

Software Project Management



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.

Management activities

- Proposal writing.
- Project planning and scheduling.
- Project costing.
- Project monitoring and reviews.
- Personnel selection and evaluation.
- Report writing and presentations.

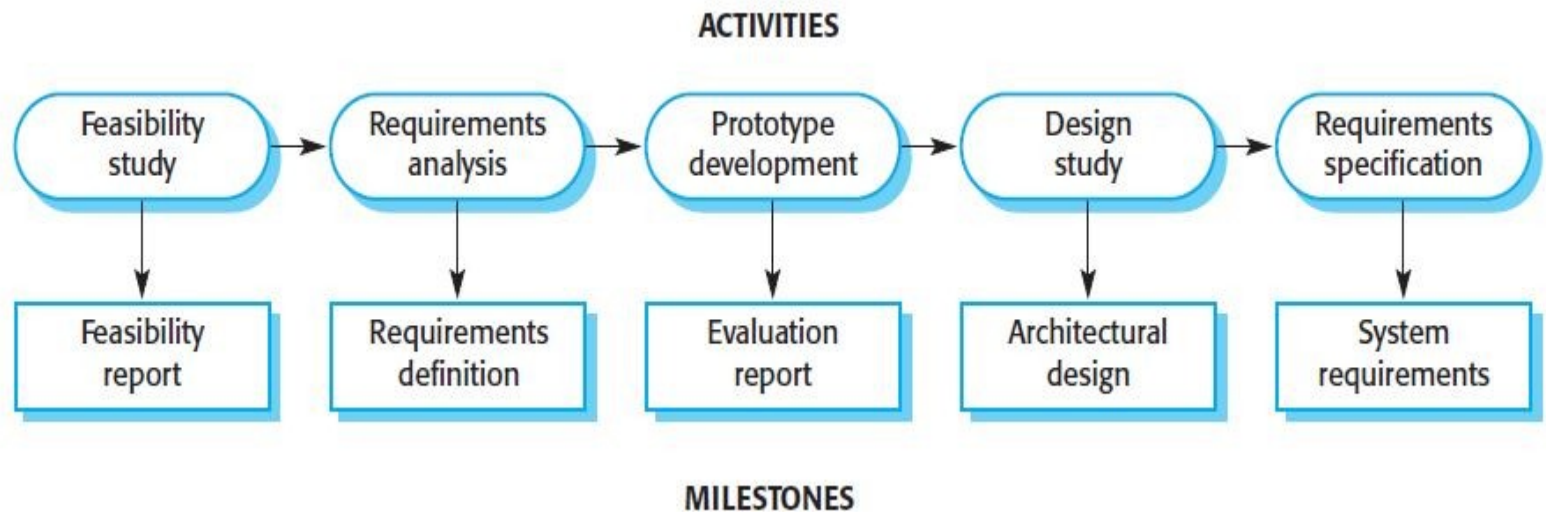
Project planning

- Probably the most time-consuming project management activity.
- Continuous activity from initial concept through to system delivery. Plans must be regularly revised as new information becomes available.
- Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget.

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.
- The waterfall process allows for the straightforward definition of progress milestones.

Milestones in the requirement process



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.

