Project Management

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with some slides adapted from Software Engineering by Ian Sommerville

Outline

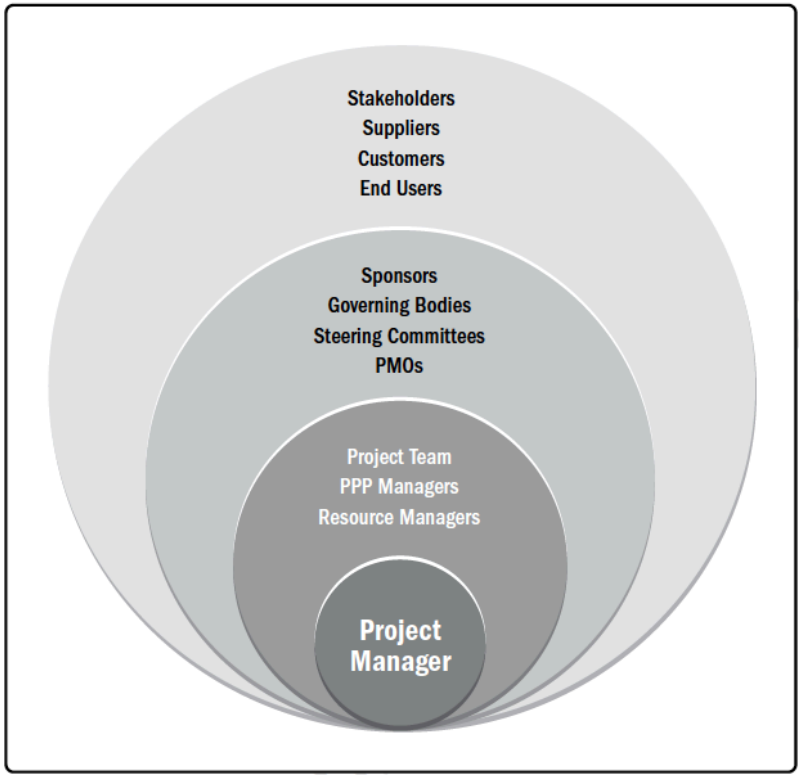
- **Overview of software project management**
- Project planning
- Project scheduling
- Risk management

Software Project Management

- Goal of project management is to ensure software is developed and delivered
  - on time
  - within budget
  - in accordance with the requirements
  - high quality
  - satisfied customers
- Project management is crucial to the success of software projects
- Responsibility: project manager, program manager, team lead, test manager, …

Project manager

- PM is a person to lead the project team to achieve project objectives
- One single important person for the project
- PM plays numerious roles of PM



Source: PMBOK

PM Skills Requirements

- Technical project management
  - Knowledge and skills in domain, program management
- Leadership
  - Knowledge and skills to build, motivate, guide, coach teams; lead people
- Strategic and business management
  - Knowledge, skills and expertise for delivering business outcomes
  - Defining strategies, goals, objectives, products, services,...

Common Management Activities

- Proposal writing and presentations
- Project estimating and costing
- Project planning and scheduling
- Team building
- Project monitoring, controlling, and reviews
- Customer relations, user relations
- Reporting and presentations

Managing Software Projects

- Most of management activities are common to other projects

- But, software projects have some differences
  - Software is intangible
  - Software is flexible
  - Software processes are flexible
  - Software project depends on human factors

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Project Planning

- Defining goals, what, who, when (and how) to do
- Planning is an continuous activity
  - Started early in project, lasted until the end of project
  - Plans are revised to reflect reality
- Activities and artifacts created dependent on processes followed
  - Agile projects require less planning than traditional projects

Project Planning (cont'd)

- Many different plans
  - Software development plan (SDP)
    - Budget and schedule
    - Staffing plan
    - Training plan
    - Risk management plan
    - Schedule
    - Monitoring and controlling
  - Testing plan
  - Deployment plan
  - Configuration management plan
  - Quality management plan
  - Software acceptance plan
  - …

Project Planning (cont'd)

- Main activities to form SDP
  - Estimate overall project effort, cost, and staff
  - Plan phases, iterations
  - Define and customize processes to use
  - Assign roles and responsibilities to staff
  - Plan training needs
  - Identify and assess risks

