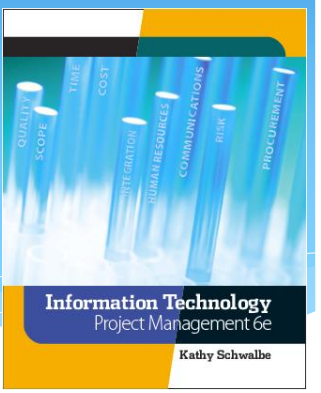
# Chapter 11: Project Risk Management

**Information Technology Project Management, Sixth Edition**




Note: See the text itself for full citations.

## Learning Objectives

* Understand what risk is and the importance of good project risk management
* Discuss the elements involved in risk management planning and the contents of a risk management plan
* List common sources of risks in information technology projects

# Learning Objectives (continued)

* Describe the process of identifying risks and be able to create a risk register
* Discuss the qualitative risk analysis process and explain how to calculate risk factors, create probability/impact matrixes, and apply the Top Ten Risk Item Tracking technique to rank risks

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# Learning Objectives (continued)

* Explain the quantitative risk analysis process and how to apply decision trees, simulation, and sensitivity analysis to quantify risks
* Provide examples of using different risk response planning strategies to address both negative and positive risks
* Discuss what is involved in monitoring and controlling risks
* Describe how software can assist in project risk management

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# The Importance of Project Risk Management

* Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives
* Risk management is often overlooked in projects, but it can help improve project success by helping select good projects, determining project scope, and developing realistic estimates

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# What is Project Risk?

* What is Project Risk?
  * Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one project objective.
* What are the Project Risk Management objectives?
  * The objectives of project risk management is to minimize potential **negative risks** while maximizing potential **positive risks**.

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# Possible Project Risks

1. The prices for computers rise higher than planned.
2. Found a good open source module that spare the team a week that is otherwise needed for development
3. The prices for computers fall lower than planned
4. A special offer for bulk purchase
5. The main programmer on the project quitting the job
6. The teacher unexpectedly postpones the deadline for project submission
7. A certain function or class will no longer be supported in the next version of Java programming language
8. There is a chance that you may get some highly skilled workers from another project at lower rates



# Negative Risk (Threat)

* Negative risk involves understanding potential problems that might occur in the project and how they might impede project success

* Examples:
  * The price for purchasing the computers rise higher than planned 2 months ago
  * The main programmer on the project quitting the job
  * A certain function or class will no longer be supported in the next version of Java programming language

# Risk Can Be Positive (Opportunity)

* Positive risks are risks that result in good things happening; sometimes called opportunities
* Examples:
  * The price for purchasing the computers falls lower than planned 2 months ago
  * A special offer for bulk purchase
  * The teacher unexpectedly postpones the deadline for project submission
  * There is a chance that you may get some highly skilled workers from another project at lower rates
  * Found a good open source module that spare the team a week that is otherwise needed for development

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# Project Risk Management Processes

* **Planning risk management:** deciding how to approach and plan the risk management activities for the project
* **Identifying risks:** determining which risks are likely to affect a project and documenting the characteristics of each
* **Performing qualitative risk analysis:** prioritizing risks based on their probability and impact of occurrence

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## Project Risk Management Processes (continued)

* **Performing quantitative risk analysis:** numerically estimating the effects of risks on project objectives
* **Planning risk responses:** taking steps to enhance opportunities and reduce threats to meeting project objectives
* **Monitoring and controlling risks:** monitoring identified and residual risks, identifying secondary risks, carrying out risk response plans, and evaluating the effectiveness of risk strategies throughout the life of the project

