

# ICS 3207/MIT 3105 SOFTWARE/IT PROJECT MANAGEMENT

## CHAPTER 6

### SOFTWARE PROJECT RISK MANAGEMENT

# Chapter objectives

- Describe the project risk management planning framework introduced in this chapter.
- Define risk identification and the causes, effects, and integrative nature of project risks.

# Chapter objectives

- Apply several qualitative and quantitative analysis techniques that can be used to prioritize and analyze various project risks.
- Describe the various risk strategies, such as insurance, avoidance, or mitigation.
- Describe risk monitoring and control.

# Chapter Objectives

- Describe risk evaluation in terms of how the entire risk management process should be evaluated in order to learn from experience and to identify best practices.

# Introduction to project Risk

- Project plan is based on a number of **estimates** that reflect our understanding of the current situation, the information available, and the **assumptions** we must make.

# Introduction

- The fact that we must estimate implies a degree of **uncertainty** in predicting the outcome of future events.

# Introduction

- Although no one can predict the future with 100 percent accuracy, having a solid foundation, in terms of processes, tools, and techniques, can increase our confidence in these estimates.

# Introduction

- Unfortunately, things seldom go according to plan because the project must adapt to a dynamic environment.
- Project risk management is becoming an important sub-discipline of software engineering.



# What is a Risk?

- Risks are **potential problems** that may affect **successful** completion of a software project.
- Risks involve uncertainty and potential losses.

# What is a Risk?

- An uncertain event or condition that, if it occurs, has a positive or negative effect on the project objectives.
- "hazard; peril; or exposure to loss or injury"

# Risks

- This uncertainty comes from our attempt to predict the future based on estimates, assumptions, and limited information.
- Although project risk has a downside resulting from unexpected problems or threats, project risk management must also focus on positive events or opportunities.

# Risks

- Therefore, it is important that we understand what those events are and how they may impact the project beyond its objectives.
- It is also important that we understand not only the nature of project risks but also how those risks interact and impact other aspects of the project throughout the life of a project.

# Categories of Risks

- Project risks
- Product risks
- Business risks

# Project Risks

- Risks that affect the **project schedule** or **resources**.
- An example of a project risk is the loss of an experienced designer.
- Finding a replacement designer with appropriate skills and experience may take a long time and, consequently, the software design will take longer to complete.

# Product Risks

- Risks that affect the **quality** or **performance** of the software being developed.
- An example of a product risk is the failure of a purchased component to perform as expected.
- This may affect the overall performance of the system so that it is slower than expected.

# Business Risks

- Risks that affect the **organization** developing or procuring the software.
- For example, a competitor introducing a new product is a business risk.
- The introduction of a competitive product may mean that the assumptions made about sales of existing software products may be unduly optimistic.



# Project Risks

- These risk types overlap.
- If an experienced programmer leaves a project this can be a project risk because, even if they are immediately replaced, the schedule will be affected.

# Project Risks

- It inevitably takes time for a new project member to understand the work that has been done, so they cannot be immediately productive.
- Consequently, the delivery of the system may be delayed.

# Project Risks

- The loss of a team member can also be a product risk because a replacement may not be as experienced and so could make programming errors. Finally, it can be a business risk because that programmer's experience may be crucial in winning new contracts.

# Risk Management

- Risk management focuses on identifying, analyzing, and developing strategies for responding to project risk efficiently and effectively.

# What is Risk Management?

- The systematic process of identifying, analyzing, and responding to project risk.

# Risk Management

- It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events.

# Risk Management

- It is important, however, to keep in mind that the goal of risk management is **not to avoid risks at all costs**, but to **make well-informed decisions** as to **what risks are worth taking** and to respond to those risks in an appropriate manner.

# Risk Management

- Project risk management also provides an **early warning system** for impending problems that need to be addressed or resolved.
- Although risk has a certain negative connotation, project stakeholders should be vigilant in identifying opportunities.



# Risk Management

- Although many associate uncertainty with threats, it is important to keep in mind that there is uncertainty when pursuing opportunities, as well.