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Project Scheduling

- Goal: assigning right people to right tasks at right time
- Activities
  - Breakdown tasks, estimate time, resources for each task
  - Organize tasks concurrently to make optimal use of workforce
  - Minimize task dependencies, slack time, and waiting time
  - Balance workload
- Scheduling is a challenging activity
  - Requiring much intuition and experience of project managers

Challenges in Project Scheduling

- Estimating each task is difficult
  - Productivity is not proportional to the number of people working on a task
  - Dependencies
  - Resource constraints
- Adding people to a late project makes it later
  - communication overheads
  - extra training
- Unexpected things always happen
  - allow contingency in planning

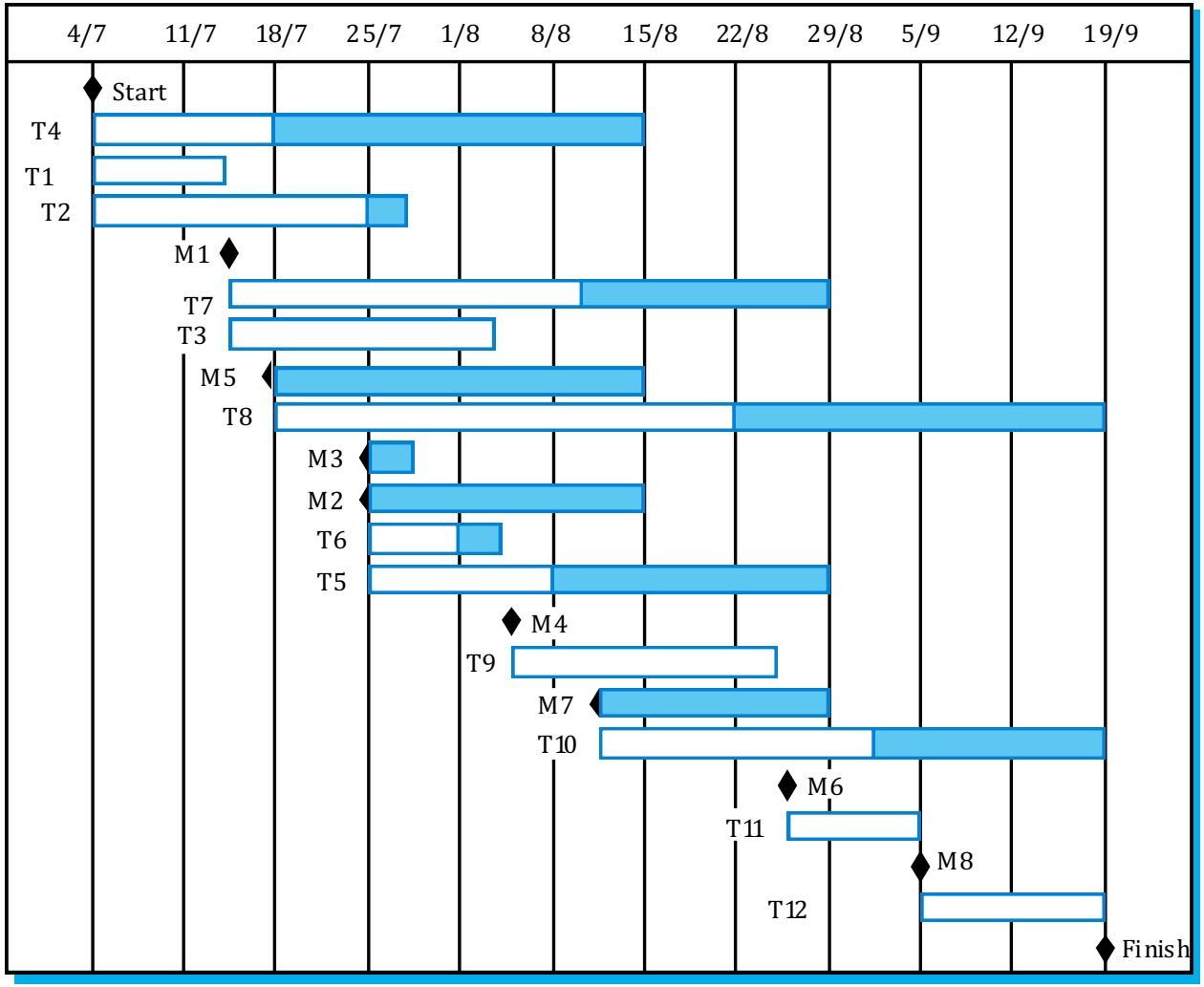
Task Organization

- Organize tasks to produce tangible outputs

- *Milestones* are the end-point of a period
- *Deliverables* are results delivered to customers or users

