



SWINBURNE
UNIVERSITY OF
TECHNOLOGY

SWE20001

Managing Software Projects

Lecture 7a

Risk Estimation and Prioritization



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Principal References



- Roger S. Pressman, *Software Engineering - A Practitioners Approach* (7th Edition), McGraw Hill, 2010, Chapter 28.
- Bob Hughes and Mike Cotterell, *Software Project Management* (4th Edition), Wiley, 2006, Chapter 7.
- Pankaj Jalote, *Software Project Management in Practice*, Addison-Wesley, 2002, Chapter 6.

Roadmap



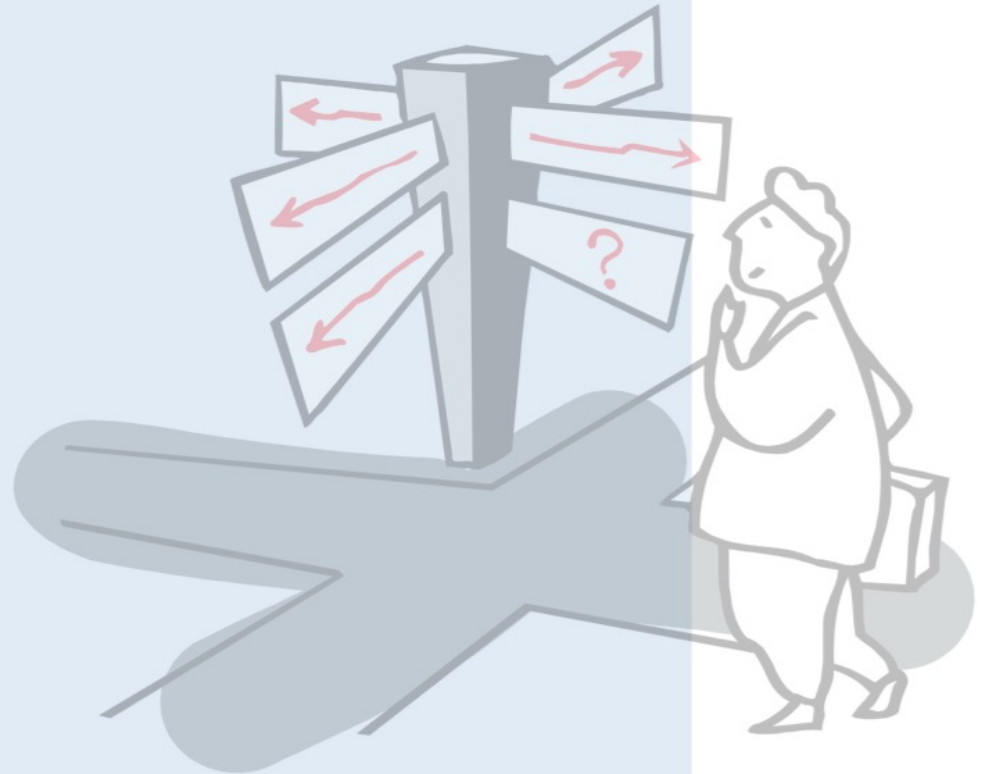
- Risk Exposure
- Risk Estimation
- Risk Prioritization



Roadmap



- Risk Exposure
- Risk Estimation
- Risk Prioritization





Risk Exposure

- Risk *probability*

- also known as *rate of occurrence*

- Risk *impact*

- severity of the consequences

- **Risk Exposure = Risk Impact * Risk Probability**

☞ *No “real” risk management can be performed unless both, probability and impact of a risk is known!*

Risk Exposure (cont.)



■ Advantages

- ☐ Risk exposure provides a way to compare or *rank* risks
- ☐ Having a good *quantitative* estimate of the risk exposure, the extra effort can provide a better understanding of the problem