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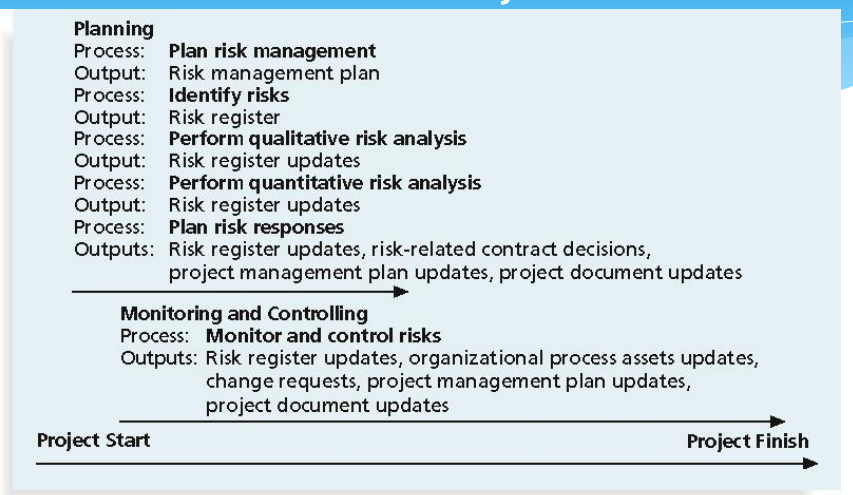
## Figure 11-3. Project Risk Management Summary

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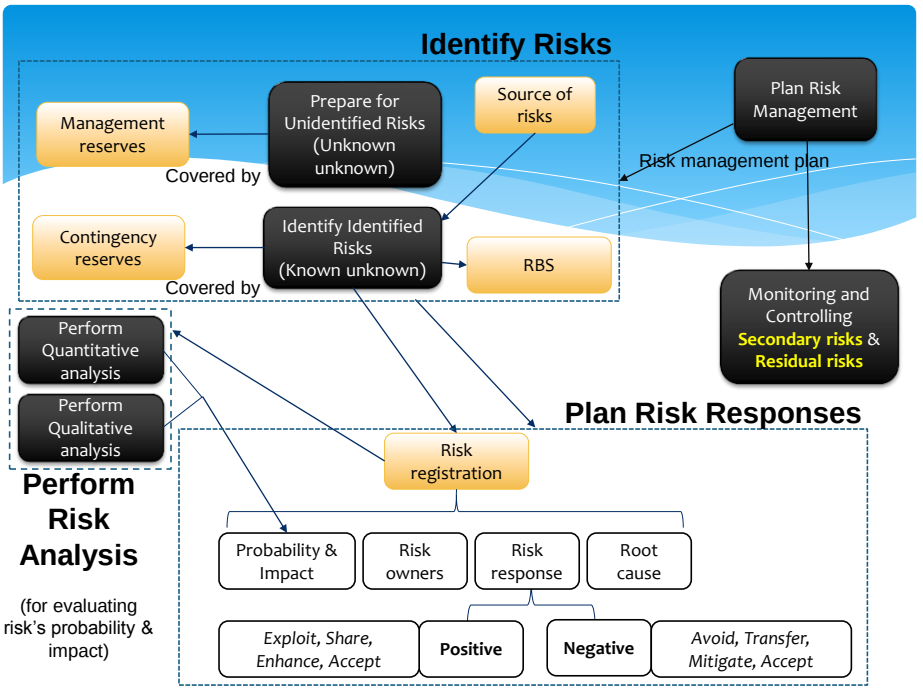


# Risk Management Planning

*The **Plan Risk Management** defining how to conduct risk management activities for a project.*

* The main output of risk management planning is a **risk management plan,** a plan that documents the procedures for managing risk throughout a project

* The project team should review project documents and understand the organization's and the sponsor's approaches and attitudes to risk

# Identifying Risks

* Identifying risks is the process of understanding what potential events might hurt or enhance a particular project
* Risk identification tools and techniques include (Information gathering):
  * Brainstorming
  * The Delphi Technique
  * Interviewing

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# Common Sources of Risk in Information Technology Projects

* **Sources of risk:**
  * The Standish Group developed an IT success potential scoring sheet based on potential risks
  * Other broad categories of risk help identify potential risks
  * Constraints & Assumptions
  * Categorization by each knowledge area