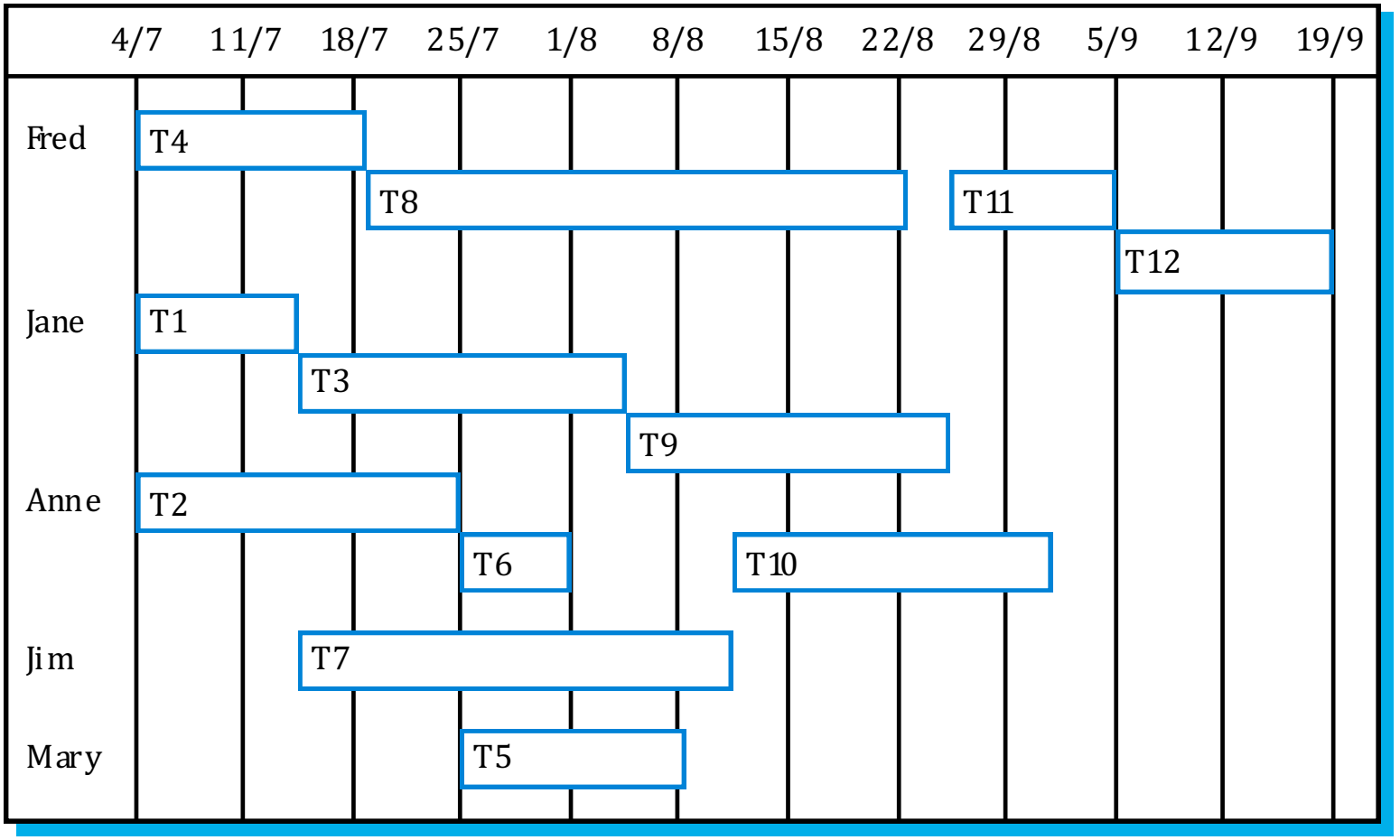
- Each milestone is often marked by a set of deliverables
  - Build 1, Build 2, ...
  - Alpha release, beta release, GA release

