Software Project Management

Book Referred : Ian Sommerville 8th Edition Chapter 5

Topics Covered

- Management activities
- Project planning
- Project scheduling
- Risk management

Objectives

- To introduce software project management and to describe its distinctive characteristics
- To discuss project planning and the planning process
- To show how graphical schedule representations are used by project management
- To discuss the notion of risks and the risk management process

Software Project Management

- Concerned with activities involved in ensuring that software is delivered on time and on schedule and in accordance with the requirements of the organisations developing and procuring the software.

- Project management is needed because software development is always subject to budget and schedule constraints that are set by the organisation developing the software.

Software Management Distinctions

- The product is intangible
- The product is uniquely flexible
- Software engineering is not recognized as an engineering discipline with the same status as mechanical, electrical engineering, etc.
- Many software projects are 'one-off' projects

Management Activities

- Proposal writing
  - Objectives and how it will be carried out and justifies why project contract should be awarded to particular organization.
- Project planning and scheduling
  - Identifying the activities, milestones and deliverables produced by project.
- Project costing
  - Cost estimation related to resources required to accomplish the project plan.
- Project monitoring and reviews
  - Progress of project and compare actual and planned progress and costs., discussions.
- Personnel selection and evaluation
- Report writing and presentations

Project Staffing

- May not be possible to appoint the ideal people to work on a project
- Project budget may not allow for the use of highly-paid staff
    - Staff with the appropriate experience may not be available
    - An organisation may wish to develop employee skills on a software project
- Managers have to work within these constraints especially when there is an international shortage of skilled IT staff

Project Planning

Plan	Description
Quality Plan	Describes the quality procedures and standards that will be used in a project.
Validation Plan	Describes the approach, resources and schedule used for system validation
Configuration Management Plan	Describes the configuration management procedures and structures to be used
Maintenance Plan	Predicts the maintenance requirements of the system, maintenance costs and effort required
Staff Development Plan	Describes how the skills and experience of the project team members will be developed

Project Planning Process

Establish the project constraints
Make initial assessments of the project parameters
Define project milestones and deliverables
while project has not been completed or cancelled **loop**
       Draw up project schedule
       Initiate activities according to schedule
       Wait (for a while)
       Review project progress
       Revise estimates of project parameters
       Update the project schedule
       Re-negotiate project constraints and deliverables
       if (problems arise) **then**
              Initiate technical review and possible revision
   **end if**
end loop

Project Plan Structure

- Introduction
- Project organisation
- Risk analysis
- Hardware and software resource requirements
- Work breakdown
- Project schedule
- Monitoring and reporting mechanisms

Activity Organization

- Activities in a project should be organised to produce tangible outputs for management to judge progress
- *Milestones* are the end-point of a process activity
- *Deliverables* are project results delivered to customers
- Milestones are internal project results that are used by the project manager to check progress but are not delivered to the customer, whereas deliverables are project results that are delivered to customer.
- Deliverables are usually milestones, but milestones need not be deliverables.