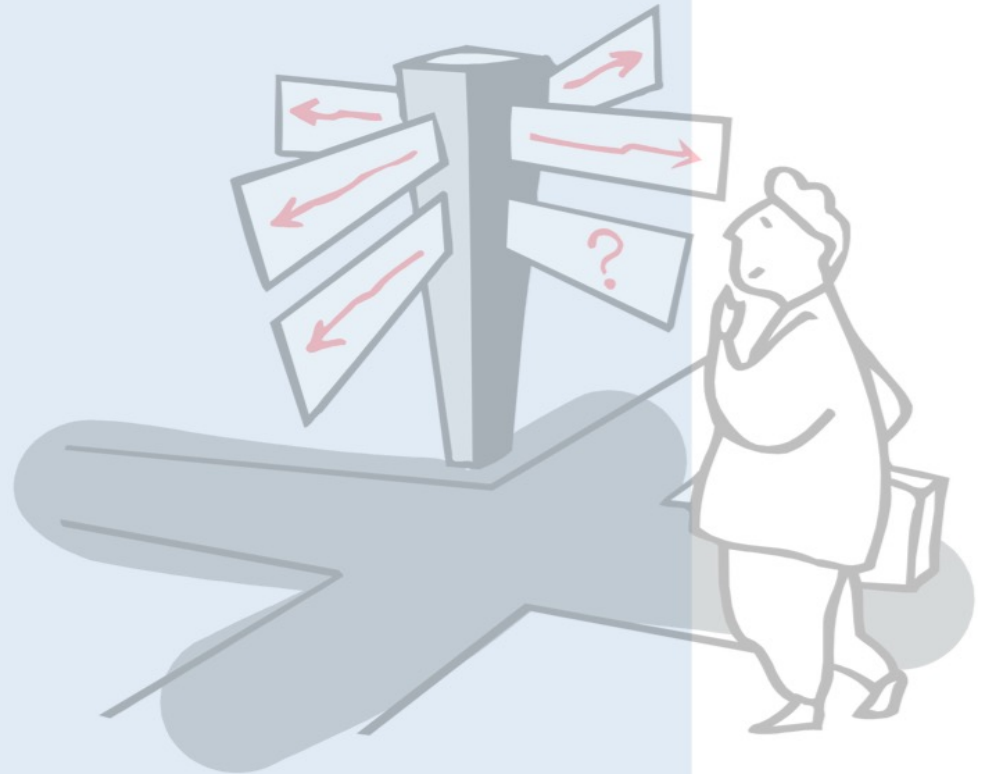
■ Disadvantages

- ☐ Difficult to have good estimation
- ☐ Estimation is *subjective* and often time-consuming
- ☐ Risk exposure alone neglects *dependencies* between risks!
 - ☐ but this goes beyond the scope of an introduction into risk management

Roadmap



- Risk Exposure
- **Risk Estimation**
- Risk Prioritization



Risk Estimation



■ Risk probability

- ☐ Use appropriate ranking criteria
 - ☐ E.g., Low, Moderate, High, Very High
 - ☐ E.g., scale from 1 (least likely) to 10 (most likely)
 - ☞ Do not use a too fine-grained scale (uncertainty factor!)

■ Risk impact

- ☐ Define suitable units of impact
 - ☐ E.g., Insignificant, Tolerable, Serious, Catastrophic
 - ☐ E.g., scale from 1 (insignificant) to 10 (catastrophic)
 - ☞ Again, do not use a too fine-grained scale...

■ Use experience data (can be difficult!)

■ Define “suitable” values for probability * impact

- ☐ What does “Moderate” * “Tolerable” mean??

Risk Estimation – Example 1



Risk Item	Likelihood	Impact	Exposure
It is impossible to recruit staff with suitable skills for the project	0.70	200,000	140,000
Organizational financial problems force to cut down the project budget	0.20	100,000	20,000
The time required to develop the system is too long	0.65	40,000	26,000
Software components are unreliable	0.40	25,000	10,000
The DBMS component cannot process as many requests as it is expected	0.45	20,000	9,000
Customers fail to understand the impact of requirements changes	0.20	15,000	3,000
User training is postponed	0.10	1,000	100

Where do the “magic” numbers come from?

Risk Estimation – Example 2



Risk Item	Likelihood (1 – 10)	Impact (1 – 10)	Exposure
It is impossible to recruit staff with suitable skills for the project	7	9	63
Organizational financial problems force to cut down the project budget	2	8	16
The time required to develop the system is too long	7	6	42
Software components are not compatible which make the system unreliable	4	4	16
The DBMS component cannot process as many requests as it is expected	5	3	15
Customers fail to understand the impact of requirements changes	2	3	6
User training is postponed	1	1	1

Where do the “magic” numbers come from?

Risk Estimation – Example 3



Risk Item	Likelihood	Impact
It is impossible to recruit staff with suitable skills for the project	High	Catastrophic
Organizational financial problems force to cut down the project budget	Low	Catastrophic
The time required to develop the system is too long	High	Serious
Software components are not compatible which make the system unreliable	Moderate	Serious
The DBMS component cannot process as many requests as it is expected	Moderate	Serious
Customers fail to understand the impact of requirements changes	Low	Tolerable
User training is postponed	Low	Insignificant

Is it impossible to quantify the risk items?

Risk Estimation – Example 3 (cont.)



