Software Project Management

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Objectives

The main objectives of this chapter are:

- To explain the main tasks undertaken by project managers
- To introduce software project management and to describe its distinctive characteristics
- 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

What is Software Engineering?

Developing software having:

- High **quality**
- Within **budget**
- On **schedule** **(time)**
- Satisfying client's **requirements**

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.

What is a Project Management ?

Project management encompasses all the activities needed to plan and execute a project:

- Deciding what needs to be done
- Estimating costs
- Ensuring there are suitable people to undertake the project
- Defining responsibilities
- Scheduling
- Making arrangements for the work

What is a Project Manager ?

- Directing
- Being a technical leader
- Reviewing and approving decisions made by others
- Building morale and supporting staff
- Monitoring and controlling
- Co-ordinating the work with managers of other projects
- Reporting
- Continually striving to improve the process

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)

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.

Software project management

S/W PM is an essential part of SE.

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 organization developing the software
  - Minimize **risk** of failure

Software project management

- Concerned with activities involved in ensuring that software is delivered on time and on schedule and in accordance with the requirements of the organisations developing and procuring the software.

- Project management is needed because software development is always subject to budget and schedule constraints that are set by the organisation developing the software.

S/W 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**

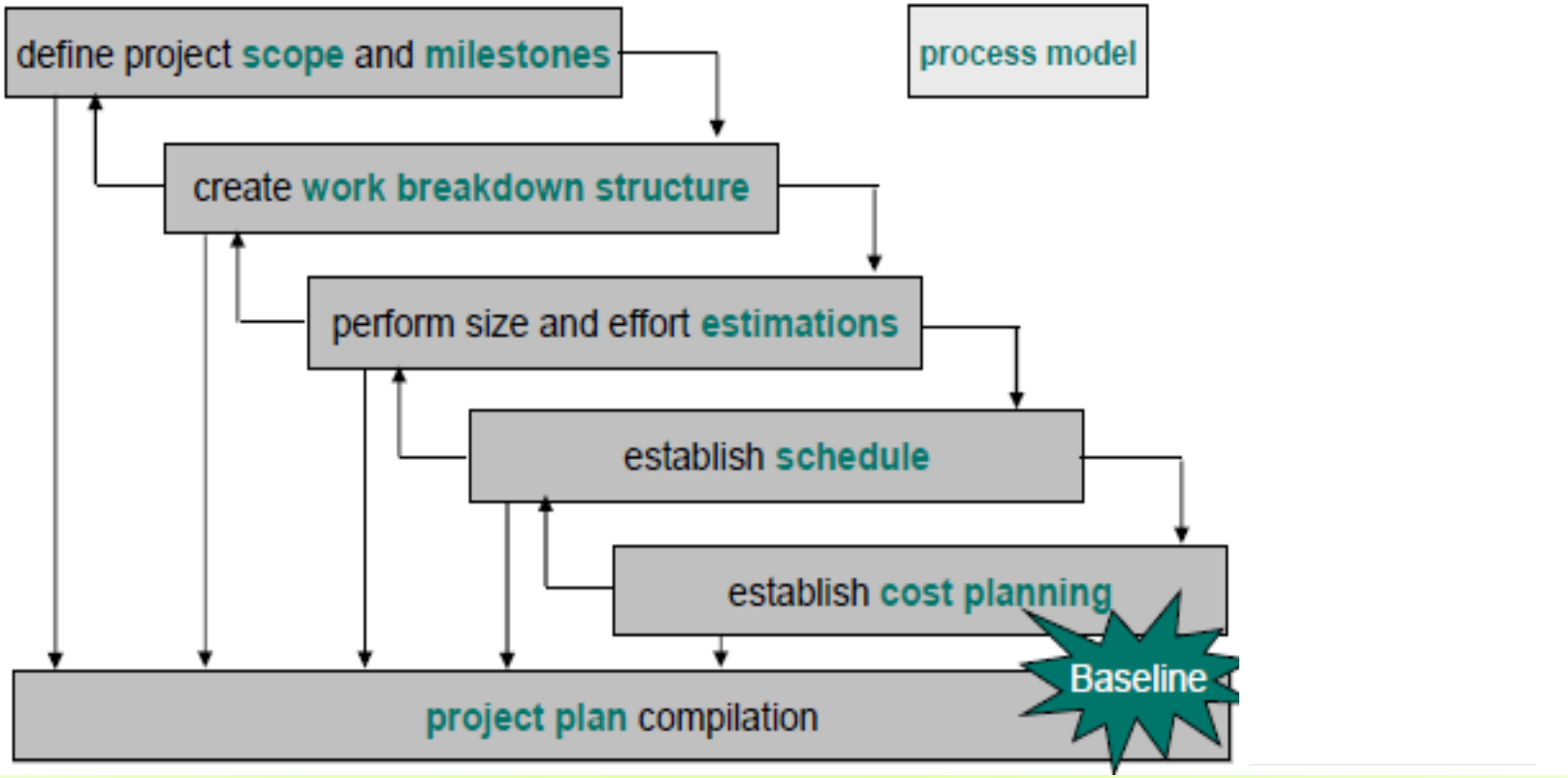
Project Management Concerns

- product quality?
- risk assessment?
- software measurement?
- cost estimation?
- project scheduling?
- customer communication?
- staffing?
- other resources?
- project monitoring?

Project 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 types of plan may be developed to support the main software project plan that is concerned with schedule and budget.

Project Planning Process



The project plan

The project plan sets out:

- The work breakdown activities/tasks **(What)**;
- The resources available to the project **(Who)**;
- A schedule for the work **(When)**.

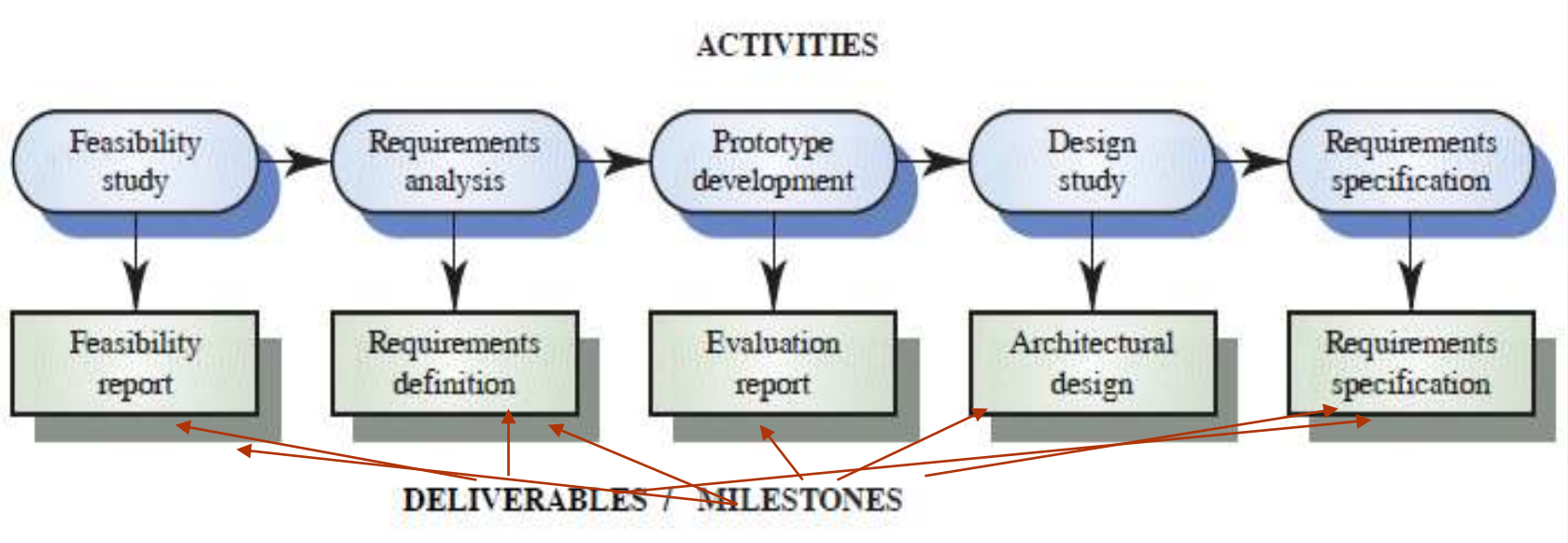
The project plan Structure

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

The project plan Structure

- Activities in a project should be organized 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
  - 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)

