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
  • 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 inevitably fail.
- The objective of this lecture is to introduce management activities rather than teach you to be managers.
- **You can only learn to manage by managing**
Software management distinctions

- The product is intangible.
- The product is uniquely flexible.
- The software development process is not standardized.
- Most 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 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.
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.
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

- Feasibility study
  - Feasibility report

- Requirements analysis
  - Requirements definition

- Prototype development
  - Evaluation report

- Design study
  - Architectural design

- Requirements specification

ACTIVITIES

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 durations and dependencies

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (days)</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>15</td>
<td>T1</td>
</tr>
<tr>
<td>T4</td>
<td>10</td>
<td>T1</td>
</tr>
<tr>
<td>T5</td>
<td>10</td>
<td>T2, T4</td>
</tr>
<tr>
<td>T6</td>
<td>5</td>
<td>T1, T2</td>
</tr>
<tr>
<td>T7</td>
<td>20</td>
<td>T1</td>
</tr>
<tr>
<td>T8</td>
<td>25</td>
<td>T4</td>
</tr>
<tr>
<td>T9</td>
<td>15</td>
<td>T3, T6</td>
</tr>
<tr>
<td>T10</td>
<td>15</td>
<td>T5, T7</td>
</tr>
<tr>
<td>T11</td>
<td>7</td>
<td>T9</td>
</tr>
<tr>
<td>T12</td>
<td>10</td>
<td>T11</td>
</tr>
</tbody>
</table>
Activity network
Activity time-line

- T4
- T1
- T2
- M1
- T7
- T3
- M5
- T8
- M3
- M2
- T6
- T5
- T9
- M4
- M7
- T10
- M6
- T11
- M8
- T12
- Finish

Start

### Staff allocation

<table>
<thead>
<tr>
<th></th>
<th>4/7</th>
<th>11/7</th>
<th>18/7</th>
<th>25/7</th>
<th>1/8</th>
<th>8/8</th>
<th>15/8</th>
<th>22/8</th>
<th>29/8</th>
<th>5/9</th>
<th>12/9</th>
<th>19/9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fred</td>
<td></td>
<td>T4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jane</td>
<td>T1</td>
<td></td>
<td>T8</td>
<td></td>
<td>T11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anne</td>
<td>T2</td>
<td>T3</td>
<td></td>
<td></td>
<td>T9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jim</td>
<td></td>
<td>T7</td>
<td>T6</td>
<td>T10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mary</td>
<td></td>
<td>T5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Staff names: Fred, Jane, Anne, Jim, Mary
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.
Key points

- 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.