Project management

◆ Organizing, planning and scheduling software projects
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
Topics covered

- Management activities
- Project planning
- Activity organization
- Project scheduling
Software project management

- Concerned with activities involved in ensuring that software is
  - delivered on time,
  - on schedule, and
  - in accordance with the requirements of the organizations developing and procuring the software
Why is management important?

- Software engineering is an economic activity and therefore is subject to economic, non-technical constraints.
- Well-managed projects sometimes fail. Badly managed projects often fail.
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.
- The software development process is not standardized
- Many software projects are 'one-off' projects
Management activities

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

- These activities are not peculiar to software management
- Many project management techniques used in engineering 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
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
## Types of project plan

<table>
<thead>
<tr>
<th>Plan</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality plan</td>
<td>Describes the quality procedures and standards that will be used in a project.</td>
</tr>
<tr>
<td>Validation plan</td>
<td>Describes the approach, resources and schedule used for system validation.</td>
</tr>
<tr>
<td>Configuration management plan</td>
<td>Describes the configuration management procedures and structures to be used.</td>
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<tr>
<td>Maintenance plan</td>
<td>Predicts the maintenance requirements of the system, maintenance costs and effort required.</td>
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<tr>
<td>Staff development plan</td>
<td>Describes how the skills and experience of the project team members will be developed.</td>
</tr>
</tbody>
</table>
Project plan structure

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

- Activities in a project should be organized 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 and deliverables

ACTIVITIES

Feasibility study → Requirements analysis → Prototype development → Design study → Requirements specification

MILESTONES

Feasibility report → Requirements definition → Evaluation report → Architectural design → Requirements specification
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 durations and dependencies

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<thead>
<tr>
<th>Task</th>
<th>Duration (days)</th>
<th>Dependencies</th>
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<td></td>
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<tr>
<td>T2</td>
<td>15</td>
<td></td>
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<tr>
<td>T3</td>
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<td>T4</td>
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<td>T5</td>
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<td>T2, T4</td>
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<td>T6</td>
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<td>T7</td>
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<td>T11</td>
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<td>T9</td>
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<td>T12</td>
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<td>T11</td>
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</table>
Activity network

[Diagram of activity network with dates and durations marked on nodes and edges.]
Staff allocation

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<tr>
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<th>15/8</th>
<th>22/8</th>
<th>29/8</th>
<th>5/9</th>
<th>12/9</th>
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<td>T8</td>
<td>T11</td>
<td>T12</td>
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<td>Mary</td>
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Key points

- Good project management is essential for project success
- The intangible nature of software causes problems for management
- Managers have diverse roles but their most significant activities are planning, estimating and scheduling
- Planning and estimating are iterative processes which continue throughout the course of a project
A project milestone is a predictable state where some formal report of progress is presented to management.

Activity charts and bar charts are graphical representations of a project schedule