Project Management

CSIT 6th

Project

A project is a temporary endeavor undertaken to provide a unique product or service
A project is a (temporary) sequence of unique complex and connected activities that have one goal or purpose and that must be completed by a specific time, within budget and according to specification.

OR

A project is a sequence of activities that must be completed on time, within budget and according to specification.

Project Management

PM is a process
Scoping,
Planning,
Staffing,
directing and controlling
the development of an acceptable system at minimum cost within a specified time frame.

Project considered as successful

✓ The resulting information system is acceptable to the customer.

✓ The system is delivered "on time".

✓ The system is delivered "within budget".

✓ The system development process had minimal impact ongoing business operations.

A project is said to be failed if:

✓ Failure to establish upper management commitment to the project.

✓ Lack of organization's commitment to the system development method.

✓ Taking shortcuts through or a around the system development method

✓ The project gets behind schedule.

✓ The project is over budget.

✓ The team is not trained or skilled.

✓ Poor planning

Cont....

✓ Lack of quality standards.
✓ Lack of communication between end users and developers.
✓ Changing requirements.

Software project management:

✓ It is 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.

Software Management Distinction

1. *The product is intangible*
2. *Software process are variable and organization specific*
3. *Large software projects are often 'one-off' projects*

✓ *Software engineering is different from other types of engineering in a number of ways. These distinctions make software management particularly difficult. some of differences are:*

 ➢ The product is intangible: it cannot be seen or touched. Software mangers cannot see progress.
 ➢ The product is uniquely flexible.

➢ Software engineering is not recognized as an engineering discipline with the same status as mechanical, electrical engineering, etc.

➢ The software development process is not standardised: process may vary dramatically from one organization to another.

➢ Many software projects are 'one-off' projects: rapid technological changes in computers and communications can make a manager's experience obsolete (out dated). Lessons learned from previous projects may not be transferable to new projects.

- Software Managers are
  - responsible for panning and
  - scheduling project development.

  They supervise the work to ensure that is carried out to the required standards and monitor progress

  to check that the development is on *time and within budget*

  Common activities Software Managers include
  - *Project planning*
  - *Reporting project*
    - *to customer, manager of the company*
    - *Brief , logical and consistent that abstract critical information from detailed project report.*
    - *Must able to present this information during progress review.*
  - *Risk management*
    - *assess the risk that may affect the project*
    - *Monitor the risk and*
    - *take action when problem arises*
  - *People Management*
    - *Responsible for managing a team of people*
    - *Choose people for their team and*
    - *Established way of working that lead to effective team performance.*
  - *Proposal writing*
    - *Writing a proposal to with the contract*
    - *Proposal describe Objective of the project and how it will be carried out*
    - *Cost and schedule estimates*

Management activities

- Proposal writing
- Project planning and scheduling
- Project costing
- 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 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

- Involve making detailed plan to achieve the objectives
  - most time consuming project management activities.
- Activity form initial through to system delivery.
- Plan must be regularly revised and new information becomes available.
- Various plan may be developed to support the main software project plan that is concerned with
  - schedule and budget

Types of project plan

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 of the system, maintenance costs and effort required.
Staff development plan.	Describes how the skills and experience of the project team members will be developed.

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

✓ *The project plan sets out*:
- The resources available to the project;
- The work breakdown;
- A schedule for the work.

✓ The details of the project plan vary depending on the type of project and organization. However, most plans should include the following sections:

1. **Introduction**: This briefly describes the objectives of the project and sets out the constraints (e.g. budget, time etc.) that affect the project management

2. **Project organization**: This describes the way in which the development team is organized, the people involved and their roles in the team.

Cont....

3. **Risk analysis:** This describes possible project risks, the likelihood of these risks arising and the risk reduction strategies that proposed.
4. **Hardware and software resource requirements:** This specifies the hardware and the support software required to carry out the development. If hardware has to be bought, estimate of the prices and delivery schedule may be included.
5. **Work breakdown:** This sets out the breakdown of the project into activities and identifies the milestones and deliverables associated with each activity.
6. **Project schedule:** This shows the dependencies between activities, the estimated time required to reach each milestone and the allocation of people to activities.
7. **Monitoring and reporting mechanisms:** This defines the management reports that should be produced, when these should be produced and the project monitoring mechanisms used.

Milestones and Deliverables:

➤ Activities in a project should be organised to produce tangible outputs for management to judge progress.

➤ *Milestones* are the end-point of a process activity.

