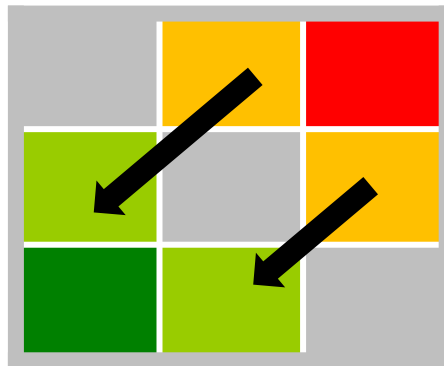
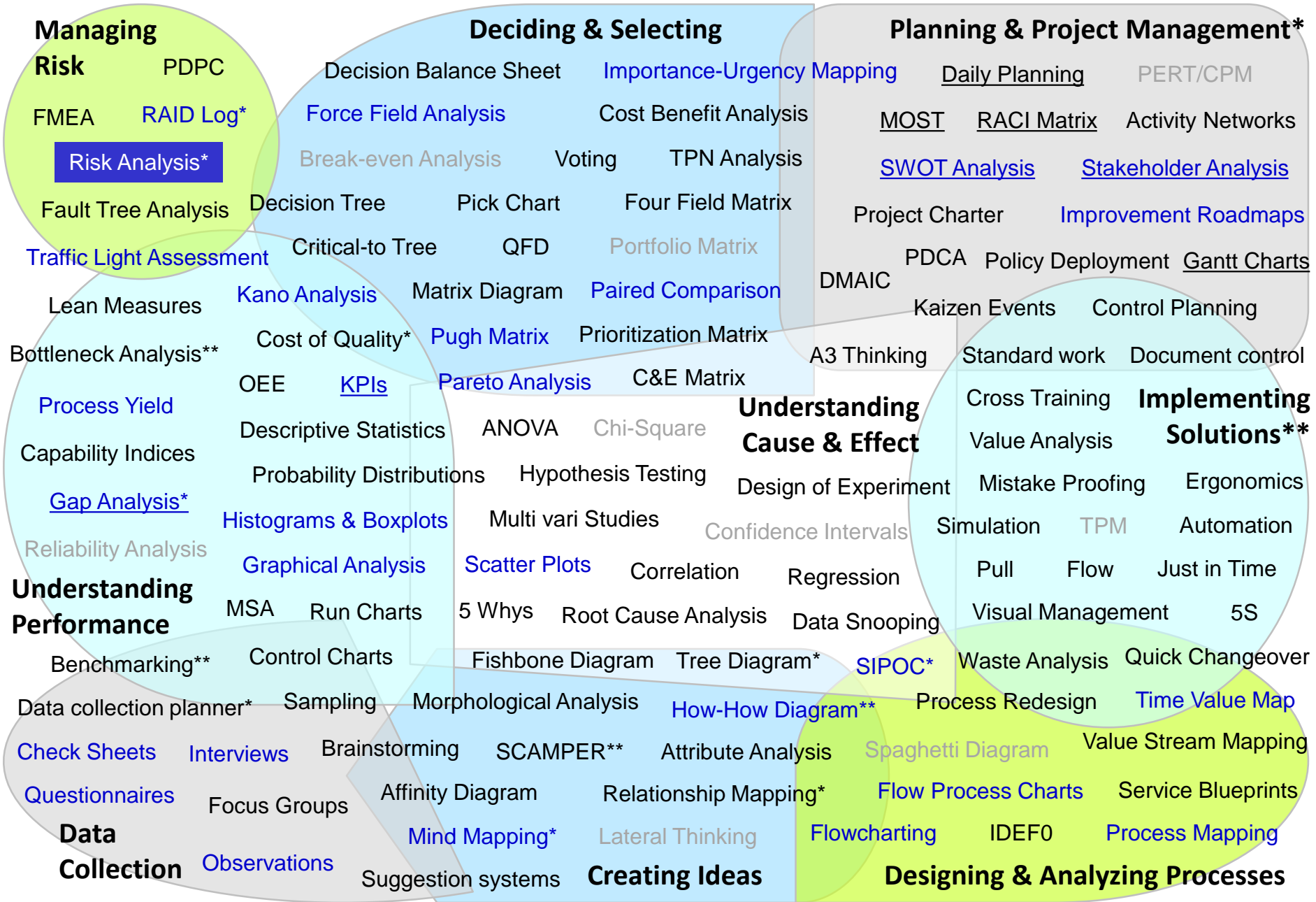


