



Category	Percentage
I don't know	10%
I don't want to	60%
I want to	20%
I don't want to	10%

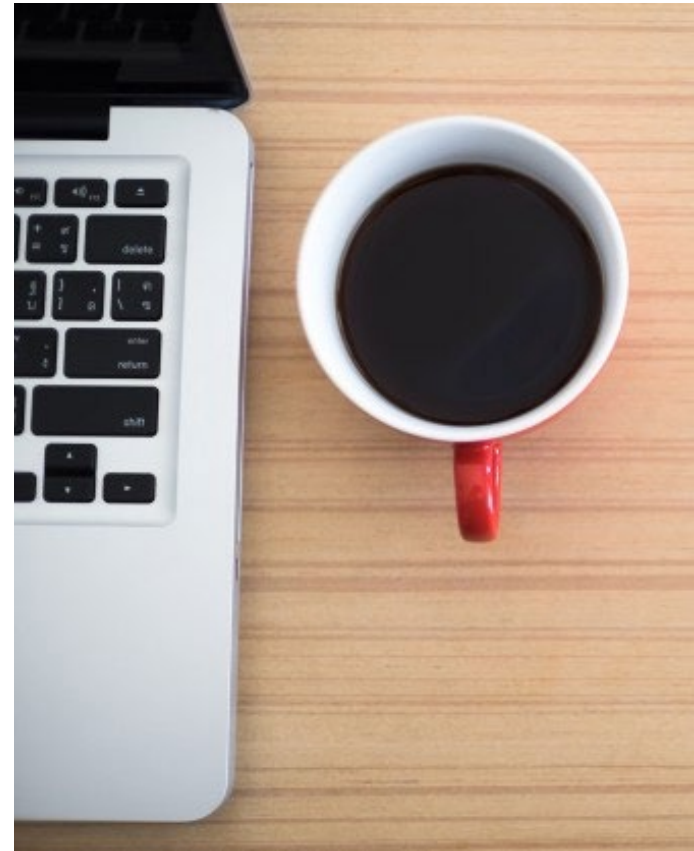
# Project Planning and Scheduling

# Course Topics

- Introduction
- Software Process Models
- Requirements Engineering
- Modeling
- Software Construction Techniques
- Testing
- Refactoring
- Project Management
- Ethical Issues

# Lecture Objectives

- ✓ Software Project Plan
  - Milestones & Deliverables
- ✓ Project Scheduling
  - Bar charts





**Programming Wisdom** @CodeWisdom

"You can have the project:



Done on time



Done on budget



Done properly

Pick two." – Unknown

# Project Planning



- Probably the most time-consuming project management activity.
  - Iterative process which is only complete when the project itself is complete.
  
- Project plan is regularly revised
  - As more project information is available.

# Project planning process



- Assess the project constraints
  - Required delivery date
  - Staff availability
  - Overall budget .....
  
- Define Process milestone and deliverables

# Milestones & Deliverables



## ■ Milestones

- end-point of a process activity.
- points in the schedule against which you can assess progress,
- e.g., handover of the system for testing.

## ■ Deliverables

- project results delivered to customers.
  - e.g. a requirements document for the system
- 

# Planning stages



## 1. **Proposal stage:**


when you are bidding for a contract to develop or provide a software system.

## 2. **Project startup phase:**

when you have to plan who will work on the project, how the project will be broken down into increments, how resources will be allocated across your company, etc.

## 3. **Periodically throughout the project:**

when you modify your plan in the light of experience gained and information from monitoring the progress of the work.





# Plan-driven development



- Plan-driven or plan-based development is an approach to software engineering where the development process is planned in detail.
  - Plan-driven development is based on engineering project management techniques and is the ‘traditional’ way of managing large software development projects.
- A project plan is created that records the work to be done, who will do it, the development schedule and the work products.
- Managers use the plan to support project decision making and as a way of measuring progress.

# Plan-driven development – pros and cons



early planning allows organizational issues (availability of staff, other projects, etc.) to be closely taken into account, and that potential problems and dependencies are discovered before the project starts, rather than once the project is underway.



many early decisions have to be revised because of changes to the environment in which the software is to be developed and used.

