Objectives

- To introduce software project management and to describe its distinctive characteristics
- Explain the advantages of Using Formal Project Management
- To discuss project planning and the planning process
- To explain the responsibilities of software managers
- To introduce the different types of Project Plans
- Management activities
- Project planning
- Project scheduling
IT: Budget & Cost
Management, PM & Software PM
What is Software Engineering?

Developing software having:

- High **quality**
- Within **budget**
- On **schedule** (time)
- Satisfying client’s **requirements**
What Is a Project? *

- “a temporary endeavor undertaken to create a unique product, service, or result.”*

- **Temporary**: A project has a definite beginning and a definite end.

- The result (product or service) is unique: it is distinguishable from all other results.

What Is a Project?

- A project ends
  - when its objectives have been reached,
  - or the project has been terminated.

- Project’s Results are not Temporary
  - The result of the project (product or service) may outlive the project.
Project Attributes

A project:

- Has a unique purpose.
- Is temporary.
- Is developed using progressive elaboration.
- Requires resources, often from various areas.
- Should have a primary customer or sponsor.
  
  The *project sponsor* usually provides the direction and funding for the project.

- Involves uncertainty.
Failure Statistics of SW Projects

- **Success**
  - On-time,
  - On-budget,
  - and scope-coverage (with Most of the Features & Functions)

- **Failed**
  - Over-budget,
  - Over-time,
  - and/or with **less** scope (**Fewer** Features & Functions)

- **Impaired**
  - Cancelled & Unused
Why Projects Fail?

- an unrealistic **deadline** is established
- changing customer **requirements**
- an honest underestimate of **effort**
- predictable and/or unpredictable **risks**
- **technical** difficulties
- **miscommunication** among project staff
- failure in project **management**.
A S/W project is a **Risky Business**

- All surveyed SW projects used **waterfall** lifecycle.
- 53% of projects cost almost 200% of original estimate.
Failure Statistics of SW Projects

CHAOS 2000 Results

- Failed: 49%
- Succeed: 28%
- Cancelled: 23%
PM History

- Old PM: 5000 B.C ‘The Egyptian Pyramids’
- Birth of modern PM: Manhattan Project (military) ‘development of the atomic bomb’
- 1917: Henry Gantt ‘Gantt chart’
PM History - Gantt chart Example
Web-Software development

Time

<table>
<thead>
<tr>
<th>Task Name</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
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<tr>
<td>1 Concept</td>
<td>28 11 18 25 4</td>
<td>1 8 15 22 1</td>
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<tr>
<td>2 Evaluate current systems</td>
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<td>3 Define Requirements</td>
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<td>8 Define specific functionality</td>
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<td>9 Define risks and risk</td>
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<td>management approach</td>
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<tr>
<td>10 Develop project plan</td>
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<td>11 Brief web development team</td>
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<td>12 Web Site Design</td>
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<td>13 Design User Interface</td>
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<td>18 Design Server Setup</td>
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<td>25 Develop Server Support</td>
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<td>30 Web Site Development</td>
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<tr>
<td>31 Develop pages and links</td>
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<tr>
<td>35 Develop functionality</td>
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<tr>
<td>38 Content Migration/Integration</td>
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<td>44 Testing</td>
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<td>50 Roll Out</td>
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<td>57 Support</td>
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</tbody>
</table>
PM History

1970’s
- Use of PM software:
  - military, defense,
  - construction industries,
  - Aircraft construction

1990’s: large shift to PM-based models
- 1985: TQM ‘Total Quality Management’
- 1990-93: Re-engineering
- 1996-99: Risk management, project management offices (PMO)
Project Management Offices (PMO)

- An organizational group responsible for coordinating the project management function throughout an organization.

- Possible goals of PMO:
  - Collect, organize, and integrate project data
  - Develop and maintain templates for project documentation
  - Develop and coordinate training needs
  - Provide project management consulting services
# Failure Statistics of SW Projects

## Success
- On-time,
- On-budget,
- and scope-coverage (with Most of the Features & Functions)
- High quality

## Failed
- Over-budget,
- Over-time,
- and/or with less scope (Fewer Features & Functions)

## Impaired
- Cancelled & Unused
Software Project Management

- Why S/W Project Management?