Milestones
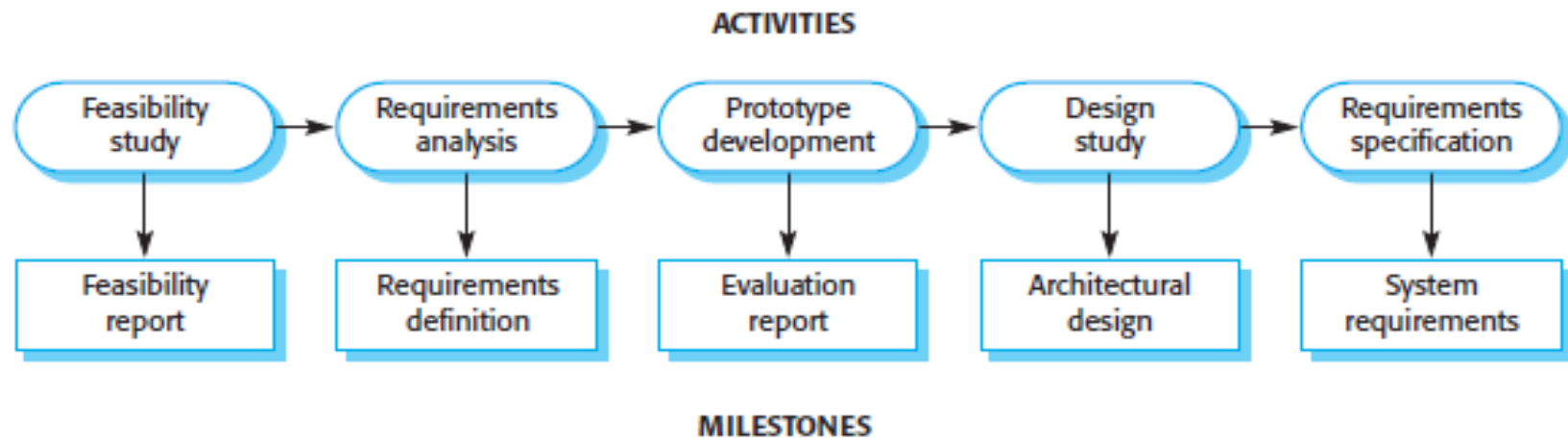
Project Scheduling

- Split project into tasks and estimate time and resources required to complete each task

- Organize tasks concurrently to make optimal use of workforce

- Minimize task dependencies to avoid delays caused by one task waiting for another to complete

- Dependent on project managers intuition and experience
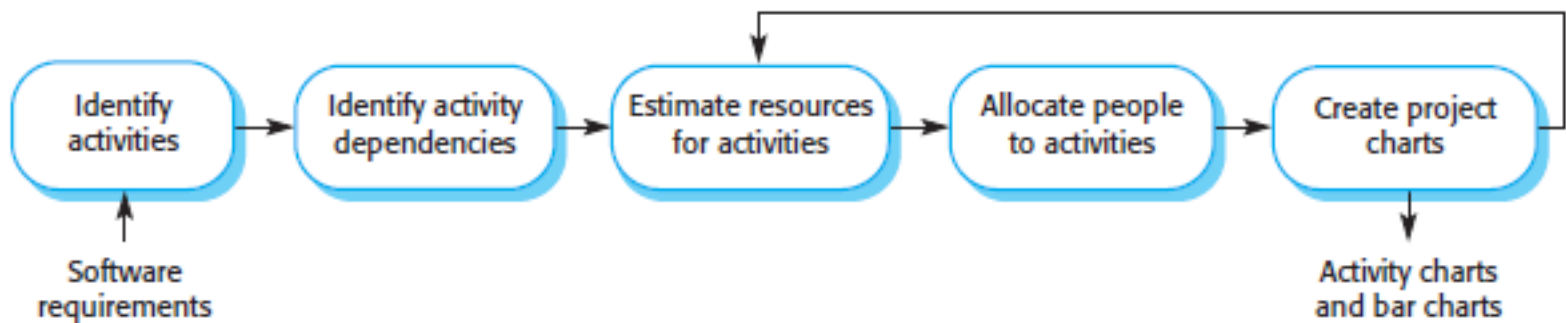
Scheduling Problems

- Estimating the difficulty of problems and hence the cost of developing a solution is hard
- Productivity is not proportional to the number of people working on a task
- Adding people to a late project makes it later because of communication overheads
- The unexpected always happens. Always allow contingency in planning

