"Of things that could go wrong, the one that causes the most damage will occur! "

Murphy's Laws

Risk Management

We are here

Ang Mo Kio Hub

Walk (20 min)

Bus (12 min)

MRT (23 min)

Car/Taxi (6 min)
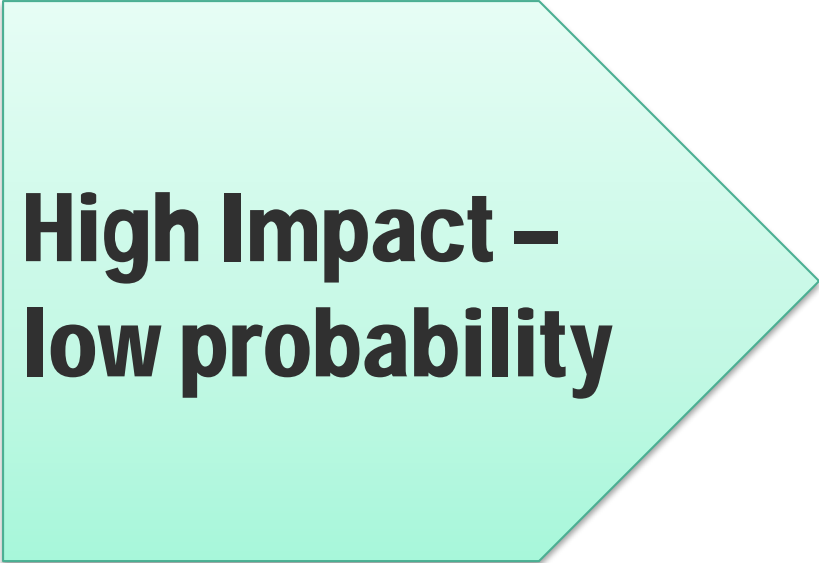
+ 5min

Resource

Time

Scope

Risk Management

- A "Risk" MAY happen *in future* (probability < 100%)
  - Risk is the possibility that you may not achieve your product, schedule, or cost because something unexpected occurs or something planned doesn't occur.
  - If it happens, it has a *negative* (*or positive*) impact on the project.
- If "Risk" happened (100%), it became an issue and have to be handle immediately.
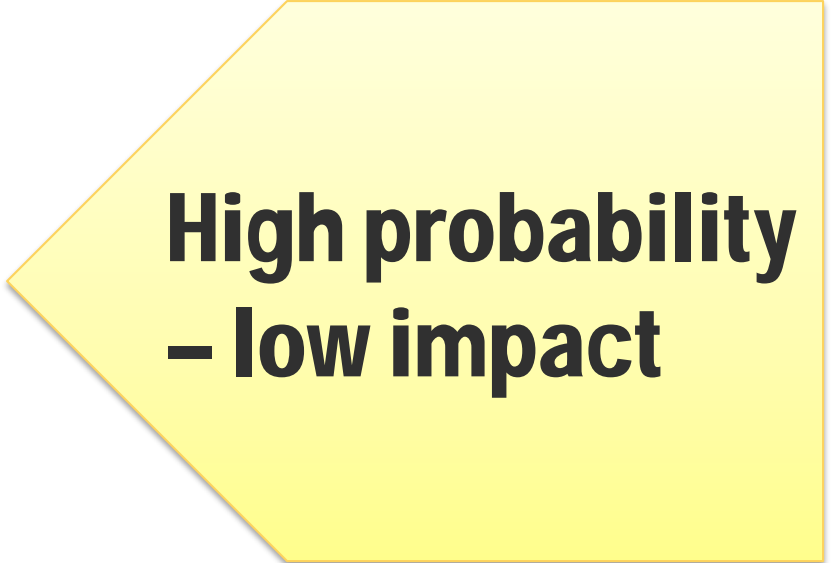 - We will review this in bug-tracking

Severity of the Risk

- The Severity of the risk depends on
  - the nature and magnitude of the impact *(possible consequences)* and
  - their probabilities.

Which is more Damaging?

- Which affect your plan more?

High Impact – low probability

High probability – low impact

Earthquake (Naturual)

A collapsed home in Sukagawa city, in the northern part of the country.