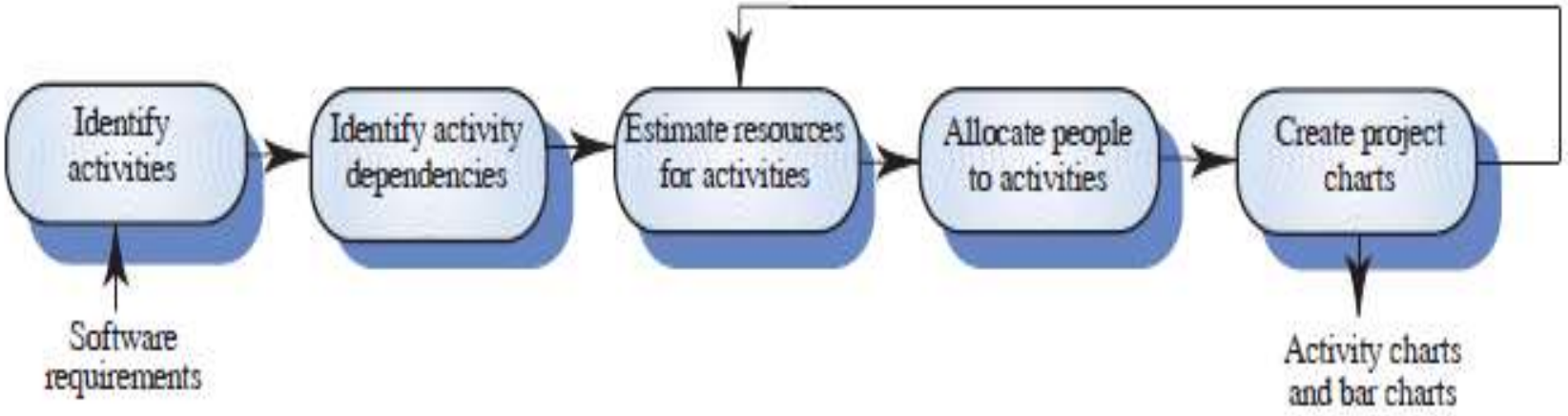


Deliverables are usually milestones

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.

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.