# Project plans

- project plan sets out the resources available to the project, the work breakdown and a schedule for carrying out the work.



# Project plan supplements

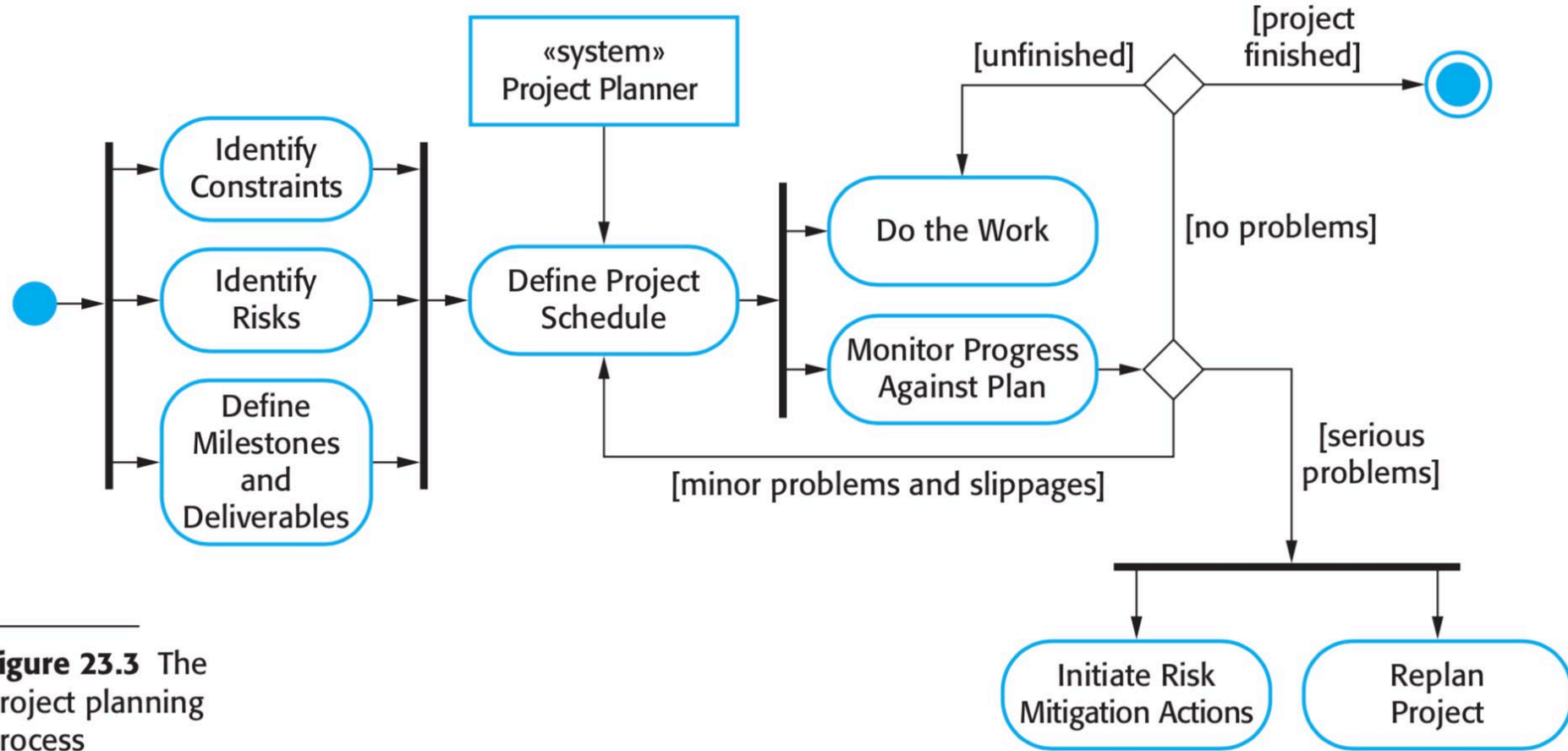
Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project.
Validation plan	Describes the approach, resources, and schedule used for system validation.
Configuration management plan	Describes the configuration management procedures and structures to be used.
Maintenance plan	Predicts the maintenance requirements, costs, and effort.
Staff development plan	Describes how the skills and experience of the project team members will be developed.

