

Unit 15: Risk Management

Objectives

- To explain the concept of *risk* & to develop its role within the software development process
- To introduce the use of risk management as a means of identifying & controlling risk in software development

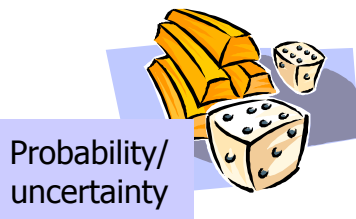
What is risk?



It is **not** just a game!

Definitions of risk

- “The possibility of suffering harm or loss; danger”
- “The possibility of loss or injury”
- “Chance of danger, injury, loss”
- “A measure of the probability & severity of adverse effects”



Risks in the everyday world

- **Financial risks** - “your house is at risk if you fail to repay your mortgage or any loans secured on it”
- **Health risks** - “the chance that a person will encounter a specified adverse health outcome (like die or become disabled)”
- **Environmental & ecological risks** - “the likelihood of extinction due to exposure of terrestrial wildlife to contaminants”
- **Security risks** - “there is a significant risk that widespread insertion of government-access key recovery systems into the information infrastructure will exacerbate, not alleviate, the potential for crime and information terrorism”



More examples?

How is risk dealt with?

- **Basic process:** identify the risk -> analyse its implications -> determine treatment methods -> monitor performance of treatment methods
- Techniques & heuristics for the identification, analysis, treatment & monitoring of risk

Insurance companies depend on understanding risk

- Risk management is a project management tool to assess & mitigate events that might adversely impact a project, thereby increasing the likelihood of success

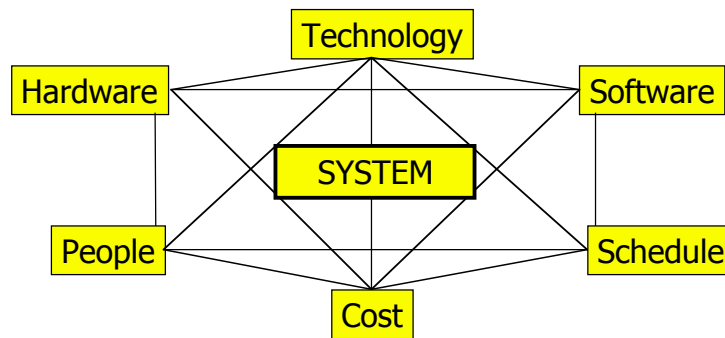
Why is the software world interested in risk?

- Many post-mortems of software project disasters indicate that problems would have been avoided (or strongly reduced) if there had been an explicit early concern with identifying & resolving high-risk elements!
- An obvious cost factor!

Browse the forum on "Risks To The Public In Computers & Related Systems"
<http://catless.ncl.ac.uk/Risks>

Successful project managers are good risk managers!

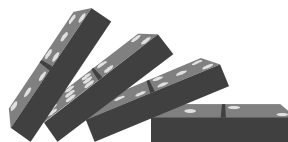
Sources of software risk (systems context)



Reproduced from [Higuera 1996]
"Software Risk Management", Technical Report
CMU/SEI-96-TR-012, ESC-TR-96-012, June 1996

Why is it often forgotten?

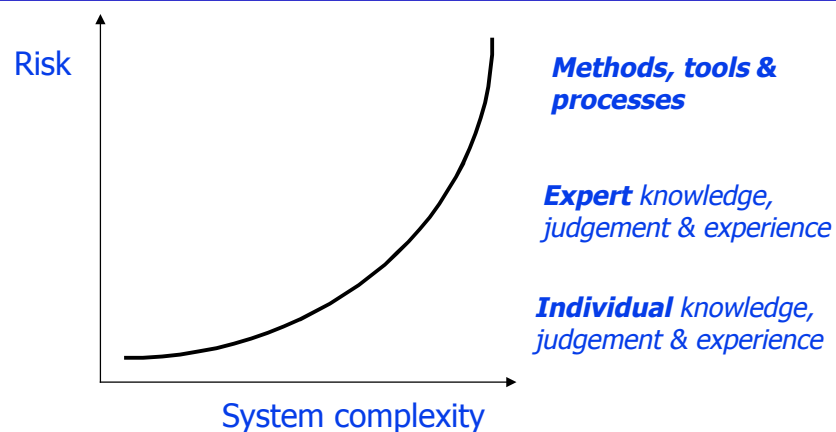
- Optimistic enthusiasm at the start of projects
- Software process can lead to over-commitment & binding requirements much too early on
- Premature coding
- The "add-on" syndrome
- Warning signals are missed
- Legal implications
- Poor software risk management by project managers