- Because software development is always subject to
  - budget and
  - schedule constraints
  - quality constraints
  - Satisfying all requirements that are set by the organisation developing the software
  - Minimise risk of failure
Quality & The Triple constraint

- Scope (Requirements)
- Budget
- Time (Schedule)

Quality
Advantages of Using Formal Project Management

- Better control of financial, physical, and human resources
- Improved customer relations
- Shorter development times
- Lower costs
- Higher quality and increased reliability
- Higher profit margins
- Improved productivity
- Better internal coordination
- Higher worker morale (less stress).
Software Project Management (Cont.)

- Amateur programmer:
  - No need for s/w project management

- Professional s/w developer:
  - Needs for s/w project management

- Good s/w project management
  - Will not guarantee project success

- Bad s/w project management
  - Will certainly result in project failure !!!
Management Activities

- S/W manager responsibilities include:
  - **Proposal writing:** Objectives, methodology, deliverables, cost & schedule estimates
  - **Project planning and scheduling:** Goals, activities, resources, milestones
  - **Project costing:** Resources needed for activities
  - **Project monitoring and reviews:** Track actual versus planned cost and time
  - **Personnel selection and evaluation**
  - **Report writing and presentations**
Project Management Concerns

- product quality?
- risk assessment?
- Software measurement?
- cost estimation?
- project scheduling?
- customer communication?
- staffing?
- other resources?
- project monitoring?
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 (as is currently the case) there is an international shortage of skilled IT staff
Project Planning – the 3 W’s

- S/W project planning describes
  - project breakdown activities/tasks (WHAT)
  - Top Down approach
  - Resources needed to carry out activities/tasks (WHO)
  - Schedule the execution of activities (WHEN)
Project Planning

- Main software project plan that is concerned with schedule and budget
- 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 plans may be developed to support the main software project plan that is concerned with schedule and budget
## Types of Project Plans

<table>
<thead>
<tr>
<th>Plan</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development process project plan</td>
<td>Describes project breakdown activities/tasks, resources needed, schedule of activities</td>
</tr>
<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 configuration management procedures and structures to be used.</td>
</tr>
<tr>
<td>Maintenance plan</td>
<td>Predicts the maintenance requirements of the system, maintenance cost and effort required</td>
</tr>
<tr>
<td>Staff development plan (Training)</td>
<td>Describes how the skills and experience of the project team will be developed</td>
</tr>
</tbody>
</table>
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

1. Introduction
   - Project objectives – constraints (budget, time, etc.)

2. Project organisation
   - People involved, roles

3. Risk analysis
   - Projects risks, Risk reduction strategies

4. Resource requirements: Hardware and software

5. Work breakdown
   - Activities, milestones, deliverables

6. Project schedule (3W: What activity, when, who)
   - Activities dependencies, activities time, allocate people to activities

7. Monitoring and reporting mechanisms
   - What management reports and when
   - Monitoring mechanism used
   - Revise plan, update schedule
Activity organization: Milestones & Deliverables

- Activities in a project should be organised to produce **tangible outputs** for management to judge progress

- **Milestones**
  - Check point based on:
    - Time
    - Budget
    - Deliverable
  - End-point of logical stage (activity) in the project
  - Has no duration
  - At each milestone there should be a formal output (report) presented to management
    - Management needs documentation & information to judge project progress

- **Deliverables**
  - Are project results delivered to customers
  - Deliverables are usually milestones but milestones need not be deliverables
Milestones Example: Requirements Engineering process (prototyping)

ACTIVITIES

Feasibility study

Requirements analysis

Prototype development

Design study

Requirements specification

Feasibility report

Requirements definition

Evaluation report

Architectural design

Requirements specification

DELIVERABLES / MILESTONES

Deliverables are usually milestones
Planning

- Without a plan we do not know:
  - What we are going to do
  - How we are going to do it
  - How long it will take
  - The resources required
  - The cost

- If you do not plan, you are planning for failure
The Project Scheduling Process

1. Identify activities
2. Identify activity dependencies
3. Estimate resources for activities
4. Allocate people to activities
5. Create project charts