# The planning process



- Project planning is an *iterative* process that starts when you create an initial project plan during the project startup phase.
  
- Plan changes are **inevitable**.
  - As more information about the system and the project team becomes available during the project, you should regularly revise the plan to reflect requirements, schedule and risk changes.
  - Changing business goals also leads to changes in project plans. As business goals change, this could affect all projects, which may then have to be re-planned.

# The project planning process



**Figure 23.3** The project planning process

# Project scheduling


- **Definition:** is the process of deciding how the work in a project will be organized as separate tasks, and when and how these tasks will be executed.



- estimate the **calendar time** needed to complete each task, the effort required and who will work on the tasks that have been identified.
- estimate the **resources** needed to complete each task, such as the disk space required on a server, the time required on specialized hardware, such as a simulator, and what the travel budget will be.

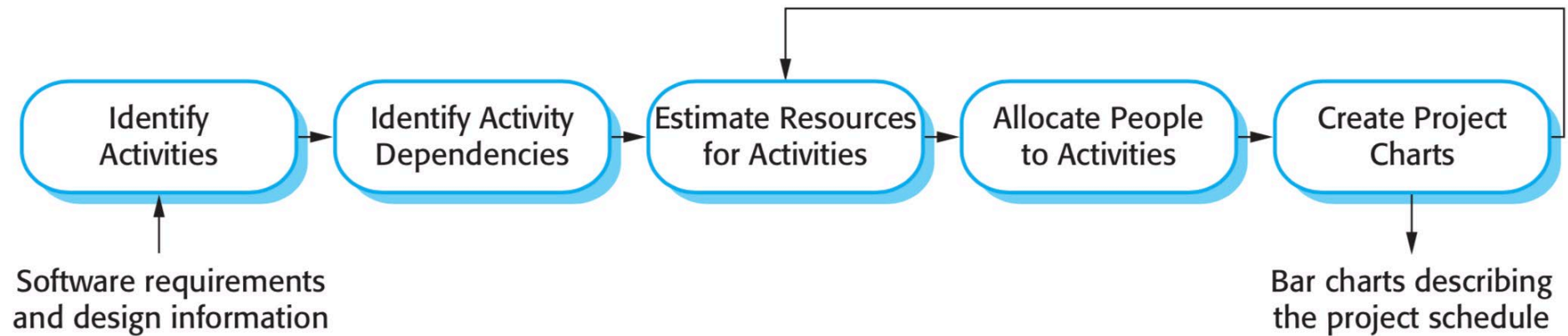
# Project scheduling activities: How?



- 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.
- 



# The project scheduling process



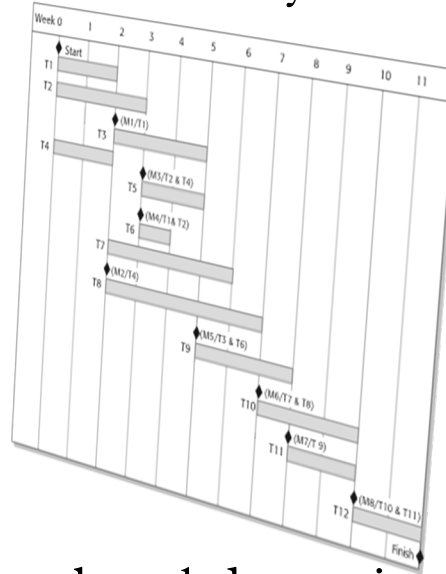
# Scheduling problems



- 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.

# Schedule representation

- Graphical notations are normally used to illustrate the project schedule.