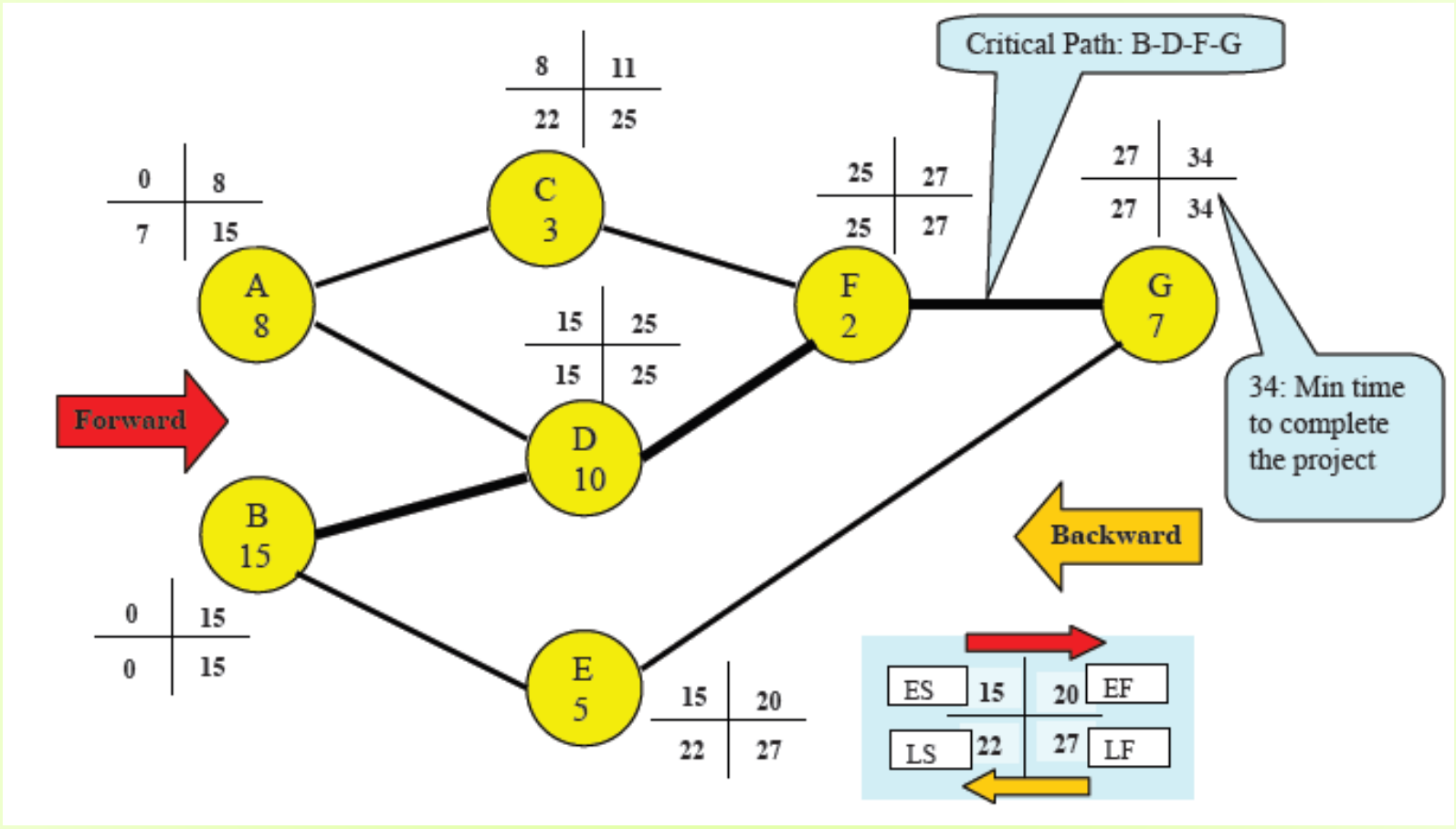
Bar charts and activity networks

- 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.

Project Precedence Table

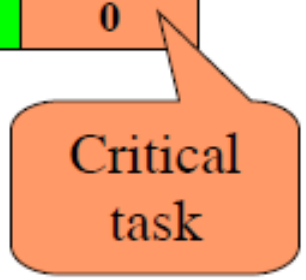
Task	Duration (Weeks)	Precedence
A	8	-
B	15	-
C	3	A
D	10	A, B
E	5	B
F	2	C, D
G	7	E, F