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# Table 11-3. Information Technology Success Potential Scoring Sheet

| Success Criterion | Relative Importance |
|---|---|
| User Involvement | 19 |
| Executive Management support | 16 |
| Clear Statement of Requirements | 15 |
| Proper Planning | 11 |
| Realistic Expectations | 10 |
| Smaller Project Milestones | 9 |
| Competent Staff | 8 |
| Ownership | 6 |
| Clear Visions and Objectives | 3 |
| Hard-Working, Focused Staff | 3 |
| **Total** | **100** |

# Broad Categories of Risk

- **Market risk**
  - deliverables useful, helpful, sellable, competitive?
- **Financial risk**
  - Affordable, worth doing the project, Benefit>Cost?
- **Technology risk**
  - Technically feasible, tech proven and available?
- **People risk**
  - Needed talents available, with senior management's and user's support?
- **Structure / process risk**
  - Maturity of the organization, complexity of the stockholder groups, adaptation to and interoperation with existing infrastructure

# Assumptions Analysis

* **Constraints** and **Assumptions** are common sources of risk
  * Constraint: Something limit your options
  * Assumption: You think they are true

| Assumption or Constraint | Could this assumption/constraint prove false? (Y/N) | If false would it affect project? (Y/N) | Convert to a risk? |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

# Constraints and Assumptions

**Project constraints**

- This must be finished before the commencement of the opening ceremony.
- The amount of funding is around 100,000.
- Use Paypal as the payment gateway.
- We do not have the domain knowledge and past experience for that project.
- We must use the Linux OS for the software.
- The software must support Java 1.12 or above.
- The core part of the system can only be revealed to a few appointed persons – biz secret.
- The weather in this region is rainy and windy quite often in this season.
- The network bandwidth is quite low for smooth video transmission.
- The delivery of the needed equipment will take at least 3 weeks.
- The effort relies on voluntary participation by multiple government agencies.

**Project assumptions**

- The weather in this region will be fine in this season.
- Customers will provide necessary business expertise as needed during development.
- The network bandwidth will be high enough for smooth video transmission.
- All imported data will be in XML format.
- Government regulation will not be changed in these 2 years.
- The 5G networks will be widespread in the region.
- Users will fully support the project.
- The sponsor really desires the project to finish with high quality and allows the high quality to justify the budget.

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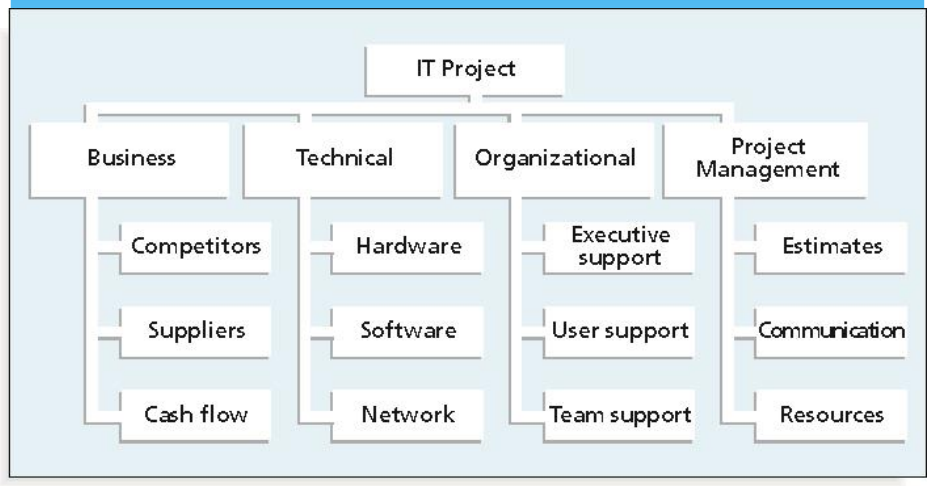
## Table 11-4. Potential Negative Risk Conditions Associated with Each Knowledge Area