From magnitude 8.9 earthquake that struck Japan

Nicoll Highway collapse (Man Make)

The Nicoll Highway collapse in Singapore was possibly the greatest civil engineering disaster of the last decade.

What are changes of these happening?

High Impact – low probability

ERP in Singapore

Traffic Jam in Orchard Road, Singapore

What are changes of these happening?

High probability – low impact

MRT during morning peak hours

What are changes of these happening?

High probability – low impact

Which is more Damaging to you?

Super typhoon Haiyan

Hailstorm in Singapore

Managing Risks

- There are four stages to risk management planning.
    - Identify the risks
    - Assess the risks
    - Risk Response/Action Planning
    - Risk Monitoring and Control

Effectiveness of Risk Management

- Effective risk management help to identify your project's strengths, weaknesses, opportunities and threats. (or SWOT)

- Effectiveness of risk management depend on
  - Length of project
  - Type of project (e.g. technology changes faster)
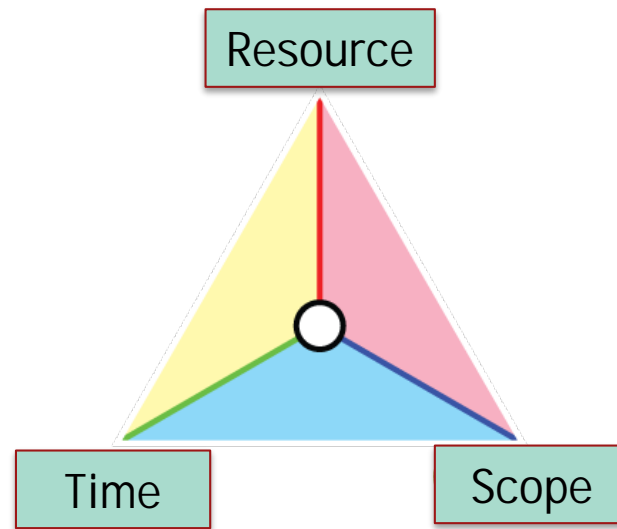 - People and organisation (e.g. experiences)

Managing Risks: Step 1

Identifying the Risks

Remember?

- The Time, Quality and Cost Triangle works on the principle that as more emphasis is placed on one element, less is placed on the others.

Poorly managed	Lack of management commitment	Lack of a solid project plan	Poorly defined roles and responsibilities
Inadequate or vague requirements	Stakeholder conflict	Team weaknesses	Competing priorities
Poor communication	Business Politics	Overruns of schedule and cost	Estimates for cost and schedule are erroneous
Lack of prioritization and project portfolio management	Scope Creep	Ignoring project warning signs	Inadequate testing processes
No change control process	Fail to meet end user expectations	Lack of user input	Lack of organizational support
Unrealistic timeframes and tasks	Bad decisions	Insufficient Resources (funding and personnel)	Undefined objectives and goals