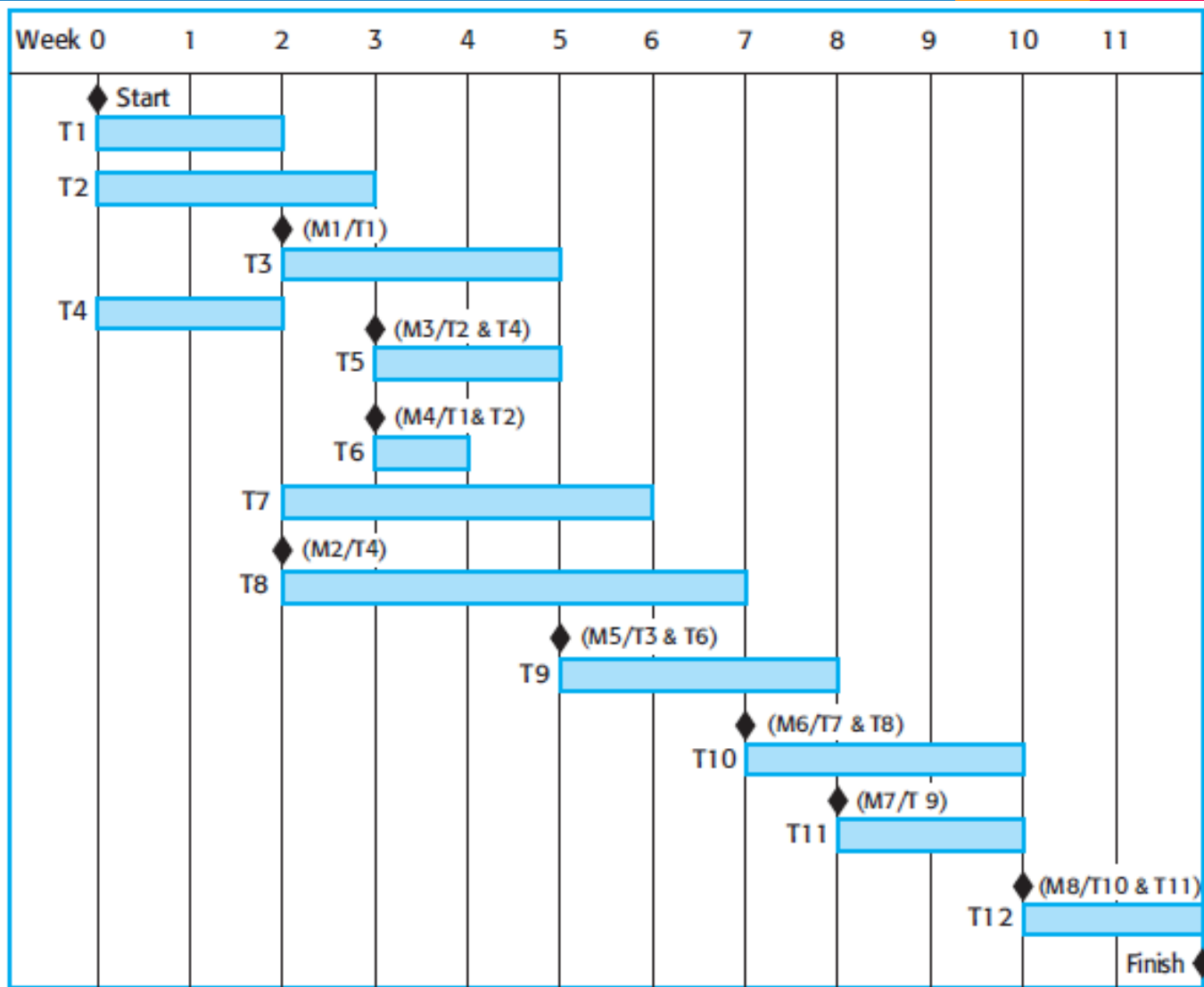


- These show the project breakdown into tasks. Tasks should not be too small. They should take about a week or two.
- Bar charts are the most commonly used representation for project schedules. They show the schedule as activities or resources against time.