| Knowledge Area | Risk Conditions |
|---|---|
| *Integration* | Inadequate planning; poor resource allocation; poor integration management; lack of post-project review |
| *Scope* | Poor definition of scope or work packages; incomplete definition |
| *Time* | Errors in estimating time or resource availability; errors in determining the critical path; poor allocation and management of float; early release of competitive products |
| *Cost* | Estimating errors; inadequate productivity, cost, change, or contingency |
| *Quality* | Poor attitude toward quality; substandard design/materials/workmanship; inadequate quality assurance program |
| *Human Resources* | Poor conflict management; poor project organization and definition of responsibilities; absence of leadership |
| *Communications* | Carelessness in planning or communicating; lack of consultation with key stakeholders |
| *Risk* | Ignoring risk; unclear analysis of risk; poor insurance management |
| *Procurement* | Unenforceable conditions or contract clauses; adversarial relations |

# Risk Breakdown Structure

* A **risk breakdown structure** (RBS) is a hierarchy of potential risk categories for a project
* Similar to a work breakdown structure but used to identify and categorize risks

# Figure 11-4. Sample Risk Breakdown Structure

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# Brainstorming

- **Brainstorming** is a technique by which a group attempts to generate ideas or find a solution for a specific problem by amassing ideas spontaneously and without judgment
- An experienced facilitator should run the brainstorming session
- Be careful not to overuse or misuse brainstorming
  - Psychology literature shows that individuals produce a greater number of ideas working alone than they do through brainstorming in small, face-to-face groups
  - Group effects often inhibit idea generation

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# Delphi Technique

* The **Delphi Technique** is used to derive a consensus among a panel of experts who make predictions about future developments
* Provides independent and anonymous input regarding future events
* Uses repeated rounds of questioning and written responses and avoids the biasing effects possible in oral methods, such as brainstorming



# Interviewing

* **Interviewing** is a fact-finding technique for collecting information in face-to-face, phone, e-mail, or instant-messaging discussions
* Interviewing people with similar project experience is an important tool for identifying potential risks

# Risk Register

* The main output of the risk identification process is a list of identified risks and other information needed to begin creating a risk register
* A **risk register** is:
  * A document that contains the results of various risk management processes and that is often displayed in a table or spreadsheet format
  * A tool for documenting potential risk events and related information
* **Risk events** refer to specific, uncertain events that may occur to the detriment or enhancement of the project



# Risk Register Contents

For each entry of the risk register, there are:

* An identification number for the risk event
* A rank for the risk event
* The name of the risk event
* A description of the risk event
* The category under which the risk event falls
* The root cause of the risk

# Risk Register Contents (continued)

- **Triggers** for each risk; triggers are indicators or symptoms of actual risk events for triggering the risk responses
- Potential responses to each risk
- The **risk owner** or person who will own or take responsibility for each risk
- The probability and impact of each risk occurring
- The status of each risk

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# Table 11-5. Sample Risk Register

| No. | Rank | Risk | Description | Category | Root Cause | Triggers | Potential Responses | Risk Owner | Probability | Impact | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R44 | 1 | | | | | | | | | | |
| R21 | 2 | | | | | | | | | | |
| R7 | 3 | | | | | | | | | | |

**Identified Risk**: The computer equipment may not be delivered on time.
**Root Cause**: This kind of equipment is often short of supply.
**Potential Responses**: Order in advance; Identify alternative vendors.

**Identified Risk**: Loss of data
**Root Cause** : System down
**Potential Responses**: Backup frequently; Redundancy

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# Performing Qualitative Risk Analysis

* Assess the likelihood and impact of all identified risks (in Risk Register) to determine their magnitude and priority
* It is a subjective analysis

* Risk quantification tools and techniques include:
  * Probability/impact matrixes
  * The Top Ten Risk Item Tracking
  * Expert judgment

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# Probability/Impact Matrix

* A **probability/impact matrix** or **chart** lists the relative probability of a risk occurring on one side of a matrix or axis on a chart and the relative impact of the risk occurring on the other
* List the risks and then label each one as high, medium, or low in terms of its probability of occurrence and its impact if it did occur
* Can also calculate **risk factors**
  * Numbers that represent the overall risk of specific events based on their probability of occurring and the consequences to the project if they do occur