Some Sources of risks

Security

People

Environmental

Technical

Physical

Political

Financial

Contractual/Legal
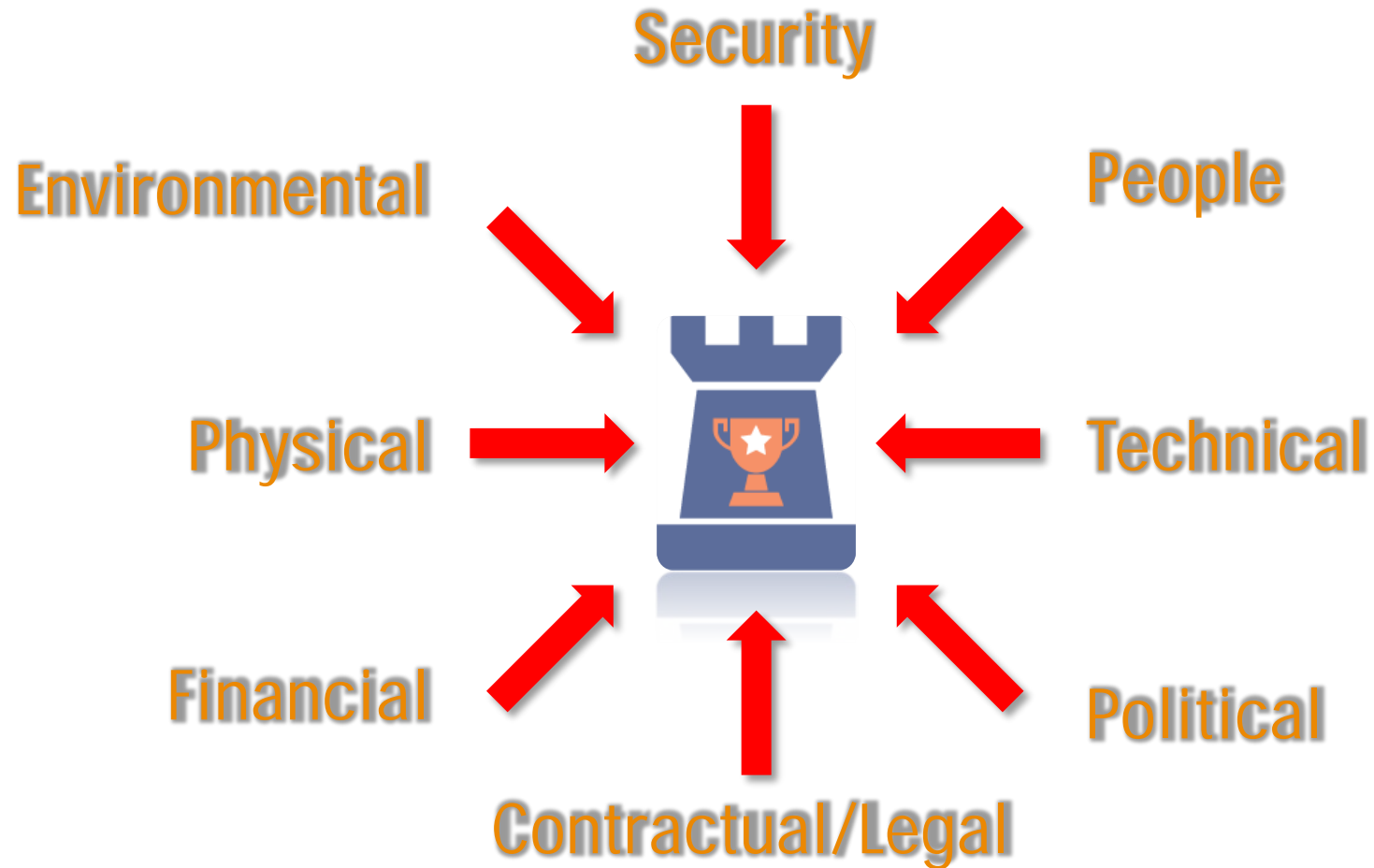
Internal and External
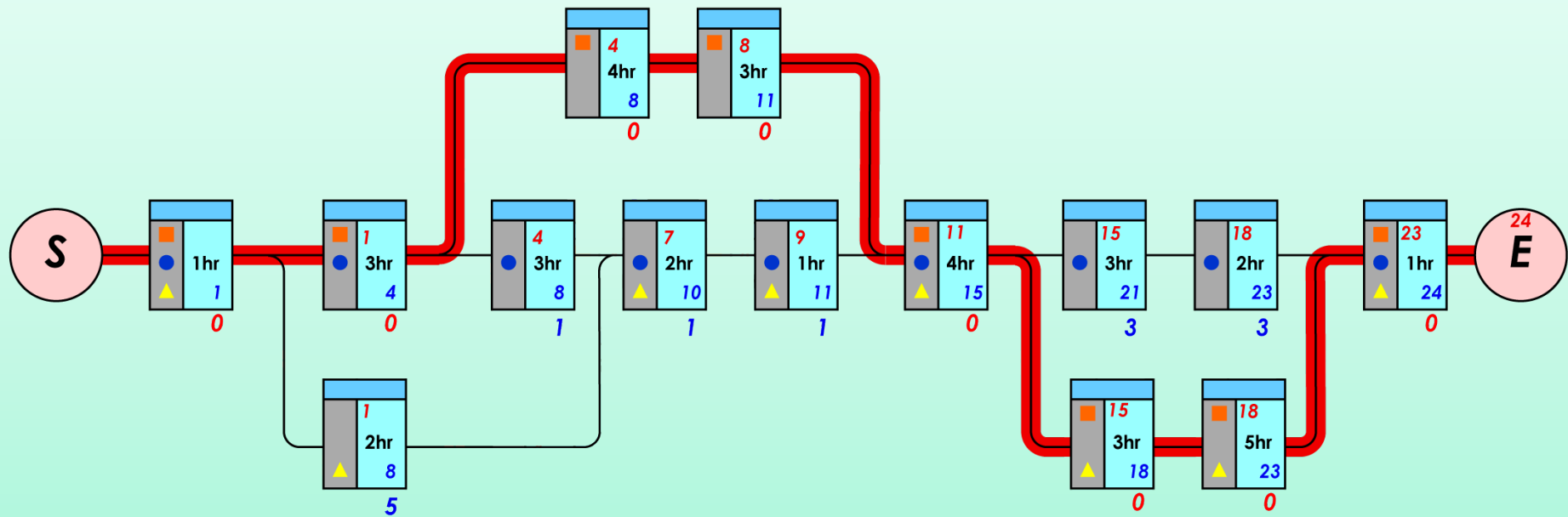
- Project risks can be
  - Internal: inherent to the project itself
  - external: beyond the control of the project team.
- External risks impact multiple projects simultaneously.

