18CSCI08I
Software Project Management

Lab (7)

Risk Management

- Project Risks
  - What are project risks?
  - What causes project risks?
  - Types of risks
- Risk Management Cycle
  - Risk Identification
  - Risk Analysis
  - Risk Reduction Strategies
  - Risk Monitoring

Project Risks:

- Factors that cause a project to be **delayed** or **over-budget**.
- It relates to possible future problems
- It involves **causes** and **effects**: a developer leaves -> task is delayed
- An uncertain event or condition that, if occurs, has a negative effect on a project's objectives – **PMBOK**
- The chance of exposure to the adverse consequences of future events **PRINCE2**

What causes Project Risks?

- Planning assumptions: previous assumptions turns out to be invalid
- Estimation errors
- Eventualities: unexpected or unimaginable events such as requirements specification needs to be rewritten.

Types of Risks

- **Generic risk** – common to all projects
  - ✓ Use checklists
  - ✓ Include Staff factors, HW and SW factors, environment factors, etc.
- **Specific risk –** only applies to individual projects
  - ✓ Use brainstorming
  - ✓ More difficult to find

Risk Management Framework (RM Cycle)

The planning for risk includes the following steps:

1. Risk identification – what risks might be there?
2. Risk Analysis and prioritization – which are the most serious risks?
3. Risk planning – what are we going to do about them or how to deal with them?
4. Risk monitoring – what is the current state of the risk?

1. Risk Identification

Risk identification approaches include

- **Checklists** – usually based on the experience of past projects
- **Brainstorming** – getting knowledgeable stakeholders together to pool concerns

2. Risk Analysis: Risk Exposure Measure

- Risk estimation is to assess the **impact** and **likelihood** of each hazard.
- Risk exposure (risk value)
  - It is the importance of the risk
  - Risk exposure = risk impact x risk likelihood
- Risk impact – the effect of the problem caused by the hazard
  - Delays to scheduled activities – months, days, weeks, etc.
  - Using additional expensive resources - currency
- Risk likelihood – the probability that a hazard is going to occur – percentage

Risk Exposure Example

A flood would cause $0.5 million of damage and the probability that this hazard will occur is one in a hundred chance 0.01.

RE = $0.5m x 0.01 = $5,000

3. Risk Planning

There are five different ways of handling risk:

- Risk acceptance
- Risk avoidance
- Risk reduction
- Risk transfer
- Risk mitigation/contingency plan

Risk reduction leverage

RRL is a value which is used to determine whether it is worthwhile to carry out the proposed risk reduction plan/solution.

The higher the **RRL** value, the more worthwhile it is to carry out the risk reduction plan.

$$\text{Risk Reduction Leverage} = \frac{(\text{Risk Exposure Before} - \text{Risk Exposure After})}{\text{Cost of Risk Reduction}}$$

If RRL > 1 it is worth doing

Example:

Let us consider a Server with some data on it. The probability of losing the data is 20%. The cost of losing such data is measured in terms of the cost of rebuilding it. This is estimated at $20,000:

Probability of loss	0.2	BEFORE Resolution
Loss	$20,000	
Exposure to data loss	0.2 x $20,000 = **$4,000**	

Now we provide a method of reducing the possibility of data loss (Say frequent backup or replication on another database, etc.). This reduces the risk to 5%. The impact on losing the data is the same since we still need to rebuild the data. However, the cost of introducing the loss reduction is $2000.

Probability of	0.05	AFTER Resolution
loss Loss	$20,000 (Same loss in this example)	
Exposure	0.05 x $20,000 = **$1000**	
Cost of Risk Reduction	**$2000**	

So using the above formula, the Risk Reduction Leverage is:

Leverage ($4000 - $1000) / $2000 = 1.5

The higher the Leverage, the better the solution.

Exercises:

1. We will assume that a certain project depends on a data center vulnerable to fire. It is estimated that if a fire occurred, a new computer configuration could be established for $500,000. It is also estimated that where a computer is located there is a 1 in 1000 chance of a fire actually happening.

   Calculate the risk exposure for the current situation.

2. Mo is a systems analyst who is gathering requirements for an application, which will record details of the training undertaken by fire fighters in the client fire brigade. Details of the training units successfully completed by fire fighters are to be input to the application by trainers who are themselves senior and active fire fighters. Mo needs to interview a trainer to obtain his/her requirements. Because of the senior fire fighters' other duties the interview has to be arranged in 2 weeks in advance. There is then a 20% chance of the fire fighter being unable to attend the interview because of an emergency call out. Each week that the fire is delayed causes the brigade approximately $1000.

   Provide an estimate for the risk exposure (as a financial value) for the risk that the senior fire fighter might not be able to attend at the times needed.

3.

A potentially risky situation involves the software for an experiment with a satellite. The experiment team understands the application well (experiments with satellites), however, is not very experienced with software development. The satellite platform manager has obtained an estimate that there is probability of 0.1 that the software will have a critical error that will wipe out the entire experiment and cause an estimated loss of the total investment in the experiment of $20 million. There are two major options for the manager for reducing the risk:

- Convincing and helping the experiment team to apply better software development methods. This causes an additional analysis and test cost of $400k and from the previous experience the manager estimates that this will reduce the failure probability Prob (Loss) to 0.05.
- Hire a contractor to independently verify and validate the software at an additional cost of $300,000. Based on previous experience with this contractor, this will reduce the error probability to 0.01.

Determine the risk exposure for each of the choices and make a decision as to the path