Continuous Improvement Toolkit

Risk Analysis



The Continuous Improvement Map



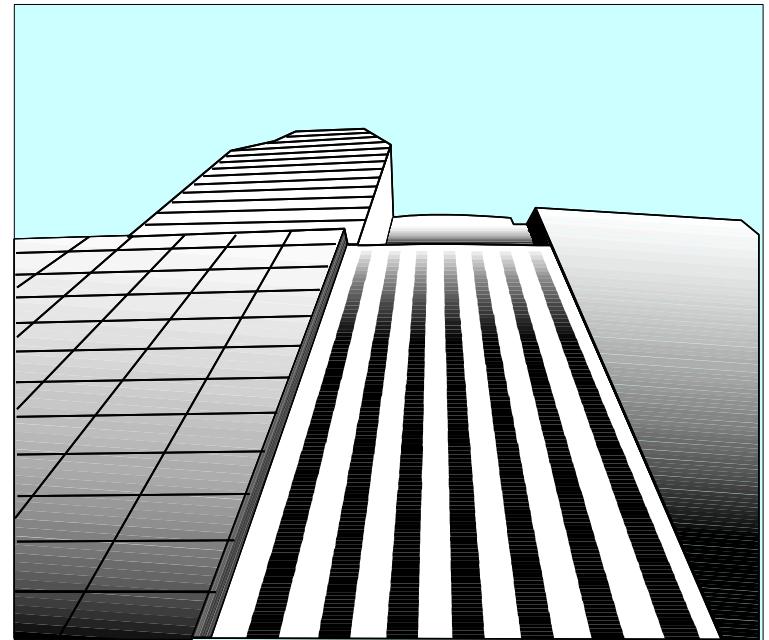
- Risk Analysis

- ❑ A process that helps identify and assess potential threats that could affect the success of a business or project.
- ❑ Includes means to measure, mitigate and control risks effectively.
- ❑ An essential tool when the work involves threats and risks.



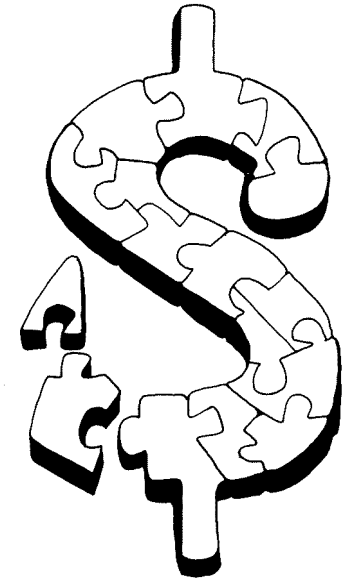
- Risk Analysis

- ❑ Many industries have recognized the increasing importance of risk analysis such as:
 - Medical.
 - Food and beverage.
 - Automotive.
 - Transportation.
 - Military.
 - Aerospace.
 - Nuclear.



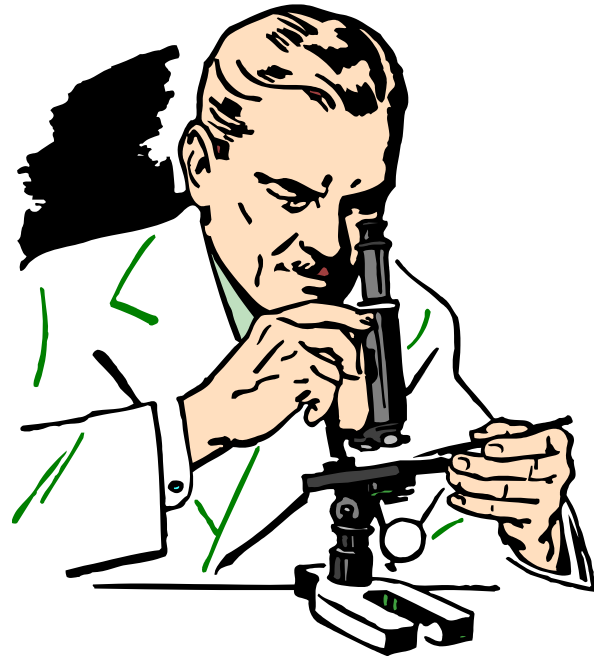
- Risk Analysis

- ❑ Many companies have established risk management functions and procedures to perform risk analysis on a continual basis.
- ❑ **These companies may need to assess:**
 - Their financial stability.
 - The financial feasibility of an investment.
 - The impact of new government policies.
 - The impact of new competitors coming into the market.



