# Project Management

Based on Sommerville's "Software Engineering" textbook

## Software Project Management

- Aimed to ensure that the software is delivered on time, within budget and schedule constraints, and satisfies the requirements of the client
- Management of software projects is different from other types of management because:
  - Software is not tangible
  - Software processes are relatively new and still "under trial"
  - Larger software projects are usually "one-off" projects
  - Computer technology evolves very rapidly

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## Management Activities

- Writing proposals
- Planning the project
- Scheduling the project
- Estimating the cost of the project
- Monitoring and reviewing the project's progress
- Selecting, hiring, and evaluating personnel
- Writing reports and giving presentations

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## Project Planning

- A *project plan* should be drawn at the start of the project. This plan drives the project and needs to be continuously adjusted
- The role of the project manager is to anticipate possible problems and be prepared with solutions for these problems
- Other plans that need be developed:
  - Quality plan
  - Validation and verification plan
  - Configuration management plan
  - Maintenance plan
  - Staff development plan

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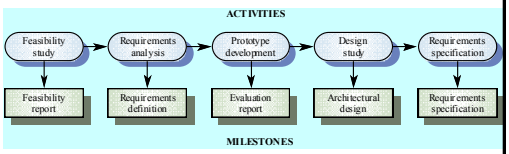
## Project Planning

- *Milestone* = end-point of a specific, distinct software process activity or task (for each milestone a report should be presented to the management)
- *Deliverable* = project result delivered to the client
- In order to establish milestones the phases of the software process need be divided in basic activities/tasks. Example for requirements engineering

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## Project Scheduling……

- Software managers:
  - Divide the project in activities/tasks
  - Estimate time and resources needed to finish the project
  - Allocate resources to tasks
  - Try to employ efficiently all the project personnel
  - Minimize dependencies between tasks and teams
  - Prepare contingency plans
  - Rely on experience and intuition

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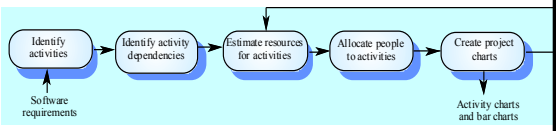
## Scheduling Process

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## Project Scheduling

- Graphical notations used in software project scheduling:
  - Tables: summary description of tasks
  - *Bar charts*: show schedule against the time
  - *Activity charts*: graphs that depict dependencies between tasks and indicate the *critical path* (the longest path in the activity graph)

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## Tabular description of tasks

| 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) |

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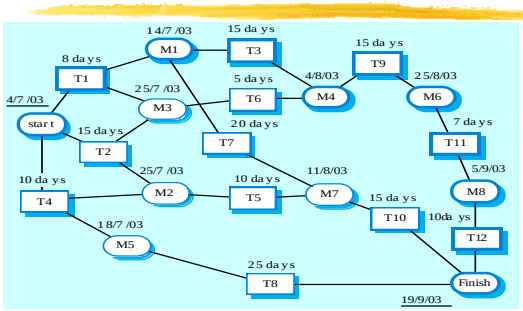
## Activity Chart

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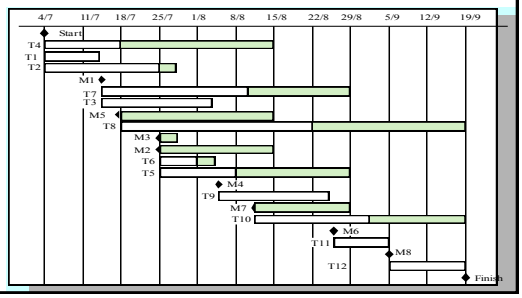
## Gannt Chart

- Example of bar chart or Gannt chart

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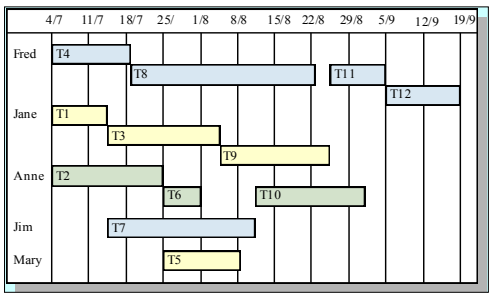
## Staff Allocation Chart

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## Risk Management

- *Risk* = some adverse circumstance that may happen and affect negatively the project, the product, and/or the business
- Categories of risk:
  - Project risks
  - Product risks
  - Business risks
- *Risk management* means anticipating risks and preparing plans to reduce their effect

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## Types of 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. |

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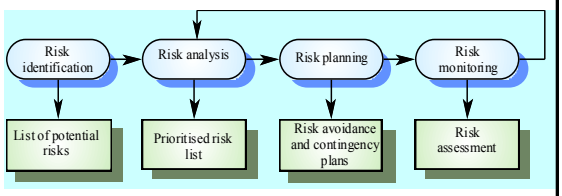
## Risk Management Process

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## Risk Categories

| 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 |
| 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 |

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## Management commonalities

- These activities are not peculiar to software management.
- Many techniques of engineering project management are equally applicable to software project management.
- Technically complex engineering systems tend to suffer from the same problems as software systems.

## 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 organization may wish to develop employee skills on a software project.
- Managers have to work within these constraints especially when there are shortages of trained staff.

## Why is Project Management so hard?

- Engineers and Architects who build skyscrapers and bridges have it easy
- Software Engineers and Software Architects have it hard... why?
- What makes these two design activities so different?
- Why did the Waterfall process used to be so common for software?
- Could Agile be used for skyscrapers and bridges?