# Risk Management

- It is unfortunate that many projects do not follow a formal risk management approach.
- Because of their failure to plan for the unexpected, many organizations find themselves in a state of **perpetual crisis** characterized by an **inability to make effective and timely decisions.**

# Risk Management

- Many people call this approach **crisis management** or **fire fighting** because the project stakeholders take a **reactive approach** or only address the project risks after they have become problems.

# Risk Management

- Risk analysis and management are intended to help a software team understand and manage uncertainty during the development process.

# Common mistakes to managing project Risk

- Not Understanding the Benefits of Risk Management.
- Not Providing Adequate Time for Risk Management.
- Not Identifying and Assessing Risk Using a Standardized Approach.

# Not Understanding the Benefits of Risk Management

- Often the project sponsor or client demands results.
- They may not care how the project team achieves its goal and objectives—just as long as it does!

# Not Understanding the Benefits of Risk Management

- The project manager and project team may rely on aggressive risk taking with little understanding of the impact of their decisions.

# Not Understanding the Benefits of Risk Management

- Conversely, project risks may also be optimistically ignored when, in reality, these risks may become real and significant threats to the success of the project.



# Not Understanding the Benefits of Risk Management

- Unfortunately, risks are often schedule delays, quality issues, and budget overruns just waiting to happen.
- Risks can result in sub-par productivity and higher than average project failure rates.

# Not providing adequate Time for Risk Management

- Risk management and the ensuing processes should not be viewed as an **add-on** to the project planning process, but should be **integrated throughout** the project life cycle.

# Not providing adequate Time for Risk Management

- The best time to assess and plan for project risk, in fact, is at the earliest stages of the project when uncertainty for a project is the highest.

# Not providing adequate Time for Risk Management

- Catastrophic problems or surprises may arise that require more resources to correct than would have been spent earlier avoiding them.

# Not providing adequate Time for Risk Management

- It is better to reduce the likelihood of a risk or be capable of responding to a particular risk as soon as possible in order to limit the risk's impact on the project's schedule and budget.

# Not Identifying and Assessing Risk using a Standardized Approach

- Not having a standardized approach to risk management can overlook both threats and opportunities.

# Not Identifying and Assessing Risks using a Standardized Approach

- Consequently, more time and resources will be expended on problems that could have been avoided; opportunities will be missed; decisions will be made without complete understanding or information; the overall likelihood of success is reduced; and catastrophic problems or surprises may occur without advanced warning.

# Not Identifying and Assessing Risk using a Standardized Approach

- Moreover, the project team may find itself in a perpetual crisis mode.
- Over time, crisis situations can have a detrimental effect on team morale and productivity.



# Effective and Successful Project Risk Management

- Effective and successful project risk management requires:
  - Commitment by all stakeholders.
  - Stakeholder Responsibility.
  - Different Risks for Different Types of Projects.

# Commitment by Stakeholders

- To be successful, project risk management requires a commitment by all project stakeholders.
- In particular, the project sponsor or client, senior management, the project manager, and the project team must all be committed.

# Commitment by stakeholders

- For many organizations, a new environment and commitment to following organizational and project processes may be required.
- For many managers, the first impulse may be to shortcut or sidestep many of these processes at the first sign that the project is in trouble.

# Commitment by Stakeholders

- A firm commitment to a risk management approach will not allow these impulses to override the project management and risk management processes that the organization has in place.

# Stakeholder Responsibility

- It is important that each risk have an owner.
- This owner is someone who will be involved in the project, who will take the responsibility to monitor the project in order to identify any new or increasing risks, and who will make regular reports to the project sponsor or client.

# Stakeholder Responsibility

- The position may also require the risk owner to ensure that adequate resources be available for managing and responding to a particular project risk.
- However, the project manager is responsible for ensuring that appropriate risk processes and plans are in place.

# Different Risks for Different Types of Projects

- Patterns of risk are different across different types of IT projects.
- The implication is that each project has its own unique risk considerations.
- To attempt to manage all projects and risks the same way may spell disaster.

