Unit 3: 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!

Successful project managers are good risk managers!

Sources of software risk (systems context)

- Technology
- Software
- System
- People
- Schedule
- Cost

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

Risk

System complexity

Methods, tools & processes

Expert knowledge, judgement & experience

Individual knowledge, judgement & experience

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?

Reproduced from [Higuera 1996]
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 groundwork 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

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E.g. top 10 risks in software project mgmt

1. Personnel shortfalls
2. Unrealistic schedules & budgets
3. Developing the wrong functions & properties
4. Developing the wrong user interface
5. Gold-plating
6. Continuing stream of requirements changes
7. Shortfalls in externally furnished components
8. Shortfalls in externally performed tasks
9. Real-time performance shortfalls
10. Straining computer-science capabilities

[Boehm 1991]

Determine a risk-management technique to deal with each of these
Always a question of balance - full risk analysis may not improve risk probability estimation significantly!

E.g. project sizing matrix

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

<table>
<thead>
<tr>
<th>Unsatisfactory outcome</th>
<th>Probability of unsatisfactory outcome</th>
<th>Loss caused by unsatisfactory outcome</th>
<th>Risk exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software error loses key data</td>
<td>3-5</td>
<td>8</td>
<td>24-40</td>
</tr>
<tr>
<td>Processor memory insufficient</td>
<td>1</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

- 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.

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E.g. PMP summarised as a risk register

<table>
<thead>
<tr>
<th>Risk Register/Risk Questionnaire/Assessment Summary Risk: Questionnaire/Assessment Summary</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Project</th>
<th>Qualification</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Risk</th>
<th>Type</th>
<th>Probability</th>
<th>Impact</th>
<th>Risk reduction measures</th>
<th>Fallout prevention</th>
<th>Overview</th>
</tr>
</thead>
</table>

| 1 | 2 | 3 | 4 | 5 | 6 |

Notes:
1. Questions may be created by non-functional project requirements. However, a non-functional questionnaire covering the minimum issues to be addressed/probably in the future. The risk questionnaire may be 'bancnised as a risk register.'
2. Task Type: Technical
   Project Management
   Overview:
   'Noted'

[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 WWWWWWHHM 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


  - Contains pointers to lots more refs


You are strongly advised to read one of these!
Supplementary references


LOTS of general risk info on the web!