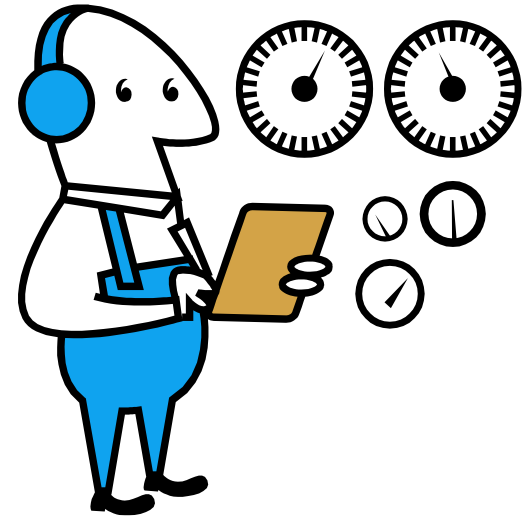
- Risk Analysis

- ❑ Used to assess the potential health effects resulting from human exposures to hazardous agents or situations.



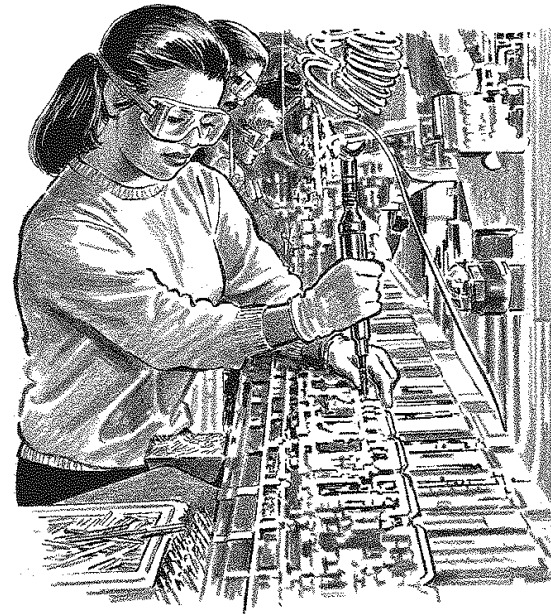
- Risk Analysis

- ❑ Widely used in manufacturing environments to improve safety and manage potential risks in production lines.



- Risk Analysis

- Used in all types of engineering of sophisticated systems to ensure safety and reliability of systems, processes and products.



- Risk Analysis

Project Management:

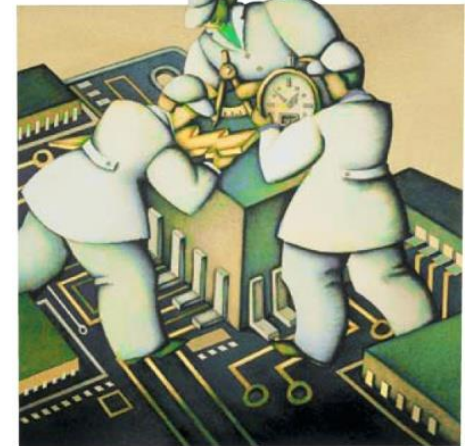
- ❑ A key process area in project management.
- ❑ Helps deciding whether to proceed with a project or not.
- ❑ Ensures only projects with the highest chance of success are selected.
- ❑ Used in project planning and during project implementation to evaluate how a project can be successfully completed.



- Risk Analysis

Project Management:

- ❑ If risks are not considered and controlled, you will not be able to minimize their impact on the schedule, scope, cost or quality.
- ❑ It is possible for a project to be stopped for example if the availability of resources become an issue, or the potential benefits might not be sufficient.



- Risk Analysis

Benefits:

- ❑ Saves time and money.
- ❑ Reduces the level of uncertainty.
- ❑ Decreases the impact of negative events.
- ❑ Improves project controls.
- ❑ Improves organizational learning.