Activity Timeline



(Sommerville 2011)

Staff Allocation



(Sommerville 2011)

Planning Poker – Exercise 1

- Estimate features in ideal hour for agile projects
- Estimators have cards with values 0, 1, 2, 3, 5, 8, ... (Fibonacci numbers)
- Estimators choose one feature as a standard and determine the size (ideal hour) for this feature
- Estimators discuss each feature
- Estimators privately choose appropriate card from deck
- If having consensus, use the estimate for the feature.
  - Otherwise, estimators discuss their estimates
  - Repeat until having consensus

Process

- 1. Everyone gathers in a meeting
- 2. Choose one feature as a standard feature
- 3. Decide the size for this feature (using like 5 ideal hours)
- 4. At each time, everyone discusses and estimates the size for one feature in comparision with the standard feature
  - 4.1 When estimating, choose a number from Fibonacci
  - 4.2 If everyone has the simimar estimate, move to the next feature, go to Step 4.
  - 4.3 Otherwise, discuss and estimate again

Planning Poker – Exercise 1 (cont'd)

- Estimating a mobile app for taking notes
  - Register an account
  - Create a note
  - Update a note
  - Delete a note
  - Send a note via SMS
  - Send a note via an account
  - Synch notes with other devices

- Suppose that the following chosen feature has 5 ideal hours
  - Create a note

Exercise 2

- Suppose that your project develops an e-commerce system
- Your team has 5 people and works in 6 months

- Work in team of 5 people to detail your project plan as far as possible
  - Process to be used?
  - Phases and iterations?
  - Roles and responsibilities?
- Report the result

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- **Risk management**

Risk Management

- Goal: minimize effects of risks on project
- A risk is a probability that some adverse circumstance will occur
  - E.g., people may leave team
- Effects
  - schedule or resources
  - quality or performance of software
  - cost
  - etc.