What Tasks to Review First?

- Review the tasks list and schedule
  - Tasks on critical path first ← *Why?*
  - Then other tasks
- All potential risks are identified.
  - Categorised and prioritised

Pay Attention to Tasks that

- You have no expertise in
- There are limited/shared resources
  - People on leave?
  - Shared/Expensive Resources – eg Mocap
- Has several predecessors
  - More likely to be delay as compared to others
- With longer durations or with a lot of resources
  - inaccurate estimation

What to Identify?

- It is not possible to identify project risks from the project plan alone.

- Call for a brainstorming meeting with members
  - where are the most likely risk

- Seek others (project managers) to review your plan

- Talk with people who have expertise/experience in particular areas of the project.
  - For example, if you're planning to use an outside contractor, talk to people who have used that contractor or other contractors.

Managing Risks: Step 2

Assessing the Risks

Assessing Risk

- Assessing risk is a complex process.
  - Involved determining the probability that a risk will occur and the impact that event would have, should it occur.

- Also known as the "cause and effect" analysis
  - The cause of the situation
    - Ah Kow is a reservist. He may has "recall manning" in March
  - The effect, the impact it has on the project if it occurred
    - Milestones not achieved

Quantifying the Risk

- Risk are be quantified in two dimensions: Impact and probability
  - Assess impact if risks were to happen
    - How serious will it be if it does?
  - Associate a probability with each of the risk
    - How likely is it to happen?

Quantitative vs Qualitative

- ## Qualitative Risk Analysis

  - Based on ranking or scale

Low				High
1	2	3	4	5

- ## Quantitative Risk Analysis

  - Provide quantitative estimates of risks
  - Based on measurable and objective data

Impact (Scale 1—5)

		Impact				
		1	**2**	**3**	**4**	**5**
Probability	**1**					
	2					
	3					
	4					
	5					

5 – Severe   4 – Critical   3 – Moderate   2 – Minor   1 – Negligible

Impact (Scale 1-5)

- Severe (5)
  - Project Failure, one or more goals not achieved.
- Critical (4)
  - jeopardize some aspects, not completely ruin the project but major increase in cost/schedule
- Moderate (3)
  - some problems, but nothing too significant. Moderate increase in cost/schedule. Major objectives met.
- Minor (2)
  - mild impact, slight increase in cost/schedule.
- Negligible (1)
  - No significant threat, can be left unattended

Impact

Project Objective	Relative or Numerical Scale				
	1 Very Low	2 Low	3 Moderate	4 High	5 Very High
Cost	Insignificant cost increase	< 10% cost increase	10–20% cost increase	20–40% cost increase	> 40% cost increase
Time	Insignificant time increase	< 5% time increase	5–10% time increase	10–20% time increase	> 20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

Probability (Scale 1—5)

		Impact				
		1	2	3	4	5
Probability	1					
	2					
	3					
	4					
	5					

1 – very low (<10%)   2 – low (30%)   3 – medium (60%)   4 – high (80%)   5 – very high (95%)

Risk Score

- Calculated based on the product of probability of occurrence and impact

		Impact				
		1	**2**	**3**	**4**	**5**
Probability	**1**	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

Risk Score

- Based on the probability and the impact of the risks, decide at what level the risk should be regarded as Sever

- Severity is based on your tolerance levels
  - Determine your tolerate levels. How much cost or delay is acceptable?
  - Is cancelling the BBQ OK? What is the Cost?