- Risk Analysis

Stages of Risk Analysis:

- ❑ Risk identification.
- ❑ Risk assessment.
- ❑ Response planning and implementation.
- ❑ Risk monitoring and control.



- Risk Analysis

Risk Identification:

- ❑ Determining and documenting the potential risk that could occur.
- ❑ An iterative process:
 - As new risks may evolve or become known as the project progresses.
- ❑ Identified risks and their characteristics are recorded in the risk register.



- Risk Analysis

Risk Identification Methods and Sources:

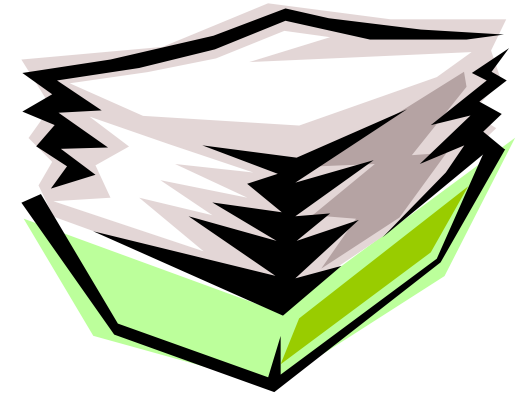
- ❑ People who have gone through similar projects or events.
- ❑ Expert opinions.
- ❑ Failure history analysis.
- ❑ SWOT analysis.
- ❑ Assumption logs.
- ❑ Observations and checklists.
- ❑ Hazard analysis.
- ❑ Scenario analysis.
- ❑ Brainstorming.



- Risk Analysis

Risk Register:

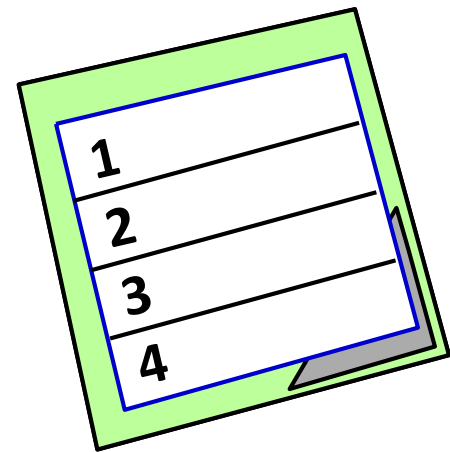
- ❑ Used to record and track all information about the identified risks.
- ❑ Contains information that results from the risk analysis process as it is conducted.
- ❑ Should be updated as new information becomes available.
- ❑ Used to support future risk analysis processes.
- ❑ High priority risks are often addressed in more details.
- ❑ Low priority risks are often included in the **Watch List** for future monitoring.



- Risk Analysis

Each risk in a risk register may include:

- A brief description of the risk.
- Added date.
- A unique identifier code.
- Causes of the risk.
- Symptoms and warning signs.
- Controls in place
- Impacts and costs of occurrence.
- Probability of occurrence.
- Priority and assessment results.
- The risk owner.
- Potential responses.
- Response approach.



- Risk Analysis

Risk Register:

Risk	Category	Causes	Impacts	Controls in place

Risk	Owner	Response approach	RPN (P*I)	Status

Risks are often listed in a Risk Register

- Risk Analysis

Risk Assessment:

- ❑ Helps to evaluate the significance of each risk.
- ❑ Highlight the risks that present the greatest threat on the overall objectives.
- ❑ Risks should be prioritized according to their potential impact and probability of occurring.
 - **Risk Impact** is the effect the risk will cause if it occurs.
 - **Risk probability** is a measure of the likelihood of the risk occurring.

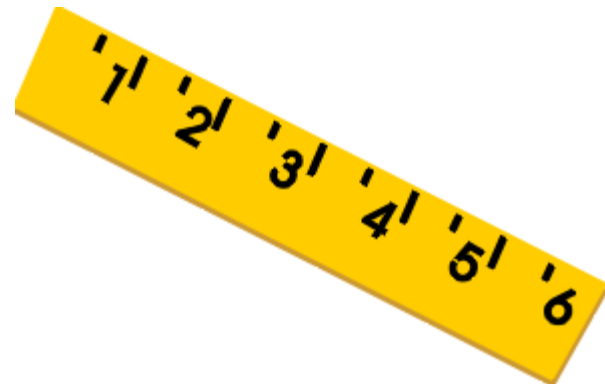
The risk score helps guide
risk responses



- Risk Analysis

Qualitative vs. Quantitative:

- ❑ Numeric values may be used to indicate the rating.
- ❑ An ordinal scale is sometimes applied to rate the probability and impact of the risks:
 - 1-5 scale.
 - Very likely, likely, indifferent, unlikely and very unlikely.