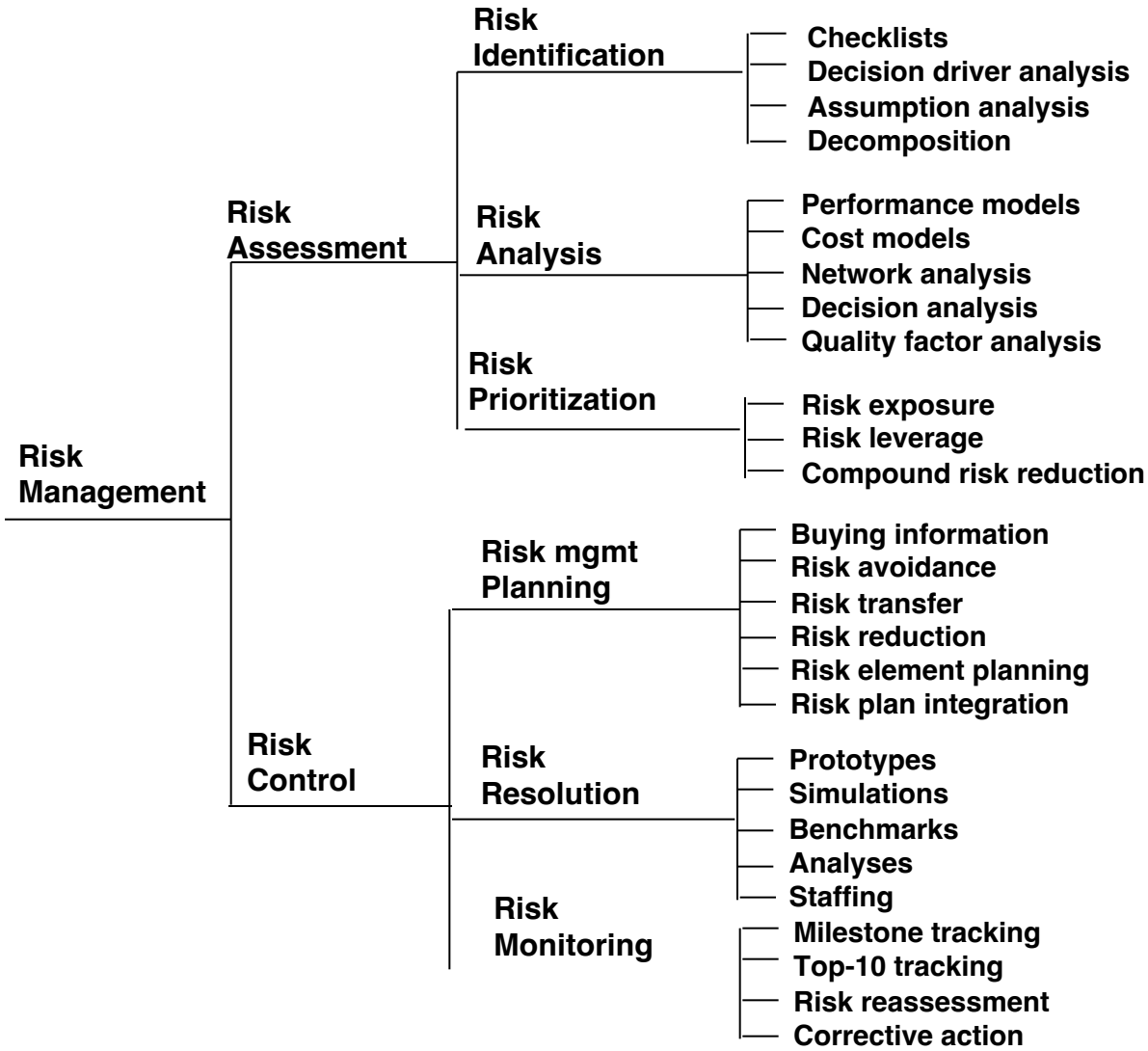
Software Risks

Risk	Affects	Description
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.

Risk Management Activities

- Risk Assessment
  - Risk identification
  - Risk analysis
  - Risk prioritization
- Risk Control
  - Risk management planning
  - Risk resolution
  - Risk monitoring

Software Risk Management



Risk Identification

- Technology risks
- People risks
- Organisational risks
- Requirements risks
- Estimation risks

Risks and Risk Types

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

Risk Analysis and Prioritization

- Assess probability and seriousness of each risk
  - Probability
  - Loss
- Risk exposure (RE) = Probability x Loss
- Probability can be
  - Categorical: very low, low, moderate, high or very high
  - Numerical: from 0% to 100%
- Loss can be
  - Categorical: catastrophic, serious, tolerable or insignificant
  - Numerical: any number representing cost

