

Software Project Management (CASC407)

BCA 7th semester – Tribhuvan University (TU)

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Unit-5 :

Risk Management

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What is a Risk?

- Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality
- Risks are not the same as issues
- Issues are problems you're aware of and know when they'll happen
- Risks are events that might happen, and you may not be able to tell when
- **Examples of Risks:**
 - Late changes to requirement
 - New technology is harder to implement than expected
 - Team member quits unexpectedly

Categories of Risk:

- There are 3 main categories of risks that might affect a project

❏ Project Risk:

- Often concerned with schedule delays, cost overruns, resource shortages, and customer-related issues
- Most common Project Risk
 - **Cost Risk:** Project will cost more than the budget allocated for it
 - **Schedule Risk:** Project will take longer than expected
 - **Performance Risk:** Project may not deliver the expected results
- **E.g.:** In 2005, Denver International Airport aimed to build the world's most advanced luggage system, but it turned out to be much more complex than expected, leading to a 16-month delay and a \$560M cost overrun.

Categories of Risk:

- There are 3 main categories of risks that might affect a project

❑ Business Risk:

- Often relates to market conditions, competition, and the company's financial health
- Most common Business Risk
 - **Market Risk:** Building an excellent product or system that no one really wants
 - **Sales Risk:** Building a product that a sales team doesn't know how to sell
 - **Management Risk:** Losing senior management support due to shifting priorities
- E.g.: Ford's Edsel flopped because the market had shifted to compact cars

❑ Technical Risk:

- Involves problems with quality, design, implementation, interface, and maintenance
- E.g.: On January 28, 1986, the Space Shuttle Challenger exploded 73 seconds after launch

What is a Risk Management?

- Risk management is the **process of identifying, analyzing and responding to any risk** that arises over the life cycle of a project to help the project remain on track and meet its goal.
- **Why it is important?**
 - **Spots potential risks early**, so you can **take action before they become serious**.
 - **Prevents costly delays and resource waste by fixing problems early**
 - **Enhances decision-making** by identifying potential risks and their impacts
 - **Protects reputation by identifying and handling risks** that could harm the company's image.
 - **Can increase profitability** by minimizing losses and maximizing opportunities

Risk Identification:

- Process of recognizing and listing potential risks that might affect a project
- How to Identify Project Risks?
 - ❑ Checklist Analysis:
 - Checklists are simply lists of the risks that have been found to occur regularly in software development project
 - ❑ Brainstorming:
 - Group activity where key stakeholders are brought together to freely generate and discuss potential risks
 - ❑ Brainwriting:
 - Where each stakeholders write down their ideas independently, often on paper or digitally, before sharing them with the group

Risk Identification:

- Process of recognizing and listing potential risks that might affect a project
- How to Identify Project Risks?
 - ❑ SWOT Analysis:
 - Identifies risks by evaluating how your project's strengths, weaknesses, opportunities and threats, influence potential risk factors
 - ❑ Expert Judgement:
 - Identifies risks by asking experienced people to share their views on possible problems based on their knowledge.

Risk Assessment:

- Problem with risk identification is that a **list of risks is potentially endless**
- Is necessary to **identify risks that are both damaging and likely to occur**, and then **rank them to prioritize** and **address the most critical ones first**
- This can be done by **estimating the risk exposure** for each risk using the formula

$$\text{Risk exposure} = (\text{potential damage}) * (\text{probability of occurrence})$$

- **Example:**

Say a project dependent on a data center vulnerable to fire. It might be estimated that **if a fire occurred a new computer configuration could be established for \$500,000**. It might also be estimated that where the computer is located there is a **1 in 1000 chance of a fire** actually happening, that is a **probability of 0.001**.

The risk exposure in this case would be:

$$\$500,000 * 0.001 = \$500$$

A crude way of understanding this value is as the **minimum sum an insurance company would require as a premium**. If 1000 companies, all in the same position, each contributed \$500 to a fund then, when the 1 in 1000 chance of the fire actually occurred, there would be enough money to cover the cost of recovery.

4x4 Risk Assessment Matrix:

- Tool **used to evaluate and prioritize risks** based on two factors:
 - **Likelihood(Probability):** How likely it is for a risk to occur
 - **Impact:** Consequence of a risk if it happens
- 4x4 risk grid maps **likelihood on the X-axis** and **impact on the Y-axis**.
- **Probability is categorized into 4-levels:**
 - **Low(1):** Less than 10% chance of happening
 - **Moderate(1):** 10-29% chance of happening
 - **Significant(3):** 30-50% chance of happening
 - **High(4):** Greater than 50% chance of happening

Risk Assessment Matrix					
		Probability			
		Low(1)	Moderate(2)	Significant(3)	High(4)
Impact	Low(1)	Low Risk(1)	Low Risk(2)	Low Risk(3)	Moderate Risk(4)
	Moderate(2)	Low Risk(2)	Moderate Risk(4)	Moderate Risk(6)	Significant Risk(8)
	Significant(3)	Low Risk(3)	Moderate Risk(6)	Significant Risk(9)	High Risk(12)
	High(4)	Moderate Risk(4)	Significant Risk(8)	High Risk(12)	High Risk(16)