➤ *A project milestone is a predictable state where a formal report of progress is presented to management.*

➤ *Deliverables are project results delivered to customers. It is usually delivered at the end of some major phase such as specification or design. Deliverables are usually milestones, but milestones need not be deliverables.*

➤ *Milestones may be internal project results that are used by the project manager to check project delivered to the customer*

➤ The waterfall process allows for the straightforward definition of progress milestones.

➤ To establish milestones, the software process must be broken down into basis activities with associated outputs. The fig (below) shows possible activities involved in requirement specification when prototyping is used to help validate requirements. The milestones in this case are completion of the outputs for each activity. The project deliverables, which are delivered to the customer, are the requirements definition and the requirements specification.

Milestones in the RE process
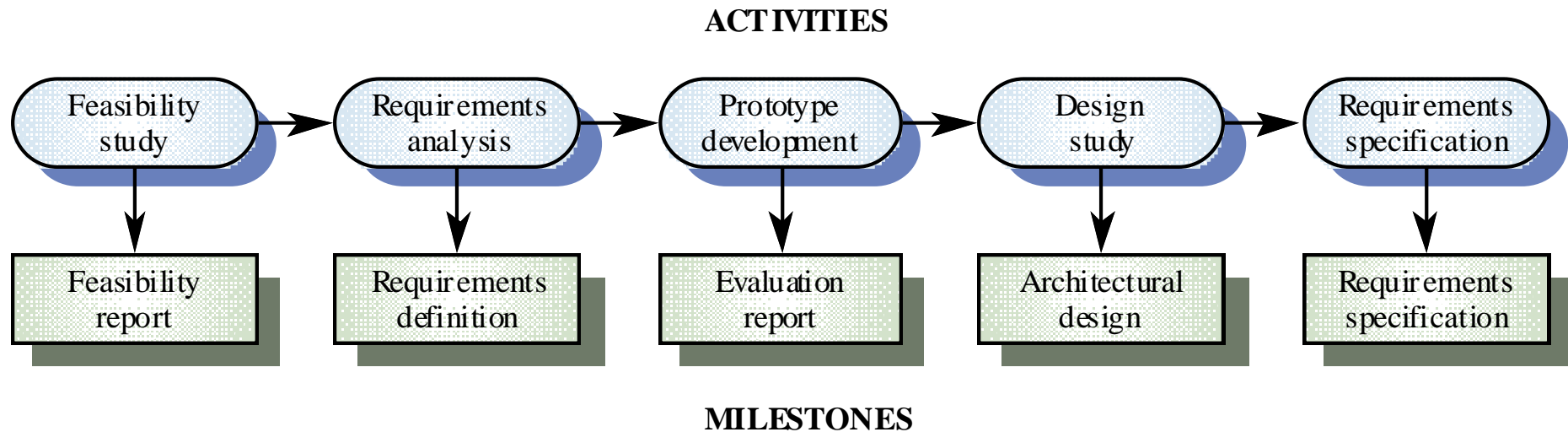
Project Scheduling

➤ It is the one of the most difficult job for a project manager. managers estimate time and resources required to complete activities and organize them into coherent sequence.

It involves:

➤ 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.
   It's Dependent on project managers intuition and experience.
✓ *Project scheduling involves preparing various graphical representations showing project activities, their durations and staffing.*

The project scheduling process
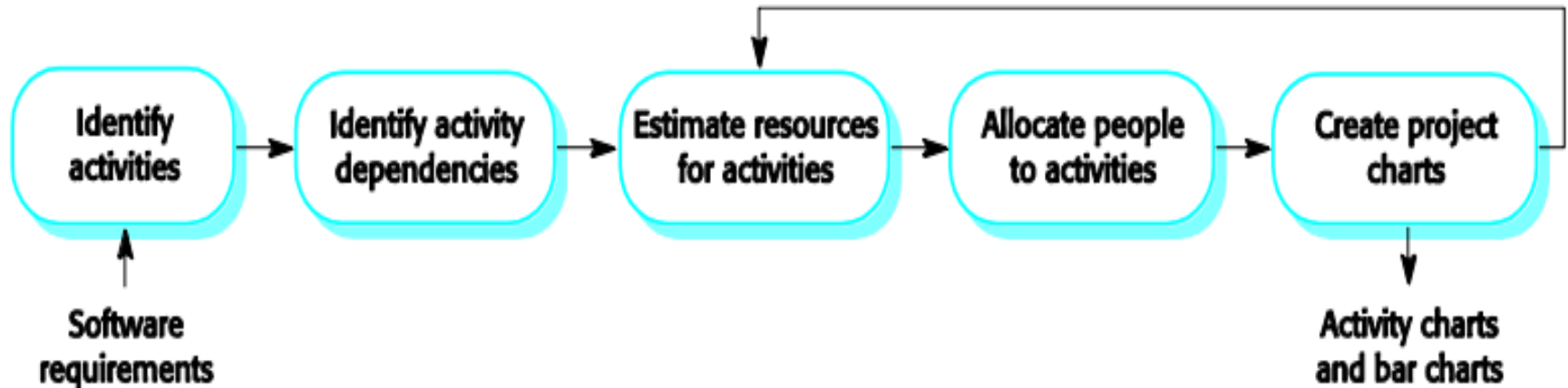
Scheduling problems