# Tasks, durations, and dependencies

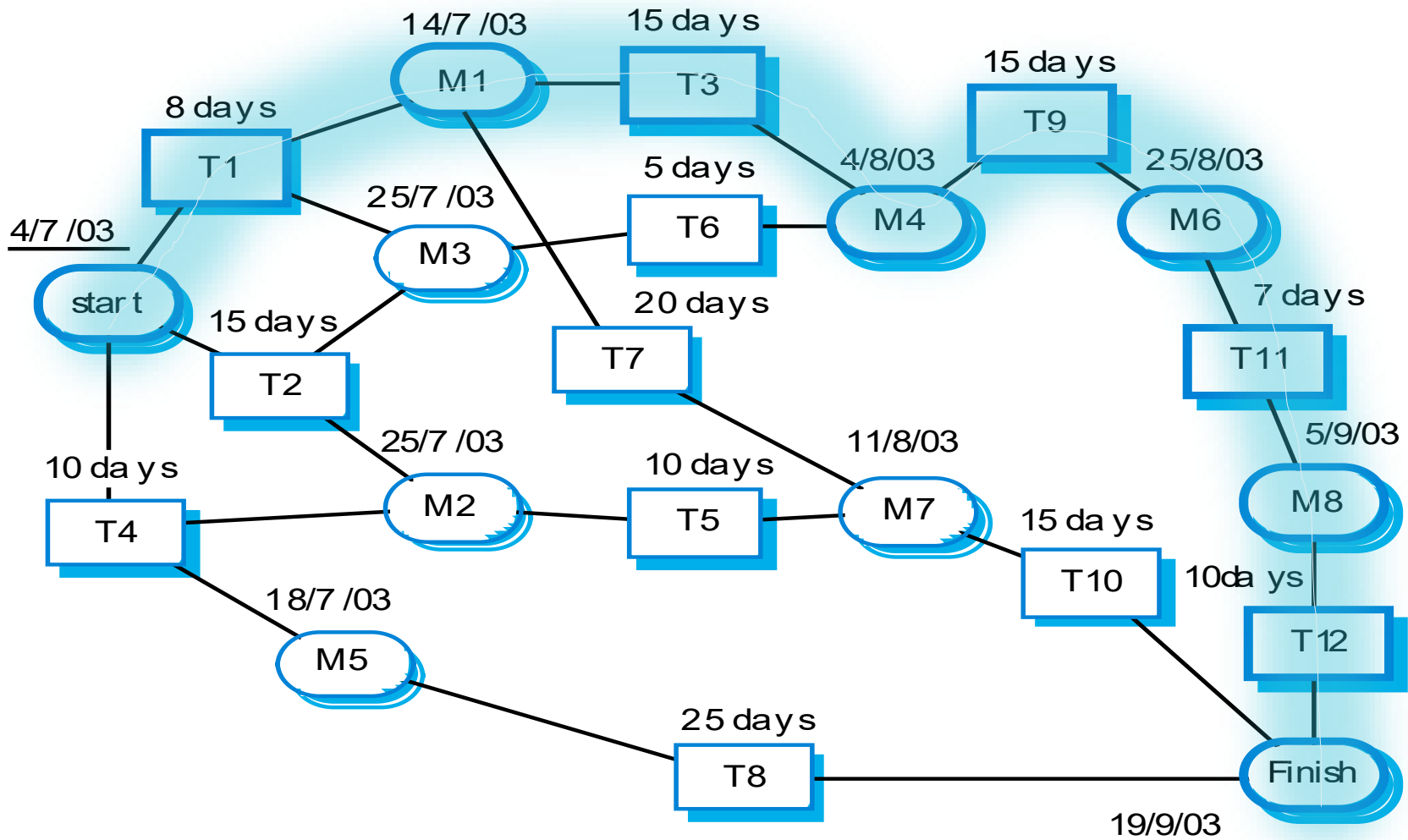
Task	Effort (person-days)	Duration (days)	Dependencies
T1	15	10	
T2	8	15	
T3	20	15	T1 (M1)
T4	5	10	
T5	5	10	T2, T4 (M3)
T6	10	5	T1, T2 (M4)
T7	25	20	T1 (M1)
T8	75	25	T4 (M2)
T9	10	15	T3, T6 (M5)
T10	20	15	T7, T8 (M6)
T11	10	10	T9 (M7)
T12	20	10	T10, T11 (M8)