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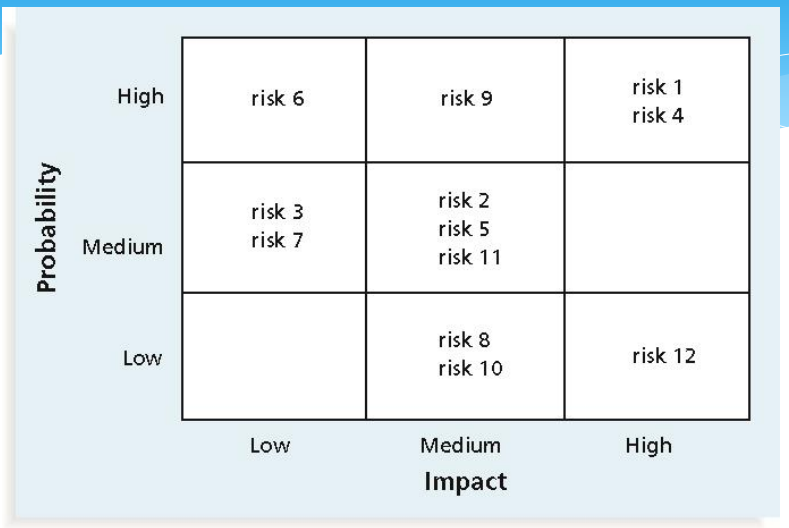
# Figure 11-5. Sample Probability/Impact Matrix






# How to use a Probability/Impact Matrix?

Odds and impact

| Risk | Probability | Impact | Risk Score |
|---|---|---|---|
| Data loss | Low | High | Moderate |
| Network speed | Moderate | Moderate | Moderate |
| Server downtime | High | Low | Moderate |
| E-mail service down | Low | Low | Low |

Each identified risk

Subjective score

# Top Ten Risk Item Tracking

* **Top Ten Risk Item Tracking** is a qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project
* Establish a periodic review of the top ten project risk items
* List the current ranking, previous ranking, number of times the risk appears on the list over a period of time, and a summary of progress made in resolving the risk item



## Table 11-6. Example of Top Ten Risk Item Tracking

| | MONTHLY RANKING | | | |
|---|---|---|---|---|
| **Risk Event** | **Rank This Month** | **Rank Last Month** | **Number of Months in Top Ten** | **Risk Resolution Progress** |
| Inadequate planning | 1 | 2 | 4 | Working on revising the entire project management plan |
| Poor definition | 2 | 3 | 3 | Holding meetings with project customer and sponsor to clarify scope |
| Absence of leadership | 3 | 1 | 2 | After previous project manager quit, assigned a new one to lead the project |
| Poor cost estimates | 4 | 4 | 3 | Revising cost estimates |
| Poor time estimates | 5 | 5 | 3 | Revising schedule estimates |

# Watch List

* A **watch list** is a list of risks that are low priority but are still identified as potential risks
* Qualitative analysis can also identify risks that should be evaluated on a quantitative basis



# Performing Quantitative Risk Analysis

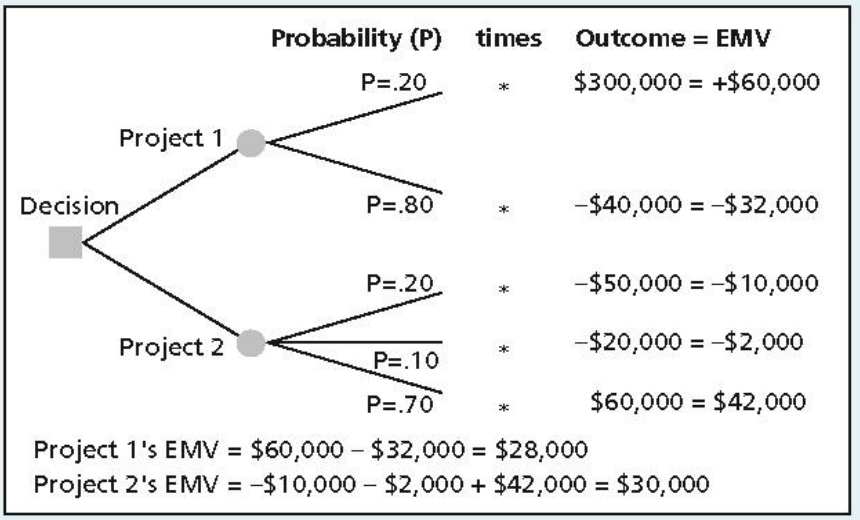
* Often follows qualitative risk analysis, but both can be done together
* Usually performed on risks that have been prioritized by the "Performing Qualitative Risk Analysis"
* Large, complex projects involving leading edge technologies often require extensive quantitative risk analysis
* Main techniques include:
  * Decision tree analysis and EMV
  * Simulation