Software risk management

- Objectives
 - To identify, address & eliminate risk items before they become either threats to successful software operation or major sources of software rework
 - Necessary that some form of measurement is undertaken to determine & classify the range of risks a software development project faces, & to identify areas where a *significant* exposure exists
- The discipline attempts to provide a set of principles & practices to achieve the above
- A response to *change & uncertainty*

The need to manage risk



Reproduced from [Higuera 1996]

The questions

What can go wrong?

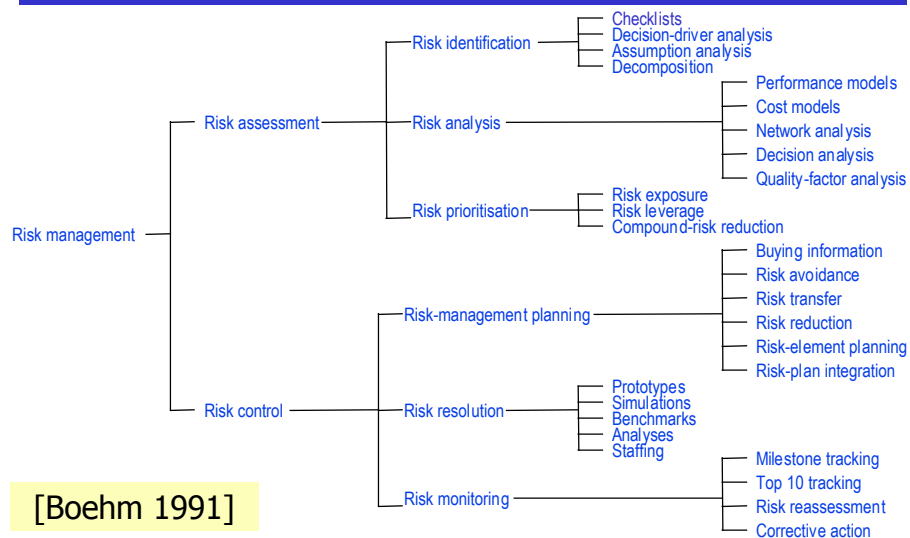
What is the likelihood
it will go wrong?

What are the consequences?

What can be done?

What options are available?

Software risk management steps & techniques



Risk assessment



- **Risk identification** - listing project-specific risk items that are likely to compromise a project's success



- **Risk analysis** - assessing the loss probability & loss magnitude for each identified risk item, & assessing compound risks



- **Risk prioritisation** - ordering & ranking the risk items identified & analysed

Risk control



- **Risk-management planning** - doing the ground work so as to be in a position to address each risk item



- **Risk resolution** - producing a situation in which risk items are eliminated or resolved



- **Risk monitoring** - tracking the project's progress towards resolving risk items & taking corrective action where required



E.g. top 10 risks in software project mgmt

- Personnel shortfalls
- Unrealistic schedules & budgets
- Developing the wrong functions & properties
- Developing the wrong user interface
- Gold-plating
- Continuing stream of requirements changes
- Shortfalls in externally furnished components
- Shortfalls in externally performed tasks
- Real-time performance shortfalls
- Straining computer-science capabilities

[Boehm 1991]

Determine a risk-management technique to deal with each of these



E.g. project sizing matrix



Phase	Task	Start	End	Resources	Cost	Risk	Impact
1	1.1	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6
2	2.1	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6
3	3.1	3.1.1	3.1.2	3.1.3	3.1.4	3.1.5	3.1.6
4	4.1	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.1.6
5	5.1	5.1.1	5.1.2	5.1.3	5.1.4	5.1.5	5.1.6
6	6.1	6.1.1	6.1.2	6.1.3	6.1.4	6.1.5	6.1.6
7	7.1	7.1.1	7.1.2	7.1.3	7.1.4	7.1.5	7.1.6
8	8.1	8.1.1	8.1.2	8.1.3	8.1.4	8.1.5	8.1.6
9	9.1	9.1.1	9.1.2	9.1.3	9.1.4	9.1.5	9.1.6
10	10.1	10.1.1	10.1.2	10.1.3	10.1.4	10.1.5	10.1.6

Always a question of balance
- full risk analysis may not improve risk probability estimation significantly!