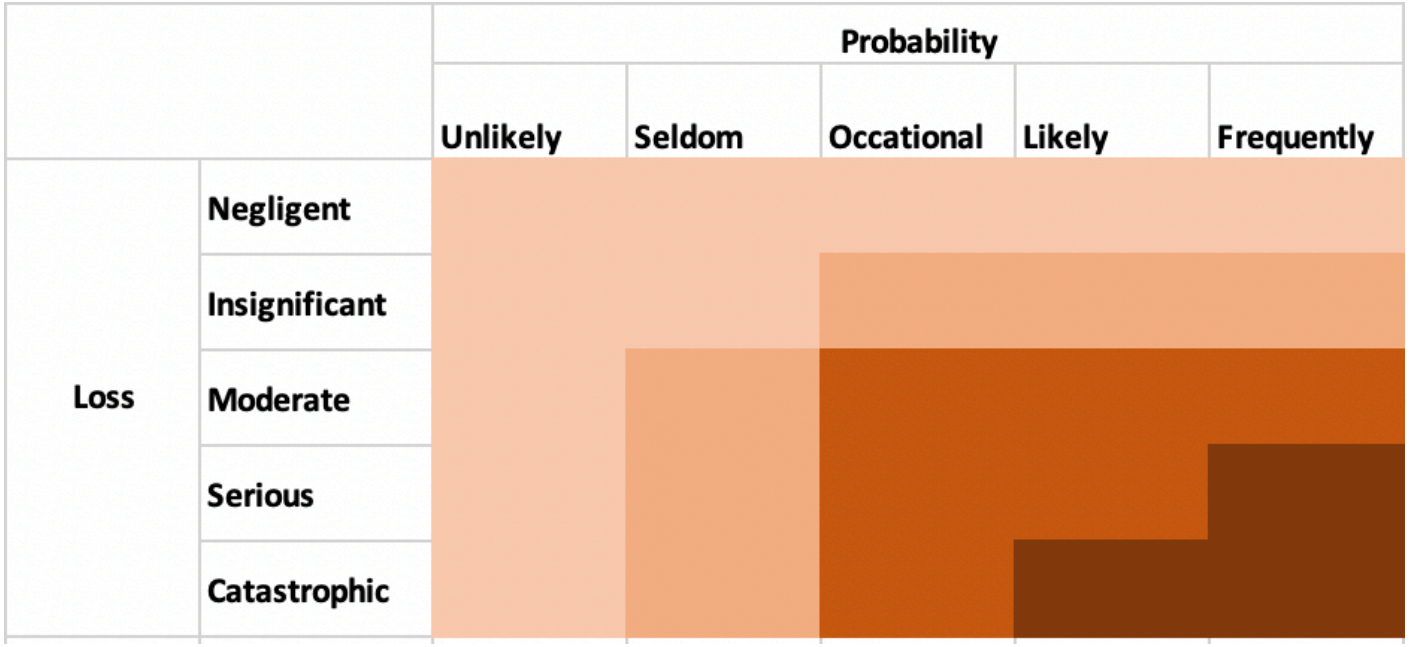
Risk Analysis and Prioritization (cont'd)

Categories to Numerical Values

Probability	Numerical Value
Unlikely	10
Seldom	25
Occational	50
Likely	75
Frequently	90

Loss	Numerical Value
Negligent	10
Insignificant	25
Moderate	50
Serious	75
Catastrophic	90

Risk Analysis and Prioritization (cont'd)



Risk Analysis and Prioritization (cont'd)

Using categorical values

Risk	Probability	Loss	Risk Exposure
Organisational financial problems force reductions in the project budget.	Seldom	Catastrophic	2,250
It is impossible to recruit staff with the skills required for the project.	Likely	Catastrophic	**6,750**
Key staff are ill at critical times in the project.	Occational	Serious	3,750
Software components that should be reused contain defects which limit their functionality.	Occational	Serious	3,750
Changes to requirements that require major design rework are proposed.	Occational	Serious	3,750
The organisation is restructured so that different management are responsible for the project.	Likely	Serious	**5,625**

Risk Analysis and Prioritization (cont'd)

- Risks are prioritized using Risk exposure (RE)
  - Higher prioritized risk has higher RE

Rank	Risk	Prob (%)	Loss (PM)	RE
1	Underestimate staff	20	2	40
2	Experienced staff leaves	15	2	30
3	Unable to recruit experienced staff on time	10	2	20
4	Customers are not supportive	5	3	15
5				

Risk Planning

- Provide mitigation strategies to manage each risk
- Avoidance strategies
- Minimization strategies
- Contingency plans
  - If risks arise, contingency plans are followed
- Risk transfer
- Buying information

Risk Management Strategies

Risk	Strategy
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.

Risk Management Strategies (cont'd)

Risk	Strategy
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

Risk Indicators

Risk type	Potential indicators
Technology	Late delivery of hardware or support software, many reported technology problems
People	Poor staff morale, poor relationships amongst team member, job availability
Organisational	Organisational gossip, lack of action by senior management
Requirements	Many requirements change requests, customer complaints
Estimation	Failure to meet agreed schedule, failure to clear reported defects

Risk Monitoring and Controlling

- Assess each identified risks regularly
  - Some risks may become less, some more probable
  - Maintain a list of top-10 risks
  - Review and revise risks regularly
- High prioritized risks should be
  - reviewed and discussed at management progress meetings
  - reported weekly
- Taking appropriate actions when problems occur

Key points

- Project management is crucial to project success
- Managers' important activities
  - team building
  - planning, estimating and scheduling
  - monitoring and controlling
- Project management is an iterative process from the start to the end of project