Activity networks

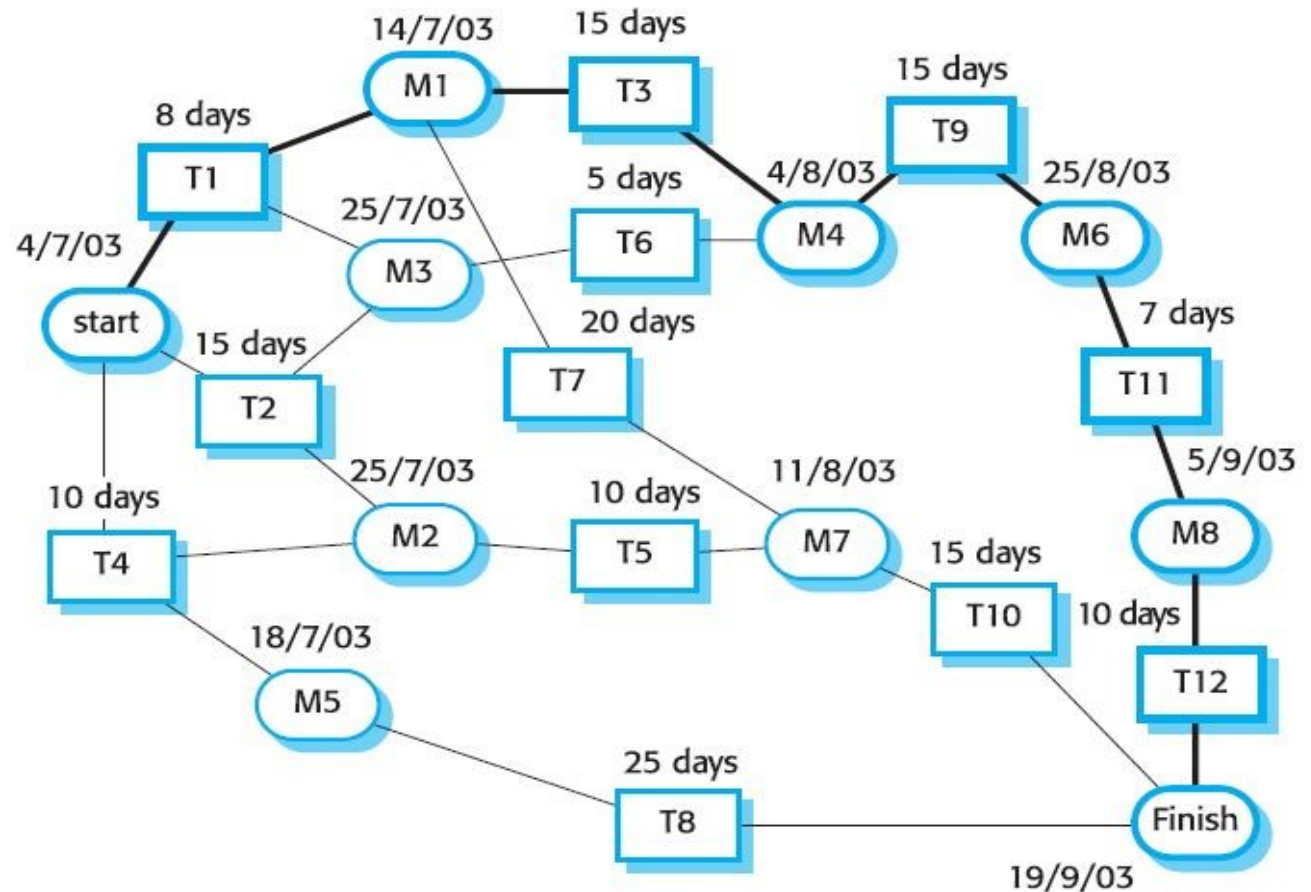
- Graphical notations used to illustrate the project schedule.
- Show project breakdown into tasks. Tasks should not be too small. They should take about a week or two.
- Activity charts show task dependencies and the critical path.

Task durations and dependencies

Activity	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)

An activity network

Figure 5.6 An activity network



Activity network

- Given the dependencies and estimated duration of activities, an activity chart that shows activity sequences may be generated.
- This shows which activities can be carried out in parallel and which must be executed in sequence because of a dependency on an earlier activity.
- Activities are represented as rectangles; milestones and project deliverables are shown with rounded corners. Dates in this diagram show the start date of the activity.
- All activities must end in milestones. An activity may start when its preceding milestone has been reached.
- Before progress can be made from one milestone to another, all paths leading to it must be complete. For example, when activities T3 and T6 are finished, then activity T9 can start.

Activity network

- **The minimum time required to finish the project can be estimated by considering the longest path in the activity graph (the critical path).** In figure, it is 11 weeks of elapsed time or 55 working days.
- The critical path is the **sequence of dependent activities** that **defines the time** required to **complete the project**.
- The overall schedule of the project depends on the critical path.
- Any slippage in the completion in any critical activity causes project delays because the following activities cannot start until the delayed activity has been completed.
- Delays in activities that do not lie on the critical path do not necessarily cause an overall schedule slippage. For example, if T8 is delayed by two weeks, it will not affect the final completion date of the project because it does not lie on the critical path.