# Decision Trees and Expected Monetary Value (EMV)

* A **decision tree** is a diagramming analysis technique used to help select the best course of action in situations in which future outcomes are uncertain
* **Estimated monetary value (EMV)** is the product of a risk event probability and the risk event's monetary value
* You can draw a decision tree to help find the EMV

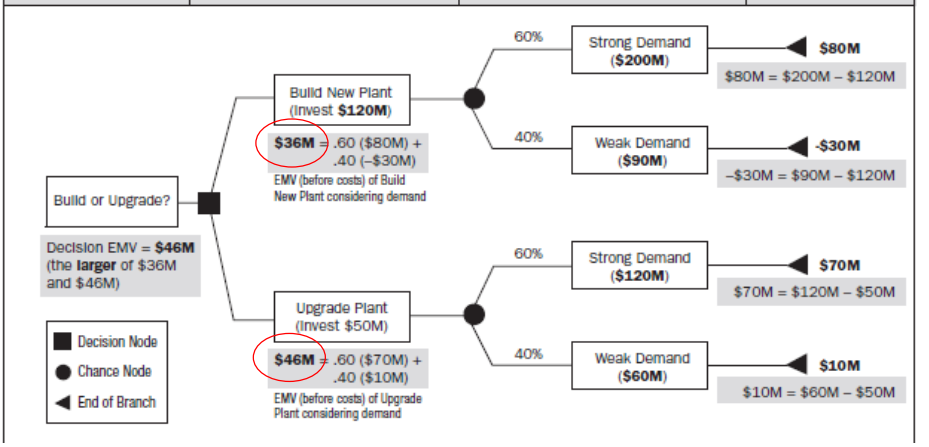


# Figure 11-7. Expected Monetary Value (EMV) Example



# Example of EMV

| Decision Definition | Decision Node | Chance Node | Net Path Value |
|---|---|---|---|
| Decision to be Made | **Input:** Cost of Each Decision<br>**Output:** Decision Made | **Input:** Scenario Probability, Reward if it Occurs<br>**Output:** Expected Monetary Value (EMV) | **Computed:** Payoffs minus Costs along Path |




# Planning Risk Responses

- After identifying and quantifying risks, you must decide how to respond to them
- Four main response strategies for **negative risks**
  - Risk avoidance
  - Risk acceptance
  - Risk transference
  - Risk mitigation

# Risk responses for negative risks (threats)

* **Avoid** - Changing the project management plan to eliminate the threat posed by an adverse risk, to isolate the project objectives from the risk's impact
  * Example: Cancel the delivery by ship due to the high probability of piracy, and choose lorry transportation instead
* **Transfer** - Shifting the negative impact of a threat, along with ownership of the response, to a third party
  * Examples : Insurance, warranties
* **Mitigate** - Implying a reduction in the probability and/or impact of an adverse risk event to an acceptable threshold
  * Examples: prototypes, system redundancy
  * Examples: Shipping partial goods in mulitple shipments to miminal the potential loss
* **Accept**–Some risk you can't avoid or mitigate or transfer
  * Do nothing, but just document it

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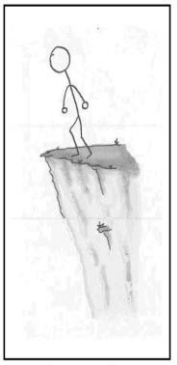
# Risk responses for negative risks (threats)