4x4 Risk Assessment Matrix:

- Impact is also categorized into 4-levels:
 - **Low(1):** Within 10% of budget expenditure
 - **Moderate(1):** 10-19% above budget expenditure
 - **Significant(3):** 20-29% above budget expenditure
 - **High(4):** More than 30% above budget expenditure
- Calculating Risks Level:
 - Risk Score = Likelihood*Impact
 - Use a risk matrix to determine the risk level based on the score

Risk Assessment Matrix					
Probability					
		Low(1)	Moderate(2)	Significant(3)	High(4)
Impact	Low(1)	Low Risk(1)	Low Risk(2)	Low Risk(3)	Moderate Risk(4)
	Moderate(2)	Low Risk(2)	Moderate Risk(4)	Moderate Risk(6)	Significant Risk(8)
	Significant(3)	Low Risk(3)	Moderate Risk(6)	Significant Risk(9)	High Risk(12)
	High(4)	Moderate Risk(4)	Significant Risk(8)	High Risk(12)	High Risk(16)

Risk Planning:

- After identifying the major risks and setting priorities, the next step is to address them.
- How to Deal with Risks?
 - ❑ Risk Acceptance:
 - Do nothing
 - Sometimes the damage from a risk is less costly than the measures needed to prevent it
 - E.g.: Delayed shipments of non-essential office supplies
 - ❑ Risk Avoidance:
 - Some activities may be so prone to accident that it is best to avoid them altogether
 - E.g.: Skipping a feature that relies on risky or untested technology
 - ❑ Risk Reduction:
 - Attempts to reduce the likelihood of the risk occurring
 - E.g.: Implementing regular code reviews to catch errors early.

Risk Planning:

- After identifying the major risks and setting priorities, the next step is to address them.
- How to Deal with Risks?
 - ☐ Risk Mitigation:
 - Action taken to ensure that the impact of the risk is lessened when it occur
 - E.g.: Taking regular back-ups of data storage to reduce impact of data corruption
 - ☐ Risk Transfer:
 - Shifting the responsibility for a risk to a third party
 - E.g.: Outsourcing certain tasks or Purchasing insurance

Deciding the Right Risk Action:

- Actions to lower risks should be cost-effective
- Cost-effectiveness of these actions can be measured by calculating the **Risk Reduction Leverage (RRL)**

$$RRL = \frac{(RE_{\text{before}} - RE_{\text{after}})}{\text{Cost of Risk Reduction}}$$

- **RRL > 1** indicates risk reduction action is worthwhile
- **Example:**

Say a project dependent on a data center vulnerable to fire. It might be estimated that **if a fire occurred a new computer configuration could be established for \$200,000**. It might also be estimated that where the computer is located there is a **1% chance of a fire**. Would it be a good idea to **install fire alarm at a cost of \$500** which would **reduce the chance of fire to 0.5%**?

$$RE_{\text{before}} = \text{Potential damage} * \text{Probability of occurrence} = \$200,000 * 0.01(\text{i.e. } 1\%) = \$2000$$

$$RE_{\text{after}} = \text{Potential damage} * \text{Probability of occurrence} = \$200,000 * 0.005(\text{i.e. } 0.5\%) = \$1000$$

$$RRL = \frac{(RE_{\text{before}} - RE_{\text{after}})}{\text{Cost of Reduction}} = \frac{(\$2000 - \$1000)}{\$500} = \frac{1000\$}{\$500} = 2 (>1)$$

Here **RRL > 1**, Therefore the action is worthwhile.

Risk Monitoring and Control:

- Risk monitoring and control means watching for any problems that could arise throughout a project and making sure to address them quickly if they do
- Crucial process in project management
- Activities include:
 - ☐ Tracking new risks that come up during the project
 - ☐ Regular reviews to track changes in risk likelihood or impact
 - ☐ Applying pre-planned solutions, to handle risks that become issues
 - ☐ Adjust the overall plan if pre-planned solution don't work
 - ☐ Reporting on risks so everyone knows the current status
 - ☐ Monitor Residual Risk (Remaining threat after all mitigation efforts have been applied)

Creating and Maintaining the Risk Register:

- A **risk register** is a document or tool that tracks and manages potential project risks, including their likelihood, impact, and mitigation actions
- Identify and record major risks in a risk register
- As the project progresses, new risks may appear and should be added
- Review and update the risk register regularly
- Some risks only affect certain tasks and can be closed once those tasks are finished
- Risk likelihood and impact can change as the project moves forward

ID	Date raised	Risk Description	Likelihood	Impact	Rating based on impact & likelihood	Owner	Mitigation action
1	2024-09-11	Personnel shortfall	Low	High	Medium	Sudarshan Baral	Hire skilled people, match them to the right roles, build teamwork, and train everyone to handle multiple tasks
2	2024-09-12	Key team member becoming unavailable due to illness	Medium	High	High	Dipesh Gautam	Train others to do the job and write down important steps so work can continue smoothly
3	2024-09-13	Delay in receiving critical hardware components from supplier	Low	High	Medium	Pratik Chaulagain	Find backup suppliers, speed up shipping, and keep a close eye on the main supplier