Tolerance Levels

$10,000?   *Delayed 10 days?*

$1,000,000?   *Delayed 2 days?*

Risk Score Matrix (Simple)

- The values range from 1 (very low exposure) to 25 (very high exposure).

low risk

Mod risk

High risk

Extreme risk

		Impact				
		1	**2**	**3**	**4**	**5**
Probability	**1**	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

Quantifying Risks : Let's BBQ

When: August or January

Impact:

Cancel due to rain – 3
→ move indoor!

Probability:

August – Low -2   **Mod risk**

January – High - 4   **High risk**

Quantifying Risks

Impact:

Cancel due to Tsunami -- 5!!!
→ *move where!!!!!*

Probability:

0.1   **low risk**

Quantifying Risks

Impact:

Cancel due to Flood 5!!!
→ *move elsewhere?*

Probability:

1

Mod risk

Managing Risks: Step 3

Risk Response Planning

Risk Response Planning

- Having identified and quantified the risks, we need to decide on the strategies to response to the risks.

- The strategies include

  – Avoidance

  – Transfer

  – Mitigation

  – Acceptance

Avoidance

- Avoiding Risk
  - Changing the project plan to eliminate the risk or condition.
  - Eliminating its cause.
  - Project is deferred (delay or not be carried out)
- Not all risks can be avoided
- e.g.
  - Use a tested game engine instead of new ones if schedule is tight.
  - Indoor BBQ to avoid risk of raining

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"Of course I'm doing something about the problem — I'm avoiding it!"

Project Deferral Risk

- Project Deferral Risks refers to *the risks of the project being deferred* (delay or not be carried out)

- What is the associated risk if the project is deferred?

  - If a maintenance project is postponed, is there a deterioration in asset performance and/or that the asset will fail?

  - It can also occurs where there may be only a limited window of opportunity for conducting a project (for Christmas)

Transfer

- Here risk is not eliminated but the risk impact is transferred to another one with extra project budget cost.

  - Hire external constructors

  - Buy insurance

- e.g.

  - Get a more experience team to work on part of the project.

  - Get the property owner to erect shelter in case of rain

Mitigation

- Mitigation is taking calculated risk *before it happen*.
  - Reduce the likelihood of a risk occurring , or
  - Reduce the impact of the risk
- May adjust scope, budget, schedule etc...

- e.g.
  - Monitor the project more closely.
  - Change to another date

Acceptance

- Worst ever strategy
  - External factors over which you have no direct control
  - Usually nothing can be done. *The ostrich approach*
  - The risk might be so small the effort to do anything is not worth while
- A contingency plan to minimize the effects of the risk
  - May produce another risk: mitigation

- e.g.
  - Change in client's boss, budget cut

Are Risks always Negative?

- "Taking a risk" is not always negative.
- Positive Risks or Opportunities can be great for your project

Respond to Positive Risks

- Exploitation
  - Once positive risk is identified, make sure the risk occurs and project and/or organization gains out of it

- Sharing
  - Your project can't get the full benefit of an opportunity if working alone.

- Enhancement
  - Taking action to increase the probability and/or the positive impact of an opportunity.

- Acceptance
  - Being willing to take advantage of an opportunity if it occurs, but not taking action to pursue it.

Exploitation

- make sure the risk occurs
  - Eliminate the uncertainty associated with an opportunity to ensure that it definitely happens.

- e.g. if you deliver a month before scheduled, you get 10% reward. (by working overtime, may incur extra expenses)

Sharing

- Join hands with a third party who is better able to take advantage of the opportunity.