Risk management

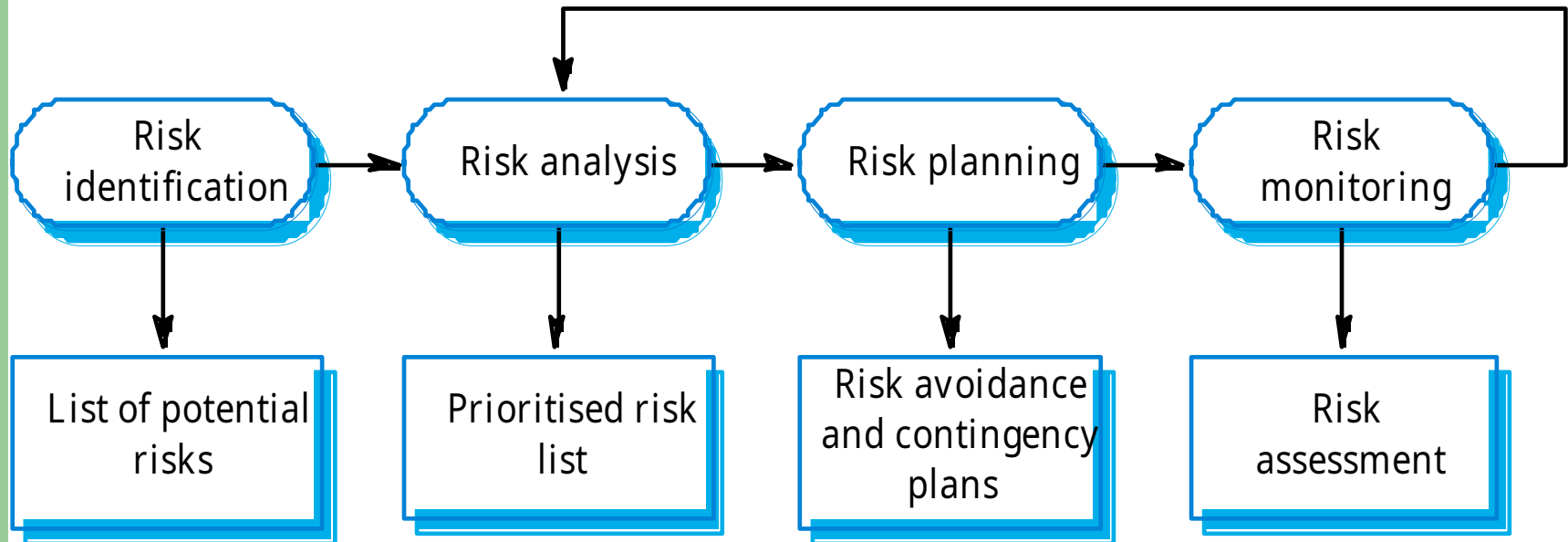
- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.
- There are three related categories of risk:
- - **Project risks** affect schedule or resources; An example might be the loss of an experienced designer.
 - **Product risks (quality risks)** affect the quality or performance of the software being developed; failure of a purchased component to perform as expected.
 - **Business risks** affect the organisation developing or procuring the software. a competitor introducing a new product is a business risk.

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.

The Risk Management process Stages

- 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
 - The risk is constantly assessed and plans for risk mitigation
 - are revised as more information about the risk becomes available.

The Risk Management Process



Risk identification

- Risk identification is the first stage of risk management which is concerned with discovering possible risks to the project.
- Risk identification may be carried out as a team process using a brainstorming approach or may simply be based on experience.

Risk identification

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

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

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	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

Risk planning

- Consider each risk and develop a strategy to manage that risk.
- These strategies fall into three categories:
- **Avoidance strategies**
 - The probability that the risk will arise is reduced;
 - An example is the strategy for dealing with defective components
- **Minimisation strategies**
 - The impact of the risk on the project or product will be reduced;
 - An example of a risk minimization strategy is that for staff illness.
- **Contingency plans**
 - If the risk arises, contingency plans are plans to deal with that risk;
 - for example the strategy for organizational financial problems

Risk management strategies (i)

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.

Risk management strategies (ii)

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.
- Some factors that give us clues about the risk probability and its effects must be observed. These factors are obviously dependent on the types of risk.

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 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