[Used @ DERA]



E.g. prioritisation scheme

- Risk-exposure quantity is an effective technique for risk prioritisation
 - Assess risk probabilities & losses on a scale 0-10
 - Multiply probability by loss to determine exposure

Unsatisfactory outcome	Probability of unsatisfactory outcome	Loss caused by unsatisfactory outcome	Risk exposure
Software error loses key data	3-5	8	24-40
Processor memory insufficient	1	7	7

- Relies on accurate estimates of the probability & loss associated with an unsatisfactory outcome



E.g. risk management plan

- The Risk Management Plan (RMP) presents the process for implementing *proactive* risk management as part of overall project management
- The RMP describes techniques for identifying, analysing, prioritising & tracking risks; developing risk-handling methods; & planning for adequate resources to handle each risk, should they occur
- The RMP also assigns specific risk management responsibilities & describes the documenting, monitoring & reporting processes to be followed





E.g. PMP summarised as a risk register

Risk Register/Risk Questionnaire/Assessment Summary Risk Questionnaire/Assessment Summary

Project: _____

Classification: _____

Reference: _____

Date: _____ Version: _____

Serial No.	Risk Type (see note 2)	Risk Title	Probability of occurrence	Impact on			Risk reduction measures	Fallback position/ contingency	Owner of risk
				Time	Cost	Perform			
1									
2									
3									
4									
5									
6									

Notes:

1. Questionnaire may be created to meet individual project requirements. However, a summary questionnaire covering the minimum issues to be addressed will probably take this form. The risk questionnaire may be known as the risk register.
2. Risk Types: Technical
Project Management
Commercial
External.

[Used @ DERA]



Ways of dealing with risks

- **Elimination:** where exposure to risk is terminated
- **Retention:** where the risk is made tolerable, perhaps after some modification
- **Avoidance:** where the risk is negated in some way, possibly by redesign of work methods
- **Transfer:** where the risk is passed to a third party, either contractually or via insurance
- Need to balance *acceptable* risks

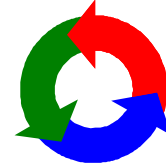




Implement & track



- An on-going process of measuring the effect that implementation of a risk management programme has had & its ability to continue
- Focus on the high-risk, high-leverage critical success factors
 - Rank a project's most significant risk items (prepare)
 - Establish a regular schedule for review of progress (meet)
 - Summarise progress on top risk items (discuss)
 - Focus on handling any problems in resolving the risk items (act)



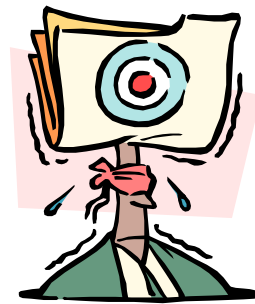
Putting risk management into practice

- Insert risk management principles & practices into your software development process, so they are risk-oriented & risk-driven - do this gradually & incrementally
- Start with a top 10 risk-item tracking process - lightweight, cheap & good returns!
- Develop a WWWWWHHM RMP template to populate
- Not a prescription - relies on *good* human judgement!

A focus on CSFs can help you win work!

The BIGGEST risk?

Not knowing
what the
risks are!



Key points

- The enemy of the software manager is risk
- Software projects must manage risks to minimise their consequences
- Time spent identifying, analysing & managing risk pays off!
- You can use the 6 stage conceptual framework with its associated techniques as a solid starting point
- If nothing else, be risk aware...

Core references



- B. W. Boehm, "Software Risk Management: Principle and Practices," IEEE Software, Vol. 8, No. 1, January 1991, pp. 32-41
- Roger Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill, 5th edition, ISBN: 0-07-709677-0 (Chapter 6)
 - *Contains pointers to lots more refs*
- Ian Sommerville, "Software Engineering", Addison-Wesley, 6th Edition, ISBN: 0-201-39815-X (Chapter 4.4)

You are **strongly** advised to read one of these!

Supplementary references



- P. G. Neumann, "Computer Related Risks", ACM Press, 1995
- J. Adams, "Risk", UCL Press, 1995
- B. W. Boehm, "Software Risk Management", CS Press, 1989
- Tom Gilb, "Principles of Software Engineering Management", Addison-Wesley, 1998, ISBN: 0-201-19246-2 (Chapter 6)
- IEEE Software - Special issues on Risk - May 1994 & May/June 1997

LOTS of general risk info on the web!