# Risk Management Processes

- Risk Identification.
- Risk Assessment/Analysis.
- Risk Management Planning.
- Risk monitoring and Control.



# Risk Identification

- This entails identifying the various risks to the project.
- Both threats and opportunities must be identified.
- When identifying threats to a project, they must be identified clearly so that the true problem, not just a symptom, is addressed.

# Risk Identification

- Moreover, the causes and effects of each risk must be understood so that effective strategies and responses can be made.

# Risk Identification

- It is important to keep in mind that project risks are rarely isolated.
- Risks tend to be interrelated and affect the project and its stakeholders differently.

# Risks and Risk Types

| <b>Risk type</b> | <b>Possible risks</b>  |
|------------------|--|
| Technology       | The database used in the system cannot process as many transactions per second as expected.<br>Software components which should be reused contain defects which limit their functionality. |
| People           | It is impossible to recruit staff with the skills required.<br>Key staff are ill and unavailable at critical times.<br>Required training for staff is not available.                       |
| Organisational   | The organisation is restructured so that different management are responsible for the project.<br>Organisational financial problems force reductions in the project budget.                |
| Tools            | The code generated by CASE tools is inefficient.<br>CASE tools cannot be integrated.   |
| Requirements     | Changes to requirements which require major design rework are proposed.<br>Customers fail to understand the impact of requirements changes.  |
| Estimation       | The time required to develop the software is underestimated.<br>The rate of defect repair is underestimated.<br>The size of the software is underestimated.                                |

# Software Risks

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| <b>Risk</b>                 | <b>Affects</b>      | <b>Description</b>  |
|-----------------------------|---------------------|---|
| Staff turnover              | Project             | Experienced staff will leave the project before it is finished.                         |
| Management change           | Project             | There will be a change of organisational management with different priorities.          |
| Hardware unavailability     | Project             | Hardware that is essential for the project will not be delivered on schedule.           |
| Requirements change         | Project and product | There will be a larger number of changes to the requirements than anticipated.          |
| Specification delays        | Project and product | Specifications of essential interfaces are not available on schedule                    |
| Size underestimate          | Project and product | The size of the system has been underestimated.   |
| CASE tool under-performance | Product             | CASE tools which support the project do not perform as anticipated                      |
| Technology change           | Business            | The underlying technology on which the system is built is superseded by new technology. |
| Product competition         | Business            | A competitive product is marketed before the system is completed.                       |

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# Risk Assessment

- Risk assessment provides a basis for understanding how to deal with project risks.
- Assessing these risks helps the project manager and other stakeholders **prioritize** and **formulate** responses to those risks that provide the greatest threat or opportunity to the project.

# Risk Assessment

- Because there is a cost associated with responding to a particular risk, risk management must function within the constraints of the project's available resources.

# Risk Assessment

- Determine how to deal with the various project risks.
- In addition to resource constraints, an appropriate **strategy** will be determined by the project stakeholders' perceptions of risk and their willingness to take on a particular risk.



# Risk Assessment

- Essentially, a project risk strategy will focus on one of the following approaches:
  - Accept or ignore the risk.
  - Avoid the risk completely.
  - Reduce the likelihood or impact of the risk (or both) if the risk occurs.
  - Transfer the risk to someone else (i.e., insurance).

# Risk Assessment

- In addition, triggers or flags in the form of metrics should be identified to draw attention to a particular risk when it occurs.

# Risk Assessment

- This system requires that each risk have an owner to monitor the risk and to ensure that resources are made available in order to respond to the risk appropriately.

# Risk Assessment

- Once the risks, the risk triggers, and strategies or responses are documented, this document then becomes the risk response plan.

# Risk Assessment/Analysis

- Once the project risks have been identified and their causes and effects understood, the next step requires that we analyze these risks.
- Answers to two basic questions are required:
  - What is the likelihood of a particular risk occurring?
  - what is the impact on the project if it does occur?