- ➢ 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.
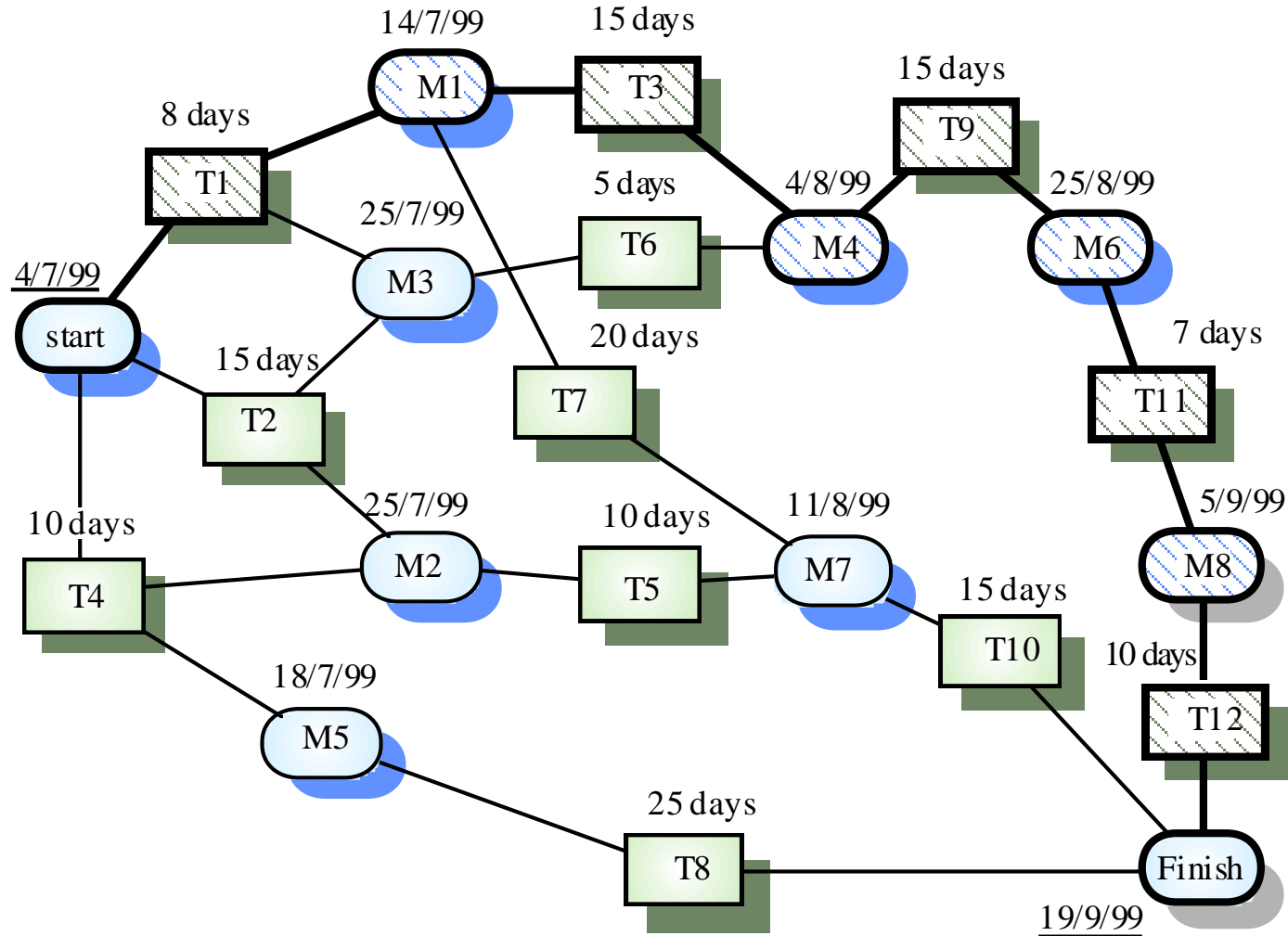- ➢ The unexpected always happens. Always allow contingency in planning.

