CS446
Software Engineering

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Software Engineering Management

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Outline

- Distinct Aspects of Software Projects
- Management Activities
- Project Planning
- Activity Organization
- Project Scheduling

Reference:

This is material from Chapter 3 of Sommerville

Background

Many large projects in the 1960s – 1980s

- Ran over budget
- Ran over schedule
- Did not meet quality standards

Not a people problem

- Challenging projects
- Talented people
- Competent supervision

A problem of management approach

- Small-project management approaches did not scale
- Software projects have distinct aspects

Distinct Aspects of Software Projects

What makes software management different?

- The product is intangible
- We have not yet found many standard processes
- There are few standard software components
- The environment is extremely heterogeneous
- Most large projects are typically first-time attempts
  - It has never been done before
- Many projects are technically innovative
  - We may not yet know how it can be done

Management Activities

There are two types of management

- Acting as a manager on the customer side
  - Contracting to have software developed to your needs
  - Assessing, purchasing, and licensing of commercial software
- Acting as a manager on the development side
  - Handling one or more of the phases of software development

Customer Side

Contracting

- Proposal description
- Functional specification
- Documents specification
- Training and assistance specification
- Acceptance specification
- Cost negotiation
- Delivery negotiation
- Contact and communication
- Prototype trials
- Revision negotiations
- Beta testing and user trials
- Acceptance and payment
- Maintenance and further working relationships

Purchasing

- Not as directly tied into software engineering

Developer Side

Life cycle phases: High level responsibilities

- Customer negotiations and liaison
- Proposal writing
- Project costing
- Project planning and scheduling
- Resource provision
- Project monitoring and reviews
- Personnel selection and evaluation
- Report writing and presentations

Life cycle phases: Low level responsibilities

- Technical specifications
- Implementation designs
- Test plans
- Integration and organization
- Quality assurance
- Validation and verification
- Code version and consistency management
- Document preparation
- Customer service
- Revision, improvement, compatibility

Project Planning and Scheduling

The activities that take most managment time

The activities that provide steering for the other activitites

◇ ◇ ◇◇

Plan the flight, and fly the plan

◇ ◇ ◇◇

A plan and schedule

- Provide a guide
- Minimize surprizes
- Anticipate risks
- Enable resource management
- Avoid omissions
- Give an early signal when things go wrong

Planning and scheduling take place

- Iteratively
- With constant tracking and revision

Iterative

Establish constraints
Make initial assessments of parameters
Define milestones and deliverables
while project not completed or cancelled **loop**
    Draw up schedule
    Initiate activities according to schedule
    At regular intervals **do**
        Review progress
        Revise parameters and milestones
        Re-negotiate constraints and deliverables
        Update the schedule
    until problems arise or project completed
    if problems **then**
        initiate technical review and project revision
    end if
end loop

Plans

We may distinguish between managerial plans, some of which would be

- Project plan
- Quality plan
- Validation and acceptance plan
- Configuration management plan
- Maintenance plan
- Staff development plan
- Delivery and marketing plan

and technical plans, some of which would be

- Implementation design plan
- Testing plan
- Integration plan
- Validation plan

Project Plan

This is the master plan consisting of at least

- Objectives and constraints
- Organization and staffing
- Risks and reduction strategies
- Resource requirements
- Activities, milestones, deliverables
- Schedule
- Monitoring and reporting procedures

In particular, note some definitions

Activities
The identifiable tasks required to meet all project goals

Milestones
Chosen checkpoints in the development that signal a goal met or a set of activities completed; formalized by the presentation of a report and possibly the delivery of an item

Deliverables
Certain milestones signal the completion of an item to be provided to the customer; a deliverable is any such item

Other Plans

Quality Plan
Procedures and standards that will be used to track and ensure

Validation and Acceptance
How the requirements will be verified and how the customer must sign off

Configuration Management Plan
Structures, tools, conventions, protocols, organization

Maintenance Plan
Predictions of requirements and effort, sets up longer term and customer service goals

Staff Development Plan
Determines skills and experience required; outlines training, hiring, and consultation needed

Delivery and/or Marketing Plan
What formalisms are followed in giving the product to the customer or what advertising is carried out on what market segment; what retail network is used

Technical Plans

Implementation Design
A precise layout of the software system that provides form and functionality; usually expressed in terms of certain diagrammatic and formalistic tools (flowcharts, data dictionaries, interface descriptions, object diagrams, entity relations, etc.)