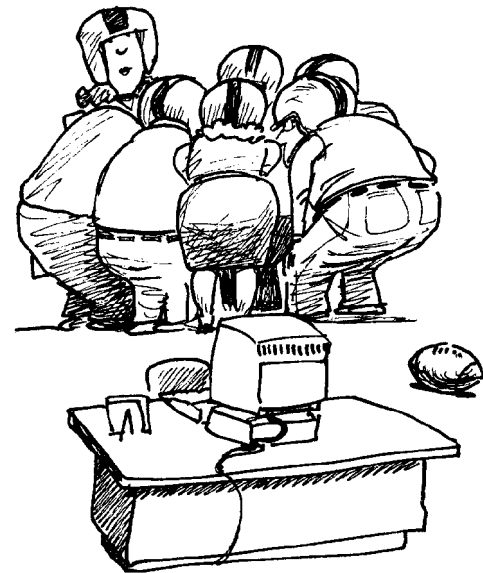
- Risk Analysis

Risk Response Planning and Implementation:

- ❑ You need now to respond to the assessed risks by developing options and actions to reduce the probability or impact.
- ❑ Here you will apply strategies to deal with them effectively.

- ❑ **This process should be:**

- Realistic.
- Cost effective.
- Agreed upon by key stakeholders.
- Owned by a responsible person.

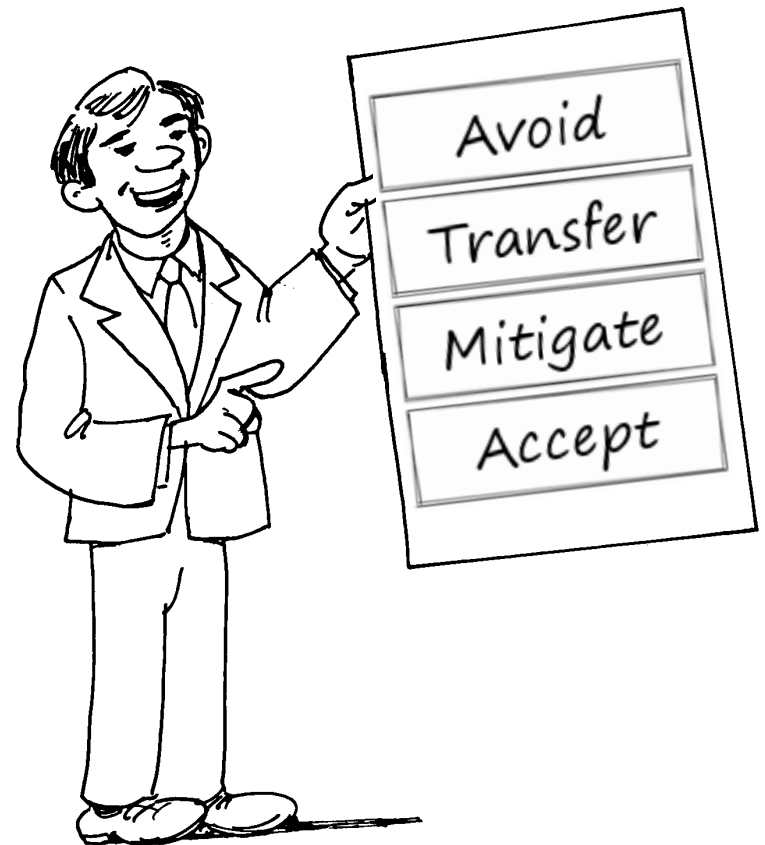


- Risk Analysis

Risk Response Planning and Implementation:

□ Response Strategies:

- **Avoiding** the risk.
- **Transferring** the risk.
- **Mitigating** the risk
- **Accepting** the risk altogether.



- Risk Analysis

Avoidance:

- ❑ It usually involves changing in the project plan such as:
 - Extending the schedule.
 - Reducing the scope.
 - Spending money or hiring resources to eliminate the risk.