Activity network – Critical Path



Project Precedence Table

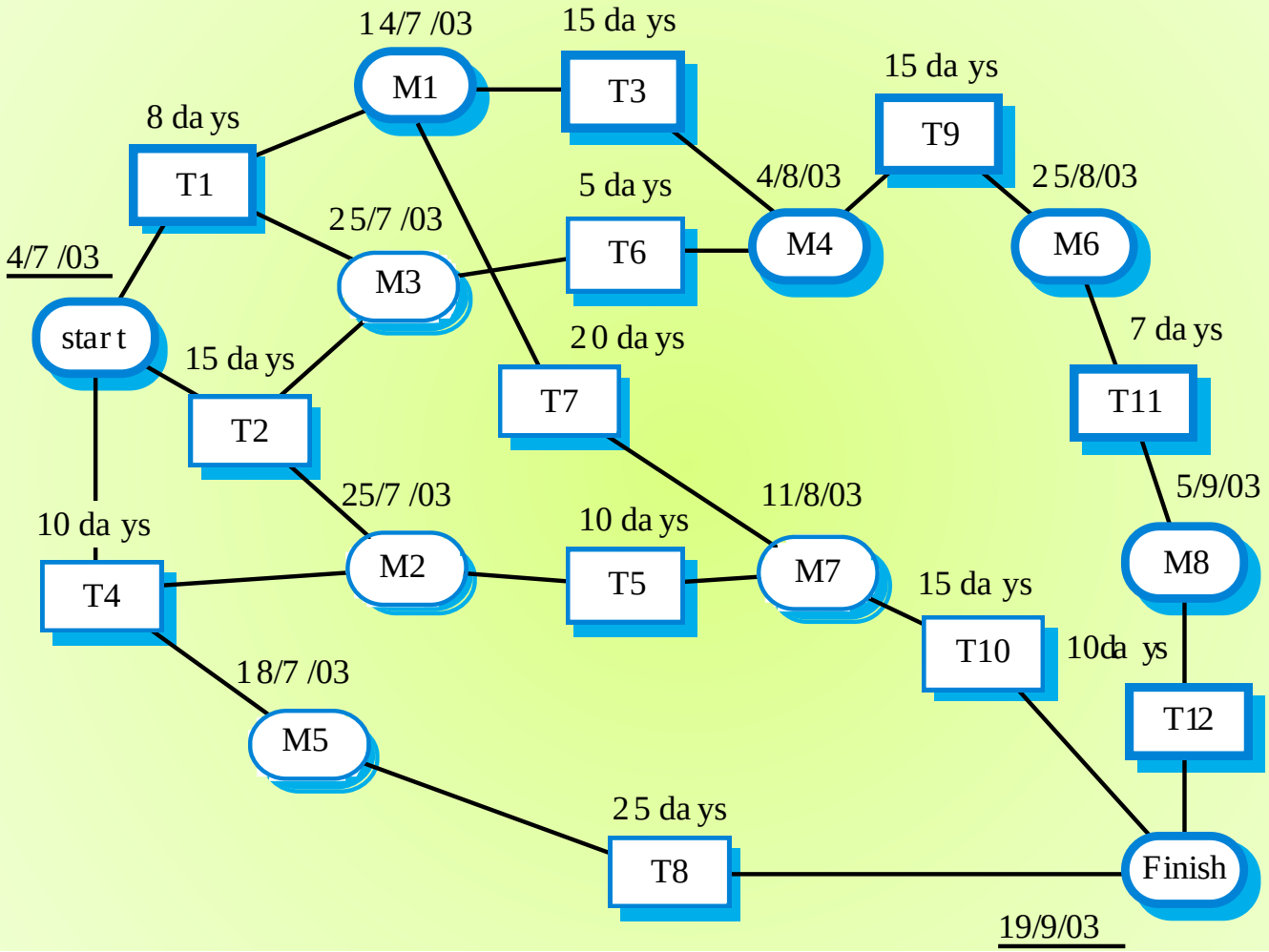
Task	Duration (Weeks)	Precedence	Earliest start	Earliest finish	Latest start	Latest finish	Slack
A	8	-	0	8	7	15	7
B	15	-	0	15	0	15	0
C	3	A	8	11	22	25	14
D	10	A, B	15	25	15	25	0
E	5	B	15	20	22	27	7
F	2	C, D	25	27	25	27	0
G	7	E, F	27	34	27	34	0



