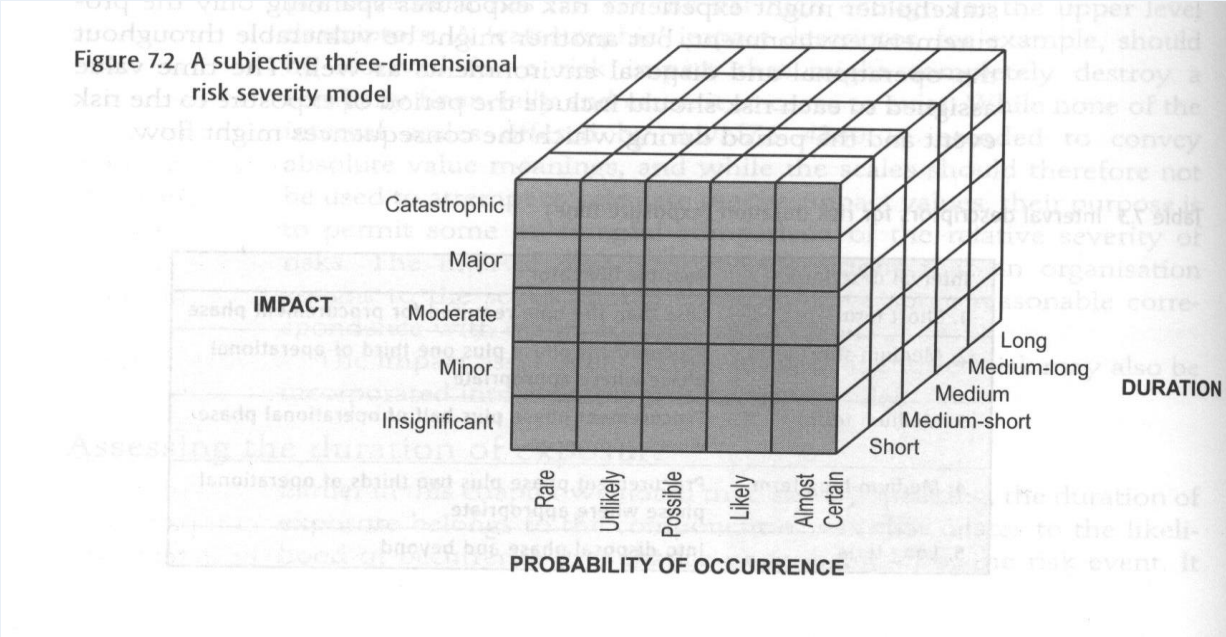
Risk analysis for projects[14]

- Impact
- Probability of occurrence
- Duration

Note: Risk analysis approach is slightly different

[14]Edwards, P., Bowen, P., Risk Management in Project Organisations

Risk Analysis[14]



[14]Edwards, P., Bowen, P., Risk Management in Project Organisations pp122

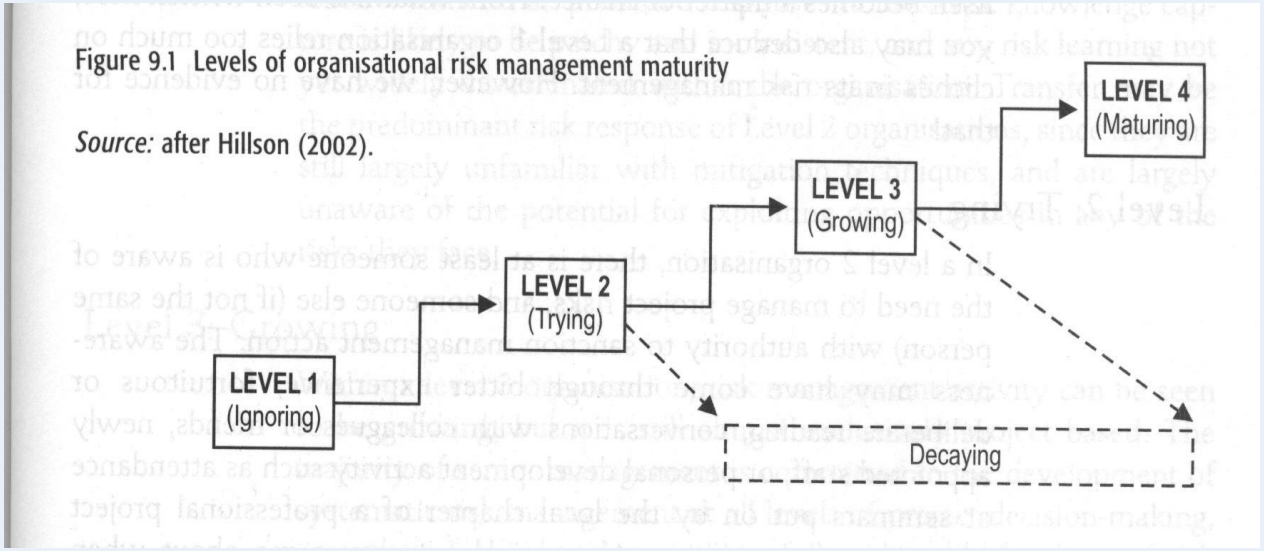
Risk Decisions

- Avoidance
- Transfer
- Mitigate
  - Reduce likelihood
  - Reduce consequence
- Share
- Retain

Developing the RMS (requirements)

- Risk management maturity;
- Clarification of objectives and tasks;
- Development of a project risk management framework;
- Assigning risk management responsibilities (risk owners and project risk manager);
- Development of risk registers;
- Risk management communication ; and
- Reviewing the RMS.