# Risk Assessment or Analysis

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| <b>Risk</b>  | <b>Probability</b> | <b>Effects</b> |
|--|--------------------|----------------|
| Organisational financial problems force reductions in the project budget.                      | Low                | Catastrophic   |
| It is impossible to recruit staff with the skills required for the project.                    | High               | Catastrophic   |
| Key staff are ill at critical times in the project.  | Moderate           | Serious        |
| Software components that should be reused contain defects which limit their functionality.     | Moderate           | Serious        |
| Changes to requirements that require major design rework are proposed.                         | Moderate           | Serious        |
| The organisation is restructured so that different management are responsible for the project. | High               | Serious        |

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# Risk Planning

- The risk planning process considers each of the key risks that have been identified, and develops strategies to manage these risks.
- For each of the risks, you have to think of actions that you might take to minimize the disruption to the project if the problem identified in the risk occurs.

# Risk Planning

- You also should think about information that you might need to collect while monitoring the project so that problems can be anticipated.



# Risk Planning

- Risk planning begins with having a firm commitment to the entire risk management approach from all project stakeholders.
- This commitment ensures that **adequate resources** will be in place to properly plan for and manage the various risks of the IT project.

# Risk Planning

- These resources may include:
  - Time.
  - People, and
  - Technology.

# Risk Planning

- Stakeholders also must be committed to the process of identifying, analyzing, and responding to threats and opportunities.

# Risk Planning

- Too often plans are disregarded at the first sign of trouble, and instinctive reactions to situations can lead to perpetual crisis management.
- In addition to commitment, risk planning also focuses on **preparation**.

# Risk Planning

- It is important that resources, processes, and tools be in place to adequately plan the activities for project risk management.
- Systematic preparation and planning can help minimize adverse effects on the project while taking advantage of opportunities as they arise.

# Categories of Risk Strategies

- Avoidance strategies
- Minimization strategies.
- Contingency plans

# Avoidance Strategies

- Following these strategies means that the probability that the risk will arise will be reduced.
- An example of a risk avoidance strategy is the strategy for dealing with defective components.

# Minimization Strategies

- Following these strategies means that the impact of the risk will be reduced.
- An example of a risk minimization strategy is the strategy for staff illness.



# Contingency Plans

- *Following these strategies means that you are prepared for the worst and have a strategy in place to deal with it.*
- An example of a contingency strategy is the strategy for organizational financial problems.

# Risk Management Strategies

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| <b>Risk</b>                       | <b>Strategy</b>   |
|-----------------------------------|---|
| Organisational financial problems | Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business. |
| Recruitment problems              | Alert customer of potential difficulties and the possibility of delays, investigate buying-in components.                                       |
| Staff illness                     | Reorganise team so that there is more overlap of work and people therefore understand each other's jobs.  |
| Defective components              | Replace potentially defective components with bought-in components of known reliability.  |

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# Risk Management Strategies

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| <b>Risk</b>                     | <b>Strategy</b>   |
|---------------------------------|---|
| Requirements changes            | Derive traceability information to assess requirements change impact, maximise information hiding in the design.                                |
| Organisational restructuring    | Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business. |
| Database performance            | Investigate the possibility of buying a higher-performance database.  |
| Underestimated development time | Investigate buying in components, investigate use of a program generator  |

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# Risk Monitoring

- Risk monitoring is the process of checking that your assumptions about the product, process, and business risks have not changed.

# Risk Monitoring and Control

- Once the salient project risks have been identified and appropriate responses formulated, the next step entails scanning the project environment so that both identified and unidentified threats and opportunities can be followed.

# Risk Monitoring and Control

- Risk owners should monitor the various risk triggers so that well-informed decisions and appropriate actions can take place.

# Risk Monitoring and Control

- Risk monitoring and control provide a mechanism for scanning the project environment for risks, but the risk owner must commit resources and take action once a risk threat or opportunity is made known.
- This action normally follows the planned risk strategy.

# Risk Monitoring and Control

- Responses to risks and the experience gained provide keys to learning.
- A formal and documented evaluation of a risk episode provides the basis for lessons learned and lays the foundation for identifying best practices.



# Risk Monitoring and Control

- This evaluation should consider the entire risk management process from planning through evaluation.

# The End