Testing Plan
A step-by-step program for ensuring that the system units function as specified

Integration Plan
A step-by-step program for ensuring that the system units are brought together into their required combinations, which function as specified

Validation Plan
A step-by-step program to ensure that the system, as a whole, meets its specified requirements

Schedule

Scheduling technology is quite mature

Scheduling involves first establishing

- Activities
- Milestones
- Dependencies
- Estimates of duration
- Assignments and allocations

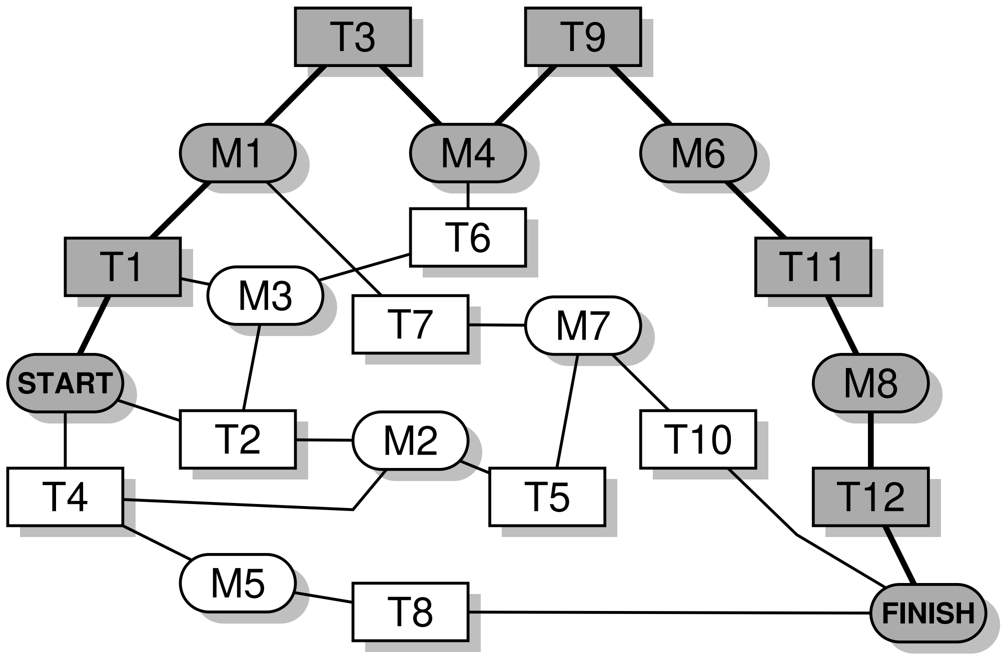
Scheduling then involves preparing

- An activity network
- A critical path through the network
- A variety of calendar, bar, allocation charts