Software requirements

Activity charts and bar charts
Project Scheduling

- Identify activities
- Estimate activity effort
- Estimate resources needed per activity
- An activity
  - At least one week duration
  - Maximum 8-10 weeks.
  - If greater subdivide into sub activities
- Increase your original estimate to cover anticipated & unanticipated problems
  - Add 30% for anticipated problems
  - Add 20% for omissioning (unanticipated problems)
## Project Precedence Table

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (Weeks)</th>
<th>Precedence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>-</td>
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<tr>
<td>B</td>
<td>15</td>
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<tr>
<td>C</td>
<td>3</td>
<td>A</td>
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<td>D</td>
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<td>E</td>
<td>5</td>
<td>B</td>
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<tr>
<td>F</td>
<td>2</td>
<td>C, D</td>
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<tr>
<td>G</td>
<td>7</td>
<td>E, F</td>
</tr>
</tbody>
</table>
Project Network – Critical Path

Critical Path: B-D-F-G

34: Min time to complete the project
## Project Precedence Table

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (Weeks)</th>
<th>Precedence</th>
<th>Earliest start</th>
<th>Earliest finish</th>
<th>Latest start</th>
<th>Latest finish</th>
<th>Slack</th>
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<td>C, D</td>
<td>25</td>
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<td>G</td>
<td>7</td>
<td>E, F</td>
<td>27</td>
<td>34</td>
<td>27</td>
<td>34</td>
<td>0</td>
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</table>

Critical task
### Task durations and dependencies: Precedence Table

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (days)</th>
<th>Dependencies</th>
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<tbody>
<tr>
<td>T1</td>
<td>8</td>
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<tr>
<td>T2</td>
<td>15</td>
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<tr>
<td>T3</td>
<td>15</td>
<td>T1 (M1)</td>
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<td>T4</td>
<td>10</td>
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<td>T5</td>
<td>10</td>
<td>T2, T4 (M2)</td>
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<td>T6</td>
<td>5</td>
<td>T1, T2 (M3)</td>
</tr>
<tr>
<td>T7</td>
<td>20</td>
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<td>T8</td>
<td>25</td>
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<td>T9</td>
<td>15</td>
<td>T3, T6 (M4)</td>
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<td>T10</td>
<td>15</td>
<td>T5, T7 (M7)</td>
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<td>7</td>
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<td>T12</td>
<td>10</td>
<td>T11 (M8)</td>
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</table>
Activity network (Task dependency)
The PM Field

Professional Organizations

- Project Management Institute (PMI) (pmi.org)
- Software Engineering Institute (SEI)
- IEEE Software Engineering Group

- Certifications
  - PMI PMP
- The “PMBOK” – PMI Body of Knowledge
PM Tools: Software

- PM software survey ‘1999’:
  - Describes & compares more than 200 software tools

- PM resources:
  - See ‘www.allpm.com/links/products’

- Software Tools
  - MS Project, Time Line, Primavera, …
PM Tools: Software

- Low-end
  - Basic features, tasks management, charting
  - MS Excel, Milestones Simplicity

- Mid-market
  - Handle larger projects, multiple projects, analysis tools
  - MS Project (approx. 50% of market)

- High-end
  - Very large projects, specialized needs, enterprise
  - AMS Realtime
  - Primavera Project Manager
Project Manager Positions

- V.P. Program Development
- Executive Program Manager
- Project Manager / Program Manager
- Assistant Project Manager
- Project Administrator / Coordinator
The Project Management (PM) Field

- Professional Organizations
  - Project Management Institute (PMI) (http://www.pmi.org)
  - Software Engineering Institute (SEI)
  - IEEE: Software Engineering Group

- Certifications
  - PMI PMP

- The “PMBOK” – PMI Body of Knowledge
Project Management Body of Knowledge (PMBOK) Guide

- PMBOK Guide is
  - approved by the American National Standards Institute (ANSI),
  - recognized by the Institute of Electrical and Electronics Engineers (IEEE) as an IEEE standard,

- PMBOK Guide is similar to the IEEE’s “Guide to the Software Engineering Body of Knowledge (SWEBOK),” which focuses on the software engineering profession.
PM Certification

- In 2003, Average senior PM salary: $90,000 per year !!

- PMI certification adds average 14% to salary

- Progress in PMI # of certs:
  - Year 1993: 1,000 certs
  - Year 2004: 81,913 certs
PMP Certification, 1993-2003