Your project Avoid Mitigate Transfer Accept

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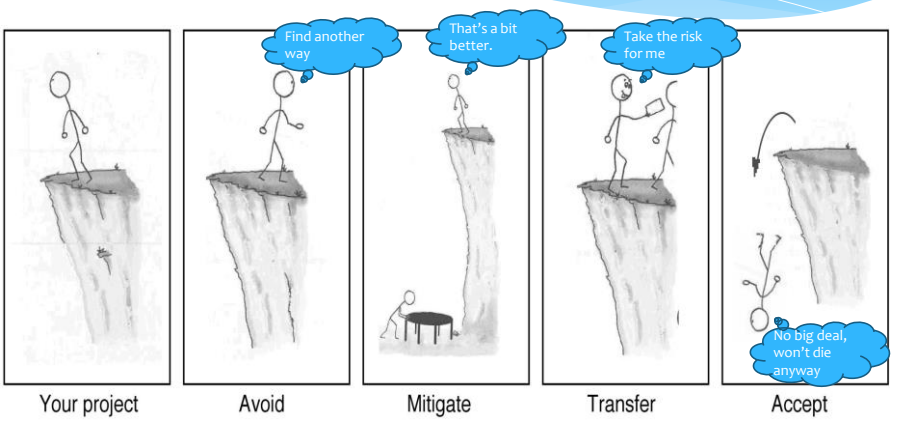
# Risk responses for negative risks (threats)

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# Risk Response for Positive Risks (Opportunities)

* Risk exploitation
* Risk sharing
* Risk enhancement
* Risk acceptance

# Risk Response for Positive Risks (Opportunities)

* **Exploit –** To do everything to make sure that to take advantage of an opportunity
  * Assign best resources to exploit it
* **Share –** Allocating ownership to a third party who is best able to capture the opportunity for the benefit of the project.
* **Enhance –** by increasing probability and/or positive impacts, and by identifying and maximizing key drivers of these positive impact risks



# Residual and Secondary Risks

* It's also important to identify residual and secondary risks
* **Secondary risks** are the risks that arise as a direct result of implementing a risk response
* **Residual risks** are the risks that remain after all of the response strategies have been implemented

# Contingency and Fallback Plans, Contingency Reserves

* **Contingency plans** are predefined actions that the project team will take if an identified risk event occurs
* **Fallback plans** are developed for risks that have a high impact on meeting project objectives and are put into effect if attempts to reduce the risk are not effective
* **Contingency reserves** or **allowances** are provisions held by the project sponsor or organization to reduce the risk of cost or schedule overruns to an acceptable level

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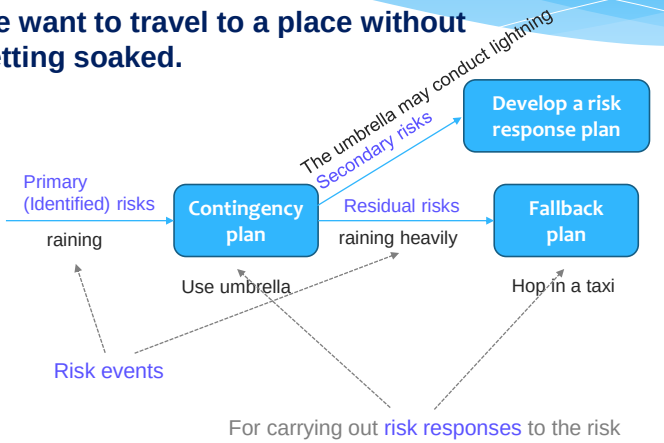
# Example of Contingency and Fallback plans

**We want to travel to a place without getting soaked.**

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# Monitoring and Controlling Risks

* Involves executing the risk management process to respond to risk events
* **Workarounds** are unplanned responses to risk events that must be done when there are no contingency plans
* Main outputs of risk monitoring and control are:
  * Risk register updates
  * Organizational process assets updates
  * Change requests
  * Updates to the project management plan and other project documents

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