Example Activities

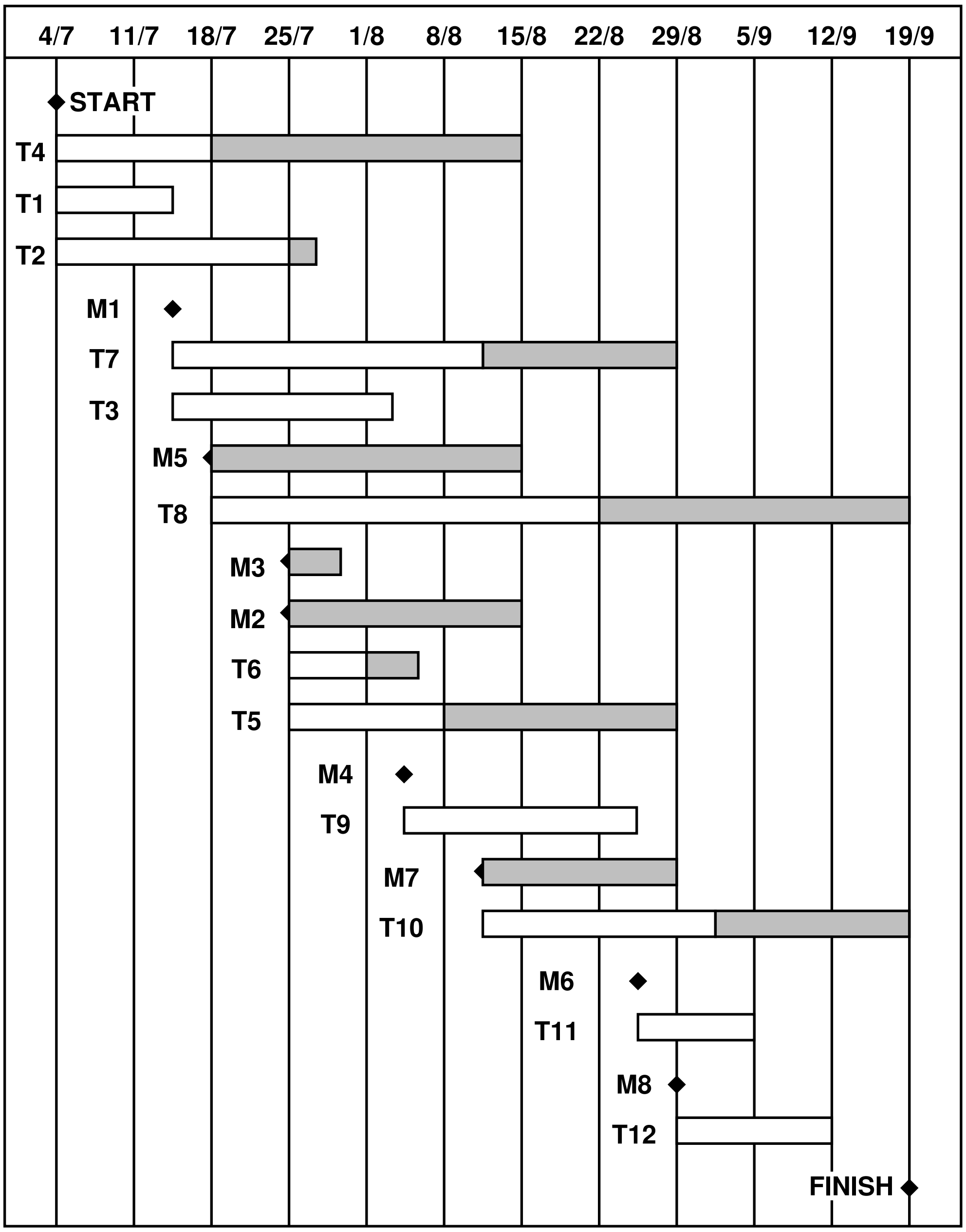
Activity	**Duration**	**Dependency**
T1	8	START
T2	15	START
T3	15	M1
T4	10	START
T5	10	M2
T6	5	M3
T7	20	M1
T8	25	M5
T9	15	M4
T10	15	M7
T11	7	M6
T12	10	M8
START	0	
M1	0	T1
M2	0	T2,T4
M3	0	T1,T2
M4	0	T3,T6
M5	0	T4
M6	0	T9
M7	0	T5,T7
M8	0	T11
FINISH	0	T8,T10,T12

Example Activity Network



A Simplified PERT Network

Example Activity Calendar



A Simplified GANTT Chart