Risk Management Maturity[15]



[15]Edwards, P., Bowen, P., Risk Management in Project Organisations pp143

Risk management maturity model[15]

Risk Management Adoption Maturity Timeline

Immature

- No formal risk assessment activities been undertaken
- Little knowledge of risk management discipline
- Aware that risk management may have benefits to the organisation

Early Starter

- Have conducted risk assessment in an informal way
- Is aware of risk management and some of the benefits
- Aware of the need to conduct formalised risk assessment but does not have resources or detailed knowledge

Progressive

- Have a risk management framework
- Have conducted risk assessment activities
- Have carried out informal risk treatment
- Aware of the benefits of risk management to the organisation

Semi-Mature

- Formal risk management program in place utilising standards
- Monitor and review processes in place
- Have defined levels of risk appetite and tolerance
- Aware of positive risk management but not carried out assessment

Mature

- Formal risk management program in place
- Monitor and review processes in place
- Embedded in organisational culture
- Have defined levels of risk appetite and tolerance
- Have conducted positive risk assessment and management programs

15. Moore, P.

Summary

What makes projects different?

- Project risk
- Project risk framework and context
- Project complexity and interdependency
- Project organisation
- Risk identification
- Project organisation, communication and stakeholders
- Risk identification and analysis
- Risk decisions
- Project risk management system

Case Studies

Projects:

- Charles De Gaulle terminal collapse
- https://www.youtube.com/watch?v=GUU6_UrP3SQ

- Break up into 4 groups to analyze studies and use project **Risk assessment and management template** to develop risk treatments.

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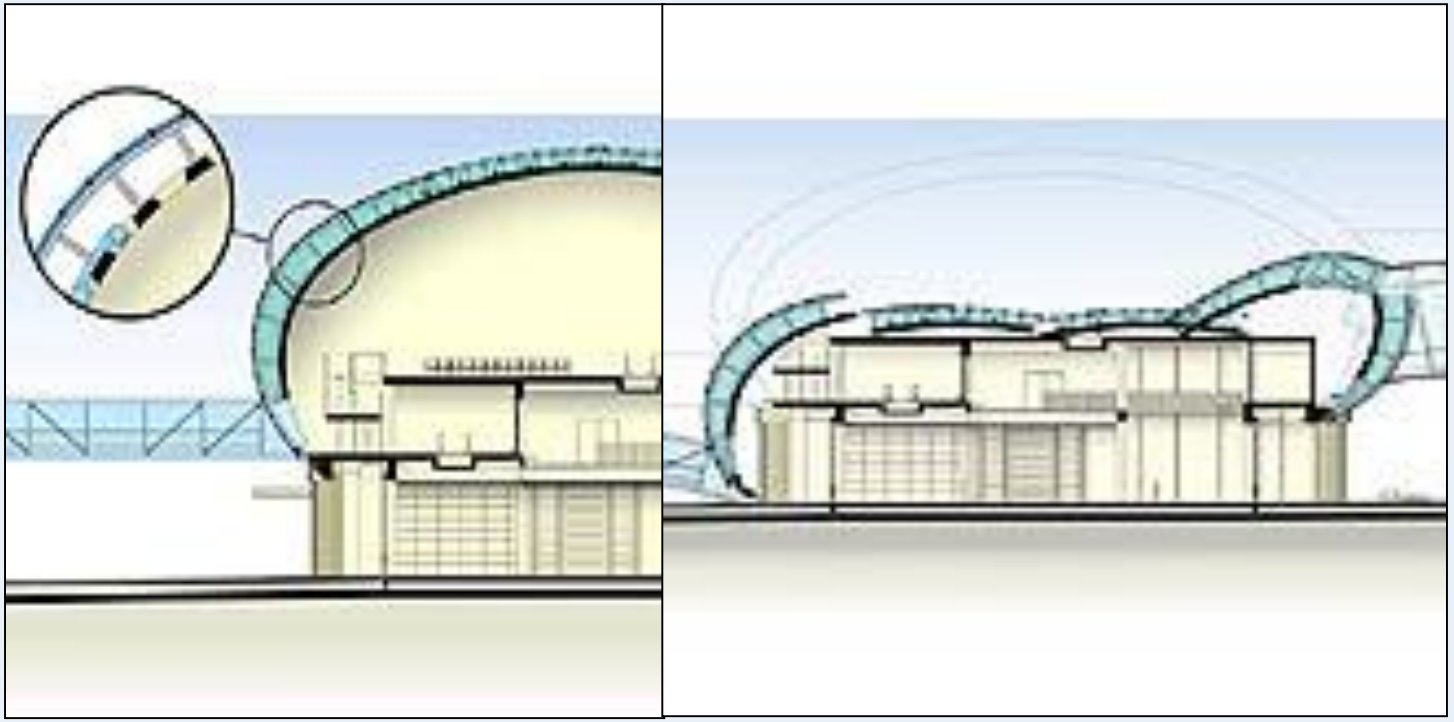
Previous Case studies- Lecturer to discuss questions below with students

- What has happened? (the event)
- What was the root cause? (contributing factors)
- What could have been done to prevent it? (controls)
- How could the stakeholders and projects be better managed? (project managers and work executors)
- What were the risks and outcomes for the stakeholders and project managers? (take different perspectives and contexts)



- **the complexity of the structure was underestimated during the entire design and construction process.**
- **lack of separation between client and architect might have contributed to the lack of controls ……..**

- http://www.architectureweek.com/2005/0427/news_1-2.html