Bar Charts and Activity Networks

- Graphical notations used to illustrate the project schedule
- Show project breakdown into tasks. Tasks should not be too small. They should take about a week or two
- Activity charts show task dependencies and the critical path
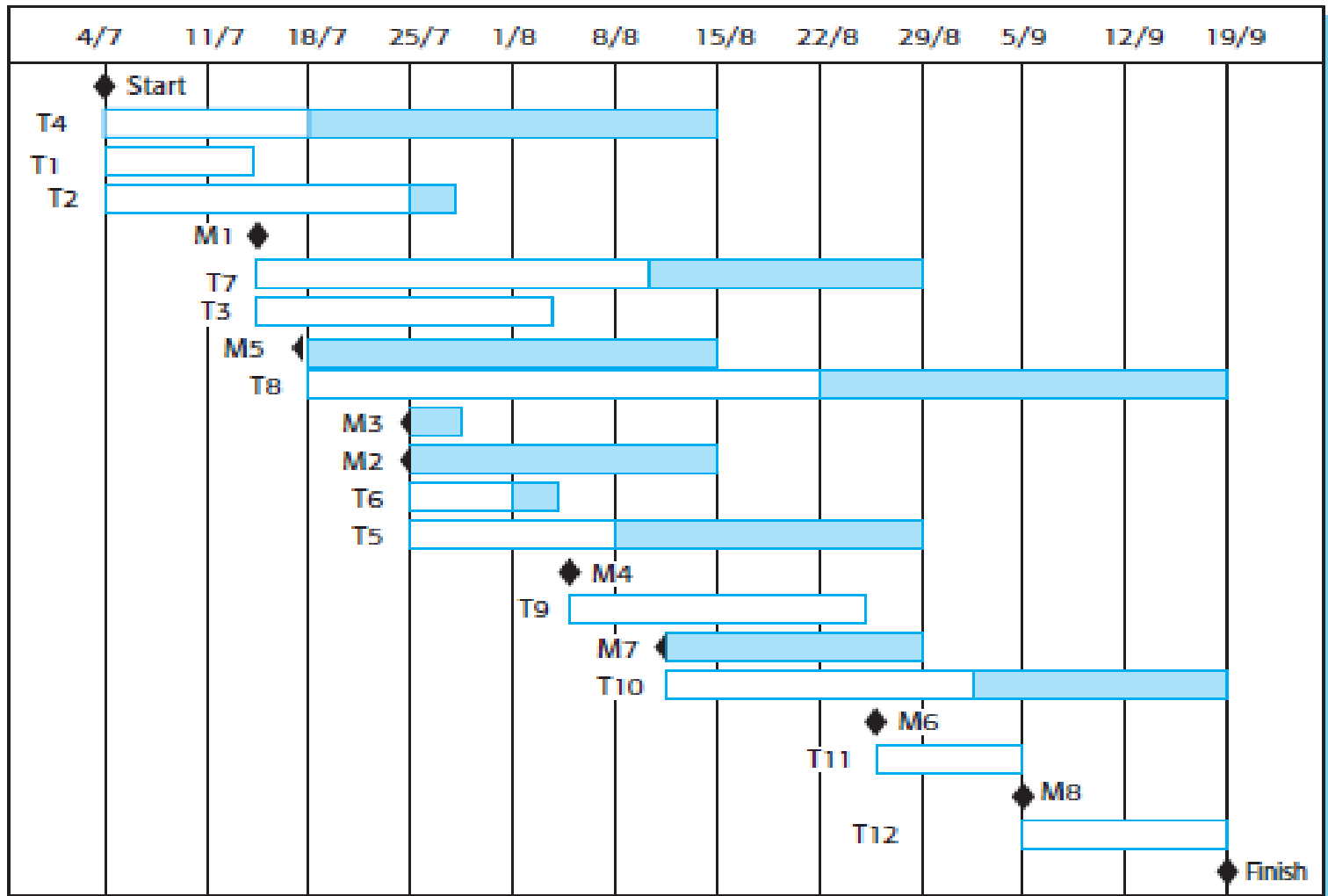- Bar charts show schedule against calendar time