# Activity bar chart



# Activity Network

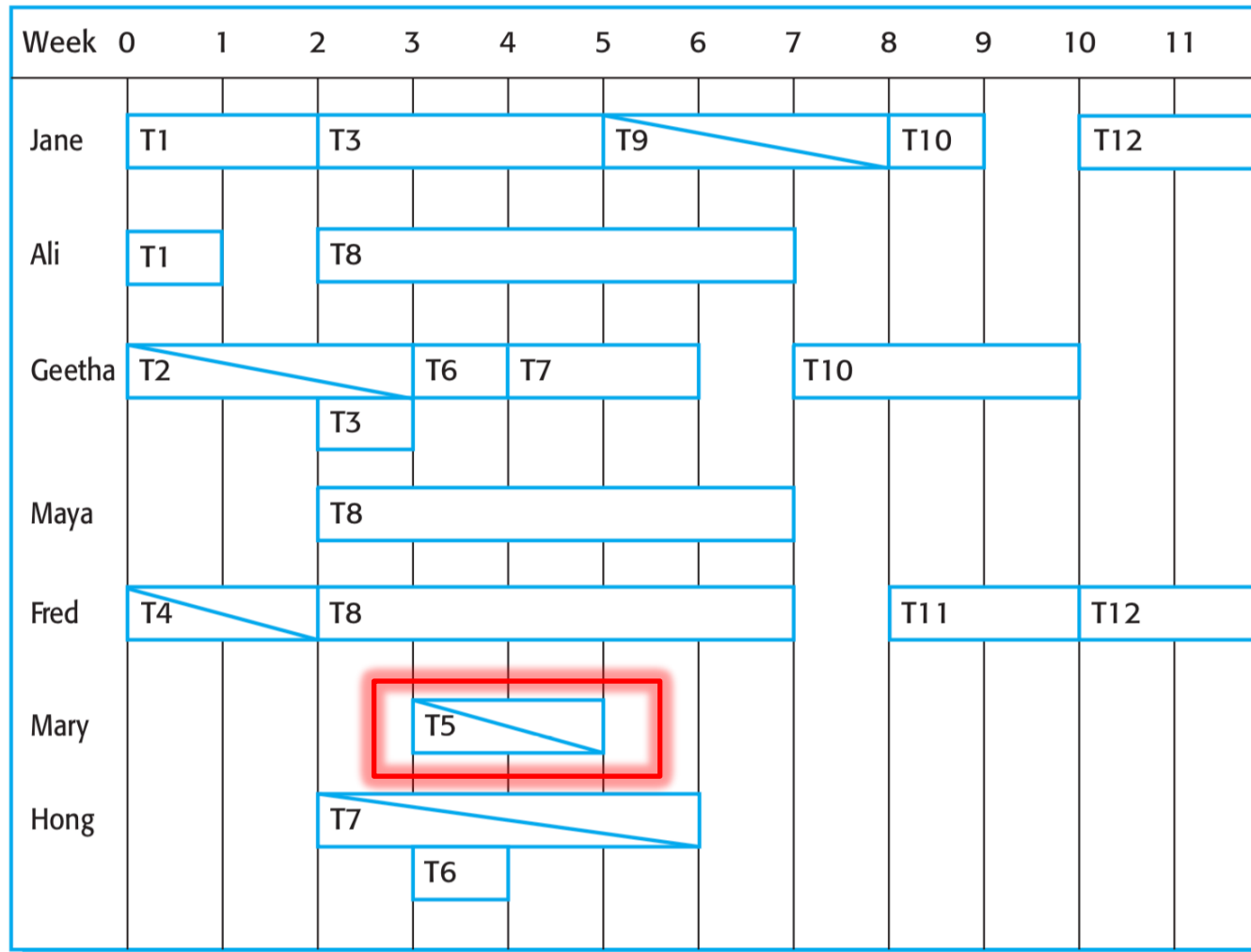
Minimum time required to finish the project. (critical path)



## Activity

- Think about a software that can assist you to draw such charts?