- e.g. A new engine is developed, you may partner with the developer for your project (reduce your reliance on other commercial engines)

Enhancement

- Enhancing is about increasing the probability of the occurrence of the event.

- e.g. Adding of additional high skilled programmers to the team enhance opportunities related to using latest technologies and improving project quality. But, this does not guarantee that fact. Isn't it?

Acceptance

- Similar to accepting negative risks

- Accept the opportunity if it occurs, but not taking action to pursue it.

- We do nothing to alter the probability or impact of a risk

Risk Response Must Be

- Proportional to the severity of the risk.
  - tolerance levels?
- Cost effective, Timely and Realistic.
- Accepted by all parties involved.
- Owned by a person or a party

Money is not a problem (?)

Managing Risks: Step 4

Risk Monitoring and Control

Risk Register

- Specify the risks, risk response strategies, and mechanisms used to control the process

- Assign a priority
  - Based on your tolerance level, the potential cost of the risk, and the probability of it occurring
  - These priorities determine which risks to focus your efforts on first.

- Assigned to a specific person
  - Has the expertise & authority to identify & response to an event

Risk Register

Identification		Rating			Response		
Risk	Affect (T/C/Q)	Prob. 1-5	Impact 1-5	Risk Scale	Trigger	Actions	Owner
Rain	Q	2	4	8	Rain 1 hr before 6pm	Move in door	Tom
Tsunami	C/Q	.1	5	.5	Earth Quake	Cancel	Jerry
Flood	C/Q	1	5	5	Heavy Rain days before	Move elsewhere	Tom

Risk Register

- Another sample

Rank	Risk Name	Consequences	Initial Risk Rating			Response	Owner	Risk Rating after Response			Contingency Plan	Trigger
			Probability	Impact	Severity			Probability	Impact	Severity		
1	Food too expensive	May not be able to buy enough food, or may need to buy lower quality food	2.5	4	10	-Shop around for cheaper prices -Get sponsors	Tom	1	4	4	Provide more Bee Hoon and less chicken wings	Cost of food exceeds budget 1 week before BBQ
2												
3												
4												

Risk Monitoring and Control

- Monitor for triggers and execute risk response strategy as needed.

- Initiating contingency plans

- Reassess your risks regularly or if your project's actual progress varies significantly from the plan
  - Meet with team members to reevaluate the risk management plan and to identify new risks to the project

Early Indicators (Trigger)

- Risk management is costly and time consuming

- Only the high-priority risks or the medium- to high-priority risks are *usually* monitored.

- Meet regularly!

Sources of Risk

Sources of risks

- People
- Technical
- Political
- Financial
- Contractual/Legal
- Physical
- Environmental

People Risks

- Staff (Internal)
  - Availability when needed.
  - Key skill sets
  - Sick/Resign.
- Subcontractors (external) under-perform and fail to meet their assignments.
  - Difficult to control
- Internal vs External
  - Easy to predict internal than external

Technical

- Technical or performance limitations
  - Integration/New & Unproved
  - Continuous changing requirements
  - Changing technology

- Project fails to produce results consistent with project specifications.

- Can you predict?

Political

- Governance risk
  - Errors in strategy, such as choosing a technology that can't be made to work.

- Poor implementation and process problems such as procurement, production, and distribution.

- Government rule changes

- Who has control?

Financial

- Wrong budget estimation.
  - Cost overruns
    - Inflation etc
  - Project scope expansion
- Running out of fund
- Unless it is political like funding cut, then the team is at fault

Contractual/Legal

- Clients failed to reach decisions in a timely manner.
- Change in client's representatives.
- A lack of clarity in the scope definition/Responsibility
- Clients' expectations
  - Changes or exceed the capabilities of technology.
  - Conflict. Delays in acceptance and sign-off

Physical

- External hazards: storms, floods, and earthquakes; vandalism, sabotage, and terrorism; strikes; and civil unrest.
  - The office damaged by fire
  - A computer infected by virus

- Hardware not delivered/failed

- Which of these we can control?

Environmental

- Office Environment.
- Inexperience team
  - Wrong time estimation/Resources are not tracked properly
- Competition, foreign exchange, commodity markets, and interest rate risk, as well as liquidity and credit risks.

- Which of these we can control?