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 the critical path

- Bar charts show schedule against calendar time

Task durations and dependencies

Task	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

Activity timeline
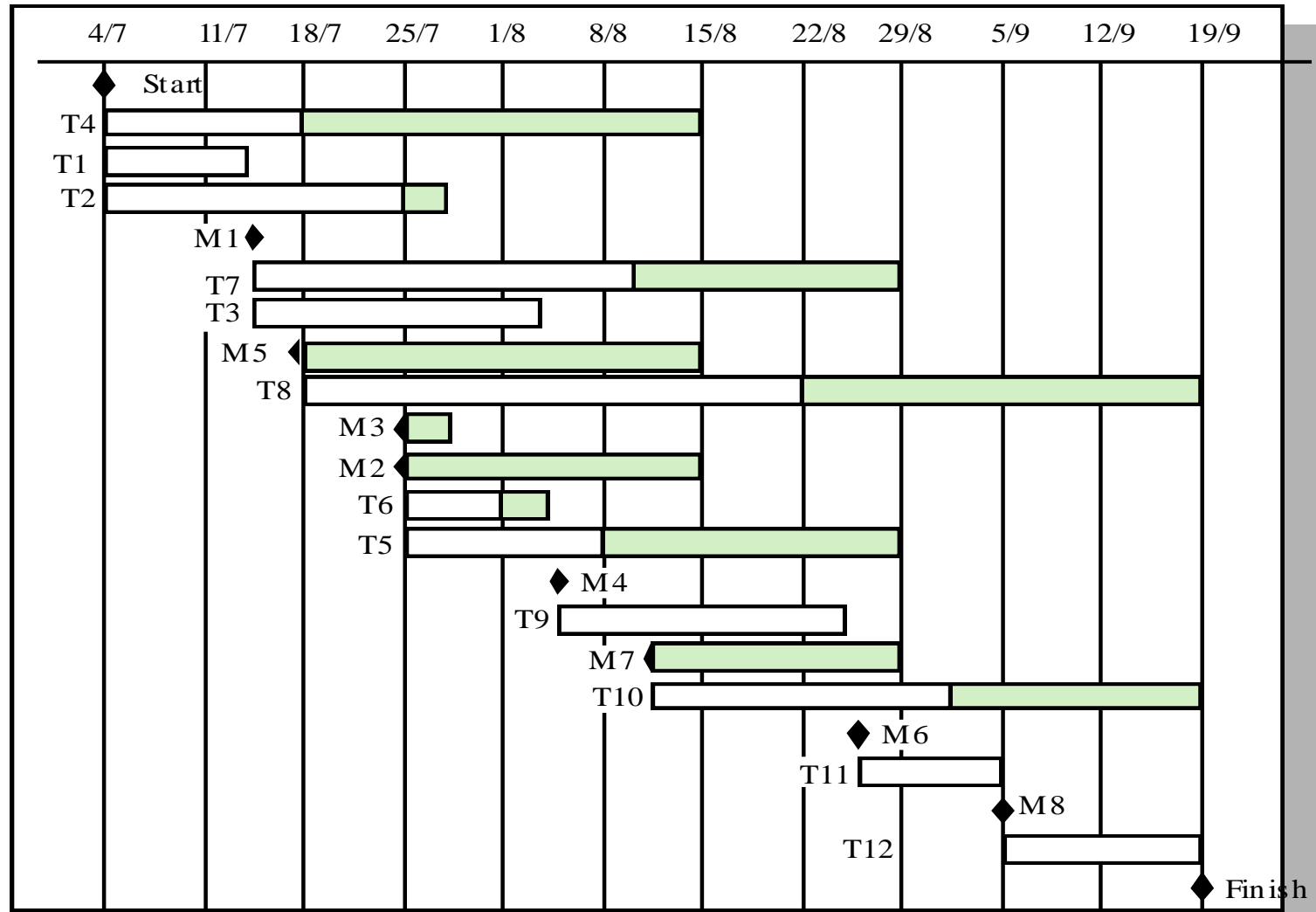
Staff allocation
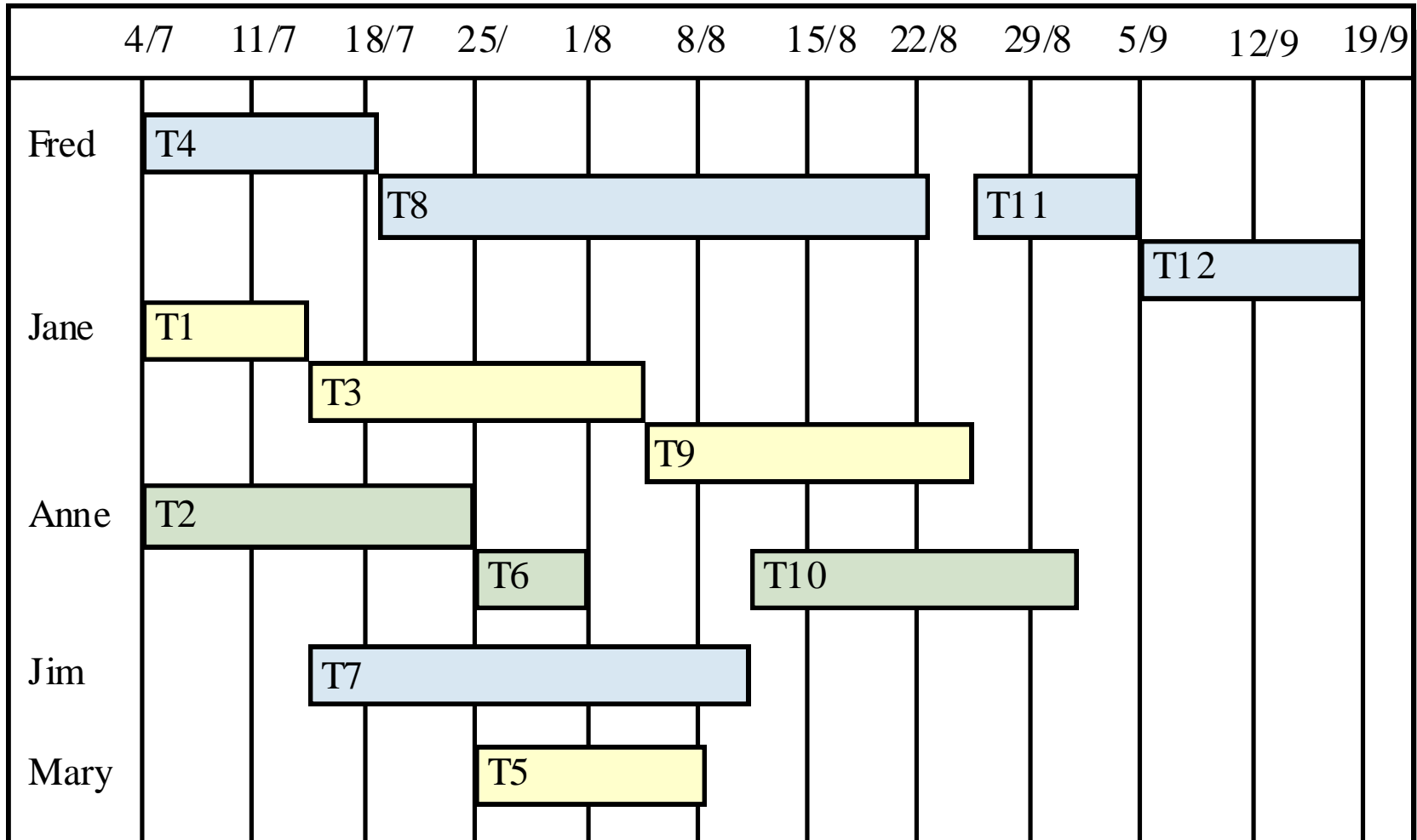
	4/7	11/7	18/7	25/	1/8	8/8	15/8	22/8	29/8	5/9	12/9	19/9
Fred	T4								T11			
			T8								T12	
Jane	T1											
			T3									
						T9						
Anne	T2											
				T6			T10					
Jim			T7									
Mary				T5								

Risk management

- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.

- A risk is a probability that some adverse circumstance will occur.
  - Project risks affect schedule or resources
  