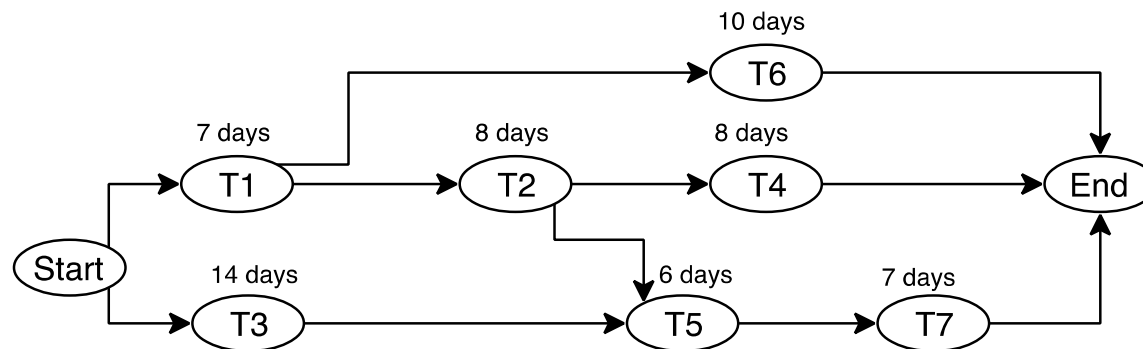




# Activity Network (Exercise)

- Draw an activity network?
- Find the critical path.


Task	Duration	Dependencies
T1	7	
T2	8	T1
T3	14	
T4	8	T2
T5	6	T2, T3
T6	10	T1
T7	7	T5



Path 1: T1, T6 = 17 days  
 Path 2: T1, T2, T4 = 23 days  
 Path 3: T1, T2, T5, T7 = 28 days  
 Path 4: T3, T5, T7 = 27 days

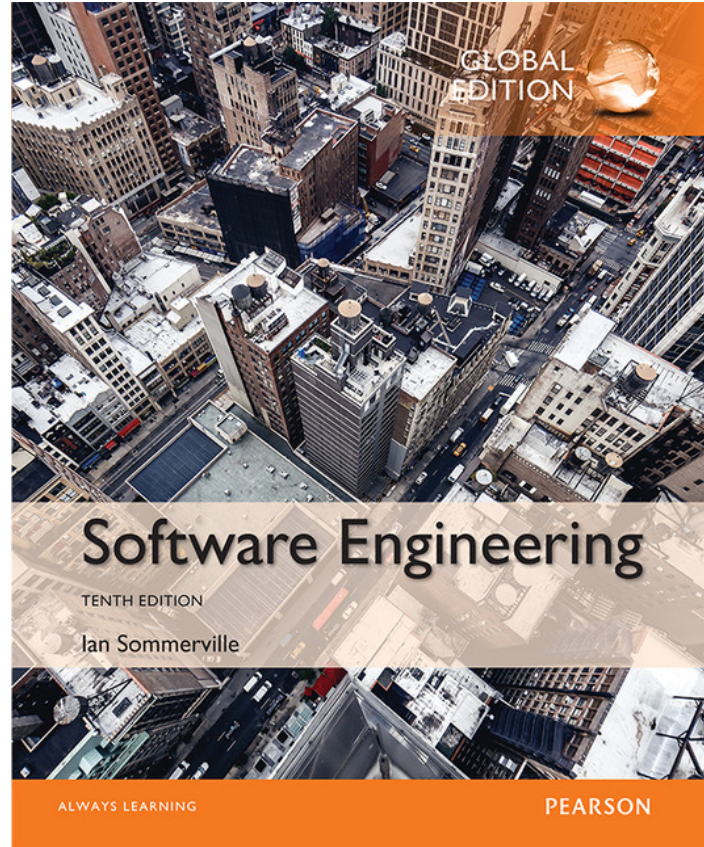
# Key Points



- Plan-driven development
    - organized around a complete project plan that defines the project activities, the planned effort, the activity schedule and who is responsible for each activity.
  
  - Project scheduling
    - Bar charts and staffing timelines are the most commonly used schedule representations
  
  - Milestone is a predictable outcome of an activity where some formal report of progress should be presented to management.
  
  - A deliverable is a milestone that is delivered to the project customer.
- 

# Read

## Chapter 23



# References



- Ian Sommerville, “Software Engineering”, 10<sup>th</sup> Edition, Addison-Wesley, 2015.
  - Timothy C. Lethbridge and Robert Laganière, “Object-Oriented Software Engineering: Practical Software Development using UML and Java”, 2<sup>nd</sup> Edition, McGraw Hill, 2001.
  - R. S. Pressman, Software Engineering: A Practitioner’s Approach, 10th Edition, McGraw-Hill, 2005.
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