- ❑ **An example** is when you hire a more skilled resource who is likely to get the tasks done in less time.



- Risk Analysis

Transference:

- ❑ Sharing the risk with someone else.
- ❑ It is simply handling off the risk to another team, organization or a third party.

- ❑ **Examples are:**
 - Outsourcing a service.
 - Buying an insurance.



- Risk Analysis

Mitigation:

- ❑ Involves carrying out work now to reduce the probability and/or impact of a risk to be within the acceptable threshold limits.
- ❑ It may include preventive, detective or testing possible ways to reduce the risk.

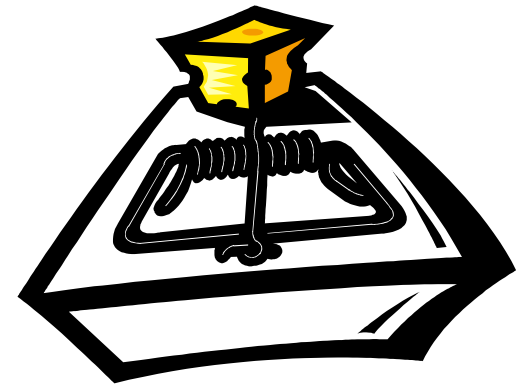
- ❑ **Examples are:**
 - Backing up the data to an offsite location.
 - Choosing a more stable supplier.



- Risk Analysis

Acceptance:

- ❑ An acceptable risk is the one that is tolerated because:
 - There is nothing you can do to prevent or mitigate it.
 - It is costly.
 - It is difficult to implement.
- ❑ One of the common acceptance strategies is to come up with a **contingency plan** to cope with its consequences.



- Risk Analysis

Controlling Risks:

- ❑ Improves the efficiency of the risk analysis process.
- ❑ Involves:
 - Monitoring and re-assessing risks overtime.
 - Identifying new risks.
 - Evaluating the effectiveness of the risk response strategies.
- ❑ Performance information should be reviewed regularly:
 - Schedule progress
 - Costs incurred.



- Risk Analysis

Controlling Risks:

- ❑ Risks and risk response plans should be reviewed in regular meetings to ensure plans are being implemented.
- ❑ In these meetings, key risks should be given more attention and new risks should be raised and discussed.



- Risk Analysis

P-I Matrix:

- ❑ A method that helps to identify which risks need attention most.
- ❑ The combined probability and impact scores of individual risks are plotted into the two dimensional matrix.
- ❑ Thresholds for low, moderate or high risks can be shown.

P / I	Insignificant	Minor	Moderate	Major	Severe
Certain	5 Moderate	10 High	15 Critical	20 Critical	25 Extreme
Likely	4 Moderate	8 Moderate	12 High	16 High	20 Critical
Possible	3 Low	6 Moderate	9 Moderate	12 High	15 Critical
Unlikely	2 Negligible	4 Moderate	6 Moderate	8 Moderate	10 High
Rare	1 Negligible	2 Negligible	3 Low	4 Moderate	5 Moderate

Risk1 (at 16 High)

Risk2 (at 4 Moderate)

Sum all the ratings to obtain a total risk assessment value

- Risk Analysis

Example:

Risk	Impact	Controls	RPN (P*I)
R.1 Disruption of operations in the absence of key managers	Ineffective managerial decision making and failure to meet goals	No controls	$2 * 10 = 20$
R.8 Failure to achieve targeted performance goals	Non attainment of goals and loss of profitability and market share	KPI's in place covering all business functions	$3 * 5 = 15$
R.15 Inadequate staff development programs	Entitlement of excessive operating costs and dissatisfied employees	Budget, policies covering staff development	$5 * 2 = 10$
R.21 Staff attendance data is not properly used	Entitlement of extra leave and excessive payroll costs	Attendance is captured & reviewed by business units	$3 * 1 = 3$
R.26 Inaccurate calculation of payroll	Incorrect processing of salary payments	Payroll system & manual intervention is very limited	$3 * 2 = 6$
R.28 Employee performance is not reviewed regularly	Unjustified evaluation and dissatisfied employees	No controls	$2 * 2 = 4$

- Risk Analysis

Example:

P / I	Insignificant (1)	Minor (2)	Moderate (3)	Major (5)	Severe (10)
Certain (10)	10 Medium	20 High	30 Critical	50 Critical	100 Critical
Likely (5)	5 Medium	10 Medium	15 High	25 Critical	50 Critical
Possible (3)	3 Low	6 Medium	9 Medium	15 High	30 Critical
Unlikely (2)	2 Low	4 Medium	6 Medium	10 Medium	20 High
Rare (1)	1 Low	2 Low	3 Low	5 Medium	10 Medium

- Risk Analysis

Example:

P / I	Insignificant (1)	Minor (2)	Moderate (3)	Major (5)	Severe (10)
Certain (10)	10 Medium	20 High	30 Critical	50 Critical	100 Critical
Likely (5)	5 Medium	R.15 Inadequate staff development programs	15 High	25 Critical	50 Critical
Possible (3)	R.21 Staff attendance data is not properly used	R.26 Inaccurate calculation of payroll	9 Medium	R.8 Failure to achieve targeted performance goals	30 Critical
Unlikely (2)	2 Low	R.28 Employee performance is not reviewed regularly	6 Medium	10 Medium	R.1 Disruption of operations in the absence of key managers
Rare (1)	1 Low	2 Low	3 Low	5 Medium	10 Medium

- Risk Analysis

Example:

P / I	Insignificant (1)	Minor (2)	Moderate (3)	Major (5)	Severe (10)
Certain (10)			R11		
Likely (5)		R6, R15	R20, R26	R3, R14, R25	R5
Possible (3)	R21, R24	R2, R7, R23	R19, R22	R4, R8, R9, R29	R18
Unlikely (2)	R16	R28	R10, R13, R30	R27	R1
Rare (1)				R12, R17	

- Risk Analysis

Further Information:

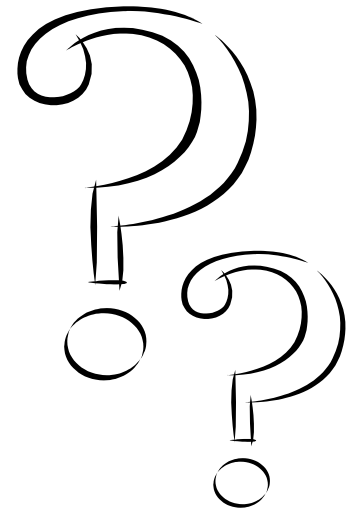
- ❑ A **Risk** is an undesirable situation which has potential consequences on an investment, a business initiative or a project.
- ❑ **Positive risks** that offer opportunities may be pursued to generate enhanced value.
 - Positive and negative risks are often referred to as opportunities and threats.
- ❑ **Risk breakdown structure** (RBS) is a hierarchical representation of risks according to the risk categories.

- Risk Analysis

Further Information:

□ Helpful Questions for Identifying Risks:

- What do you want to achieve?
- What will stop it being achieved?
- What could go wrong?
- Will the projected benefits be achieved as predicted?
- Will the benefits be achieved at no extra costs?
- Will the necessary resources be available?
- What are the constraints, assumptions and dependencies?
- Are there any potential issues beyond local control?



- Risk Analysis

Further Information:

□ Examples of Risks:

- **Project** – Going over budget or taking too long on key tasks.
- **Operational** – Disruption to operation or failures in distribution.
- **Procedural** – Failures of accountability, systems, or controls.
- **Safety** – Dangerous chemicals, poor lighting or falling items.
- **Human** – Illness, injury or death.
- **Reputational** – Loss of customer or employee confidence.
- **Financial** – Stock market fluctuations or interest rate changes.
- **Technical** – Advances in technology, or from technical failure.
- **Natural** – Weather, natural disasters, or disease.
- **Political** – Changes in tax, government policy, or foreign influence.

- Risk Analysis

Further Information:

□ Risk Assessment Tools:

- **Sensitivity analysis** helps determining which risks have the most potential impact.
- **Tornado diagram** compares relative importance of variables which have a high degree of uncertainty with those that are more stable.
- **Expected monetary value** (EMV) calculates the average expected outcomes including scenarios that may or may not happen.
- **Decision Tree Analysis** helps identify the paths and outcomes of risks which could prevent us achieving our objective. It incorporates the cost of each available choice and the probabilities of each possible scenario.