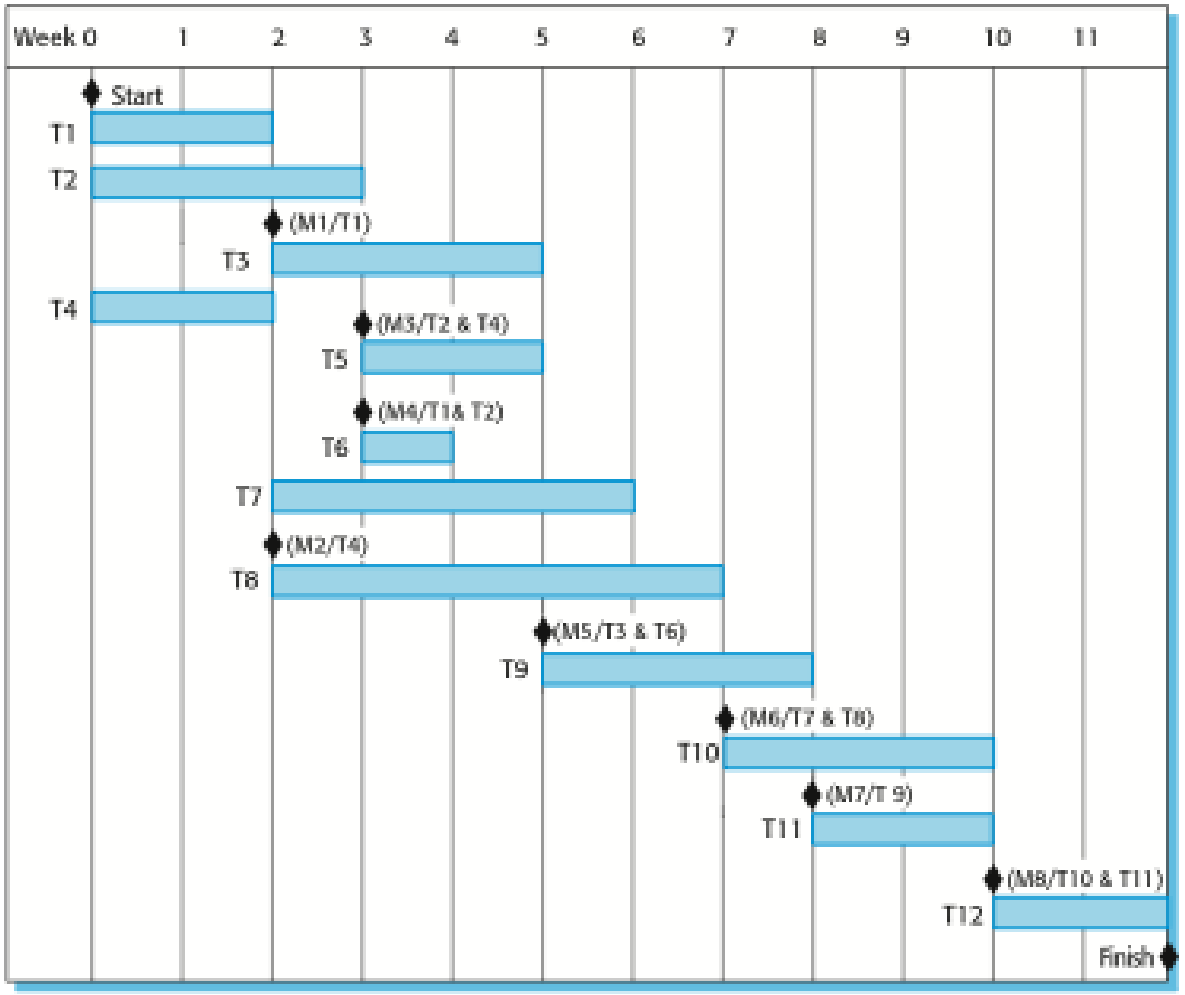
Task durations and dependencies

Activity	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1 (M1)
T4	10	
T5	10	T2, T4 (M2)
T6	5	T1, T2 (M3)
T7	20	T1 (M1)
T8	25	T4 (M5)
T9	15	T3, T6 (M4)
T10	15	T5, T7 (M7)
T11	7	T9 (M6)
T12	10	T11 (M8)

Activity network – (Task dependency)



Bar Chart


Week 0
1
2
3
4
5
6
7
8
9
10
11
Start
T1
T2
(M1/T1)
T3
T4
(M3/T2 & T4)
T5
(M4/T1& T2)
T6
T7
(M2/T4)
T8
(M5/T3 & T6)
T9
(M6/T7 & T8)
T10
(M7/T 9)
T11
(M8/T10 & T11)
T12
Finish