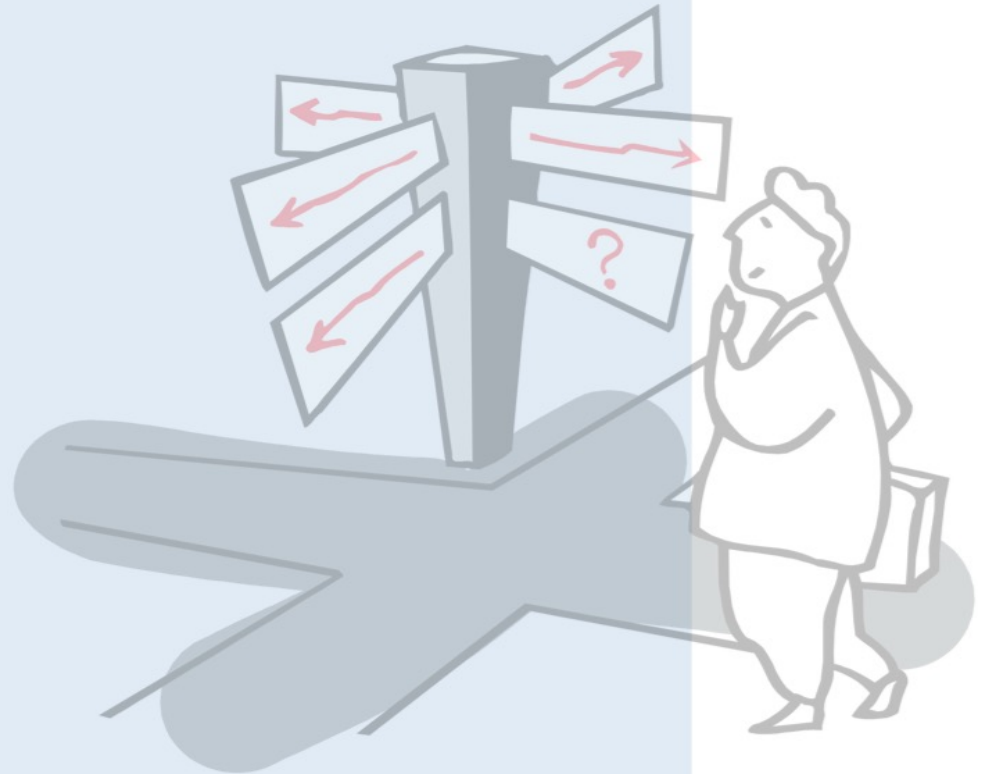
	Low (1)	Moderate (2)	High (3)	Very High (5)
Insignificant (1)	1	2	3	5
Tolerable (2)	2	4	6	10
Serious (3)	3	6	9	15
Catastrophic (5)	5	10	15	25

Some suggestion: Using Fibonacci Sequence 1, 2, 3, 5, 8, 13, ...

Roadmap



- Risk Exposure
- Risk Estimation
- **Risk Prioritization**





Risk Prioritisation

■ Ranking risks

- ☐ Rank the risks based on their *risk exposure*
- ☐ Note: ranking only shows the *order of importance*
- ☐ Need to consider factors like
 - ☐ Confidence of the risk assessment
 - ☐ Total number of risks
 - ☐ Cost of action (see next slide)

■ Select top “few” risks (e.g., Top 10)

- ☞ Risks that have a *direct impact on project goals and objectives!*
- ☞ Risks that require *risk control/mitigation strategies*
- ☞ *Risks are not static, they will change over time!*
 - ☞ *This includes both, probability and impact*

Cost of Action



- Risk management is *not for free*, there are costs associated with mitigation strategies
 - E.g., To prevent a (short-term) power failure, need to acquire a UPS (Uninterruptible Power Supply)
- Cost-Benefit analysis
 - Does the cost associated with the mitigation strategy merit its implementation?
 - E.g., Cost of risk exposure of power failure smaller than cost of UPS, no need for mitigation strategy
- If a mitigation strategy costs too much
 - Look for an alternative
 - If not possible, carefully monitor the risk!

What you should know!



- What are the key characteristics of risks?
- What is risk management?
Why do we need to manage risks in software projects?
- What are the main risk drivers?
How do they assist in identifying risks in a project?
- What is the relationship between risk probability, risk impact, and risk exposure?
- Why is it recommended to regularly watch the “Top 10” risks?

Can you answer these questions?



- Should a risk mitigation strategy be implemented at all cost?
- What may happen if risk probability and risk impact are measured at a too fine-grained scale?
- What kind of risks does N-Version Programming attempts to mitigate?
- What kind of risks does Pair Programming attempt to mitigate?
What other strategies could be put in place to achieve the same outcome?

Recommended Reading Lecture 7



- Bob Hughes and Mike Cotterell, *Software Project Management* (4th Edition), Wiley, 2006, Chapter 9.
- Ian Sommerville, *Software Engineering* (8th Edition), Addison-Wesley, 2007, Chapter 28.