Task Duration and Dependencies

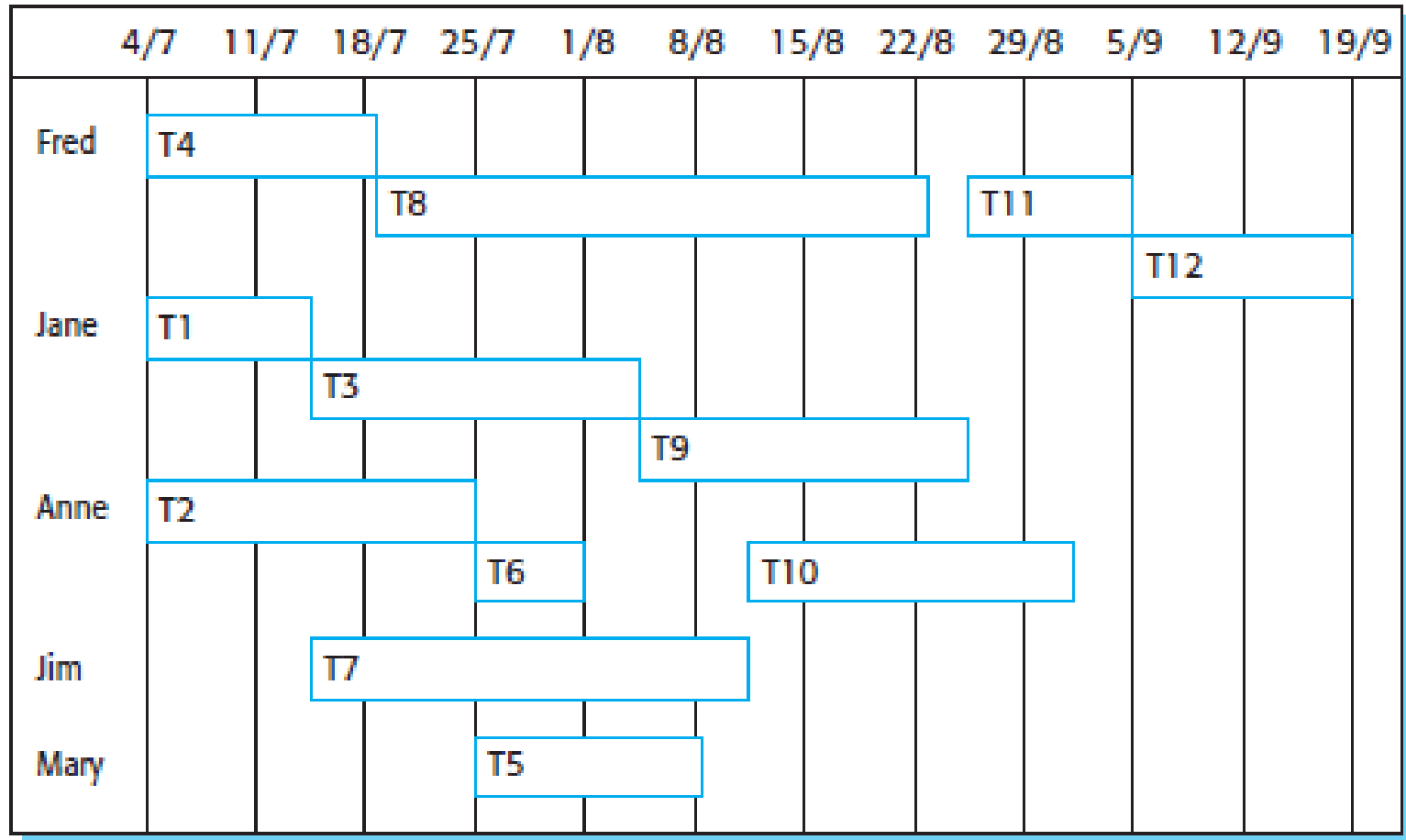| Task	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1 (M1)
T4	10	
T5	10	T2, T4 (M2)
T6	5	T1, T2 (M3)
T7	20	T1 (M1)
T8	25	T4 (M5)
T9	15	T3, T6 (M4)
T10	15	T5, T7 (M7)
T11	7	T9 (M6)
T12	10	T11 (M8)

Activity Network
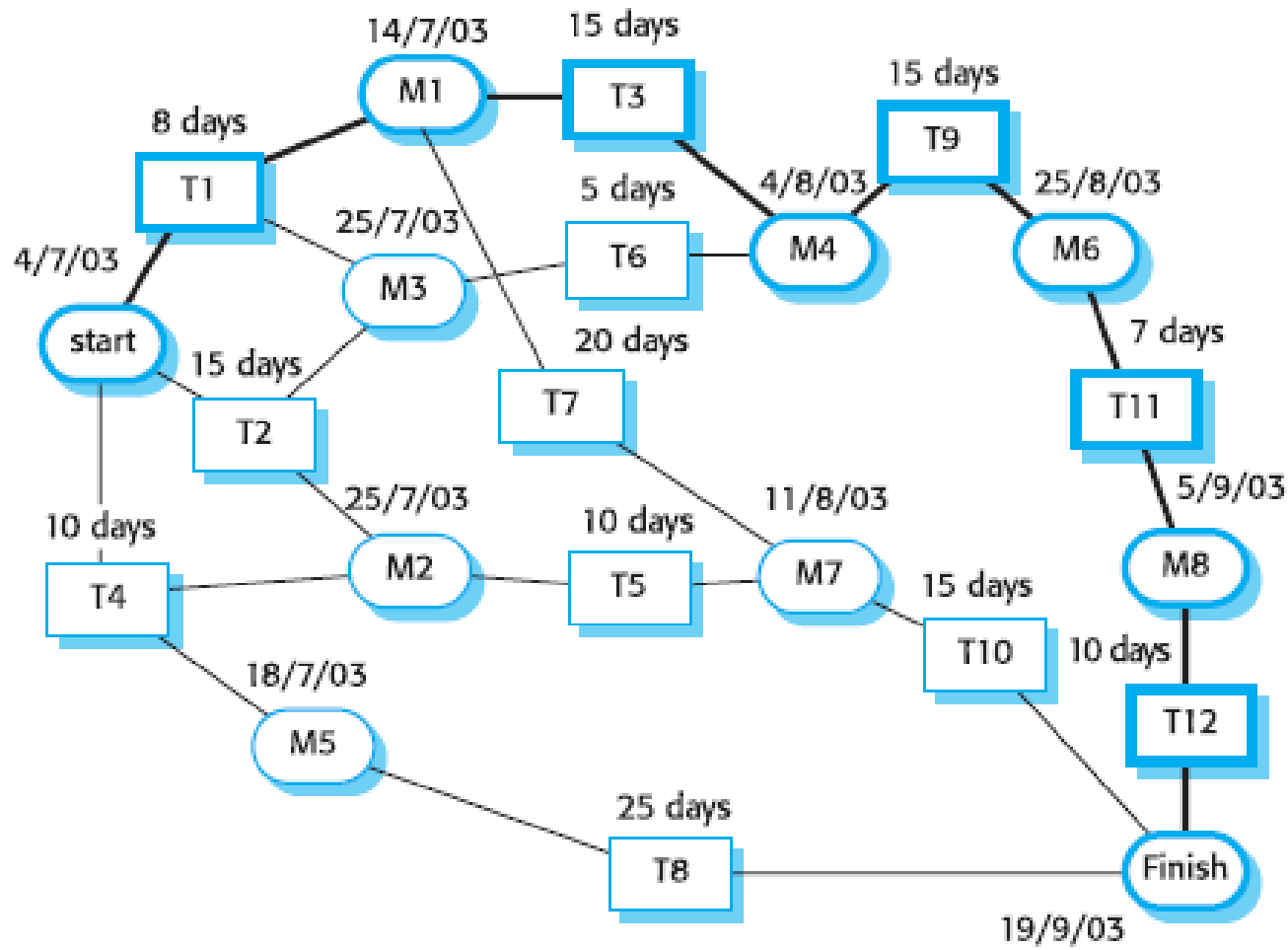
# Activity Bar Chart

Staff Allocation

Risk Management

- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.
- A risk is a probability that some adverse circumstance will occur.
  - Project risks affect schedule or resources. E.g. loss of experienced designer
  - Product risks affect the quality or performance of the software being developed. E.g. failure of a purchased component to perform as expected
  - Business risks affect the organisation developing or procuring the software. E.g. competitor introducing a new product

Software Project Risks

Risk	Risk type	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 which 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 Process

- Risk identification
  - Identify project, product and business risks
- Risk analysis
  - Assess the likelihood and consequences of these risks
- Risk planning
  - Draw up plans to avoid or minimise the effects of the risk
- Risk monitoring
  - Monitor the risks throughout the project
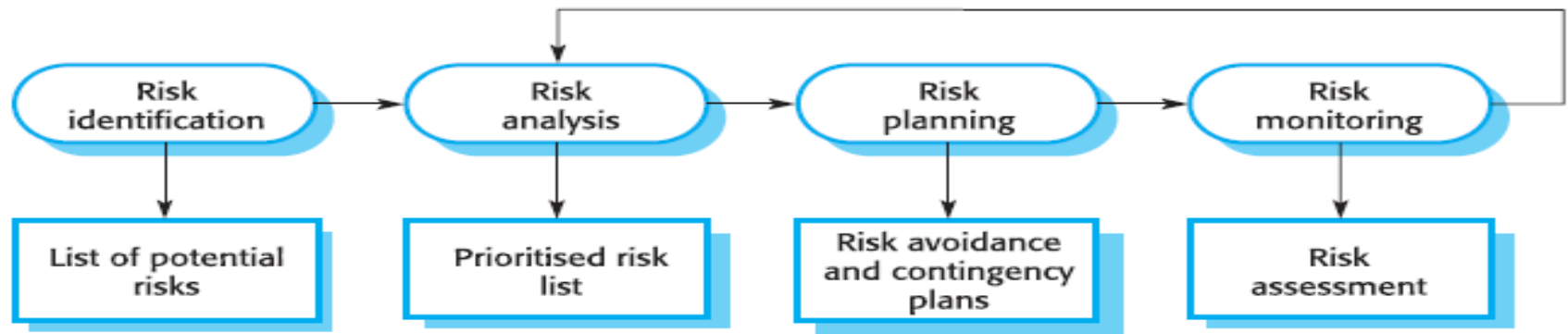
Risk Identification

- *1. Technology risks:* Risks that derive from the software or hardware technologies that are used to develop the system.
- 2. *People risks:* Risks that are associated with the people in the development team.
- 3. *Organisational risks:* Risks that derive from the organisational environment where the software is being developed.
- 4. *Tools risks:* Risks that derive from the CASE tools and other support software used to develop the system.
- 5. *Requirements risks:* Risks that derive from changes to the customer requirements and the process of managing the requirements change.
- 6. *Estimation risks:* Risks that derive from the management estimates of the system characteristics and the resources required to build the system.

Risks and Risk Type

Risk type	Possible risks
Technology	The database used in the system cannot process as many transactions per second as expected. Software components which should be reused contain defects which 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.
Tools	The code generated by CASE tools is inefficient. CASE tools cannot be integrated.
Requirements	Changes to requirements which 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 rate of defect repair is underestimated. The size of the software is underestimated.

Risk Factors

Risk type	Potential indicators
Technology	Late delivery of hardware or support software, many reported technology problems
People	Poor staff morale, poor relationships amongst team members, job availability
Organisational	Organisational gossip, lack of action by senior management
Tools	Reluctance by team members to use tools, complaints about CASE tools, demands for higher-powered workstations
Requirements	Many requirements change requests, customer complaints
Estimation	Failure to meet agreed schedule, failure to clear reported defects

Risk Analysis

- Assess probability and seriousness of each risk
- Probability may be very low, low, moderate, high or very high
- Risk effects might be catastrophic, serious, tolerable or insignificant

Risk Analysis

Risk	Probability	Effects
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 which should be reused contain defects which limit their functionality.	Moderate	Serious
Changes to requirements which require major design rework are proposed.	Moderate	Serious
The organisation is restructured so that different management are responsible for the project.	High	Serious
The database used in the system cannot process as many transactions per second as expected.	Moderate	Serious
The time required to develop the software is underestimated.	High	Serious
CASE tools cannot be integrated.	High	Tolerable
Customers fail to understand the impact of requirements changes.	Moderate	Tolerable
Required training for staff is not available.	Moderate	Tolerable
The rate of defect repair is underestimated.	Moderate	Tolerable
The size of the software is underestimated.	High	Tolerable
The code generated by CASE tools is inefficient.	Moderate	Insignificant

Risk Planning

- Consider each risk and develop a strategy to manage that risk
- Avoidance strategies
  - The probability that the risk will arise is reduced. E.g. Replacing defective components
- Minimisation strategies
  - The impact of the risk on the project or product will be reduced. E.g. Reorganize staff
- Contingency plans
  - If the risk arises, contingency plans are plans to deal with that risk. E.g. Organizational financial problems

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.
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 the use of a program generator.

Risk Monitoring

- Assess each identified risks regularly to decide whether or not it is becoming less or more probable
- Also assess whether the effects of the risk have changed
- Each key risk should be discussed at management progress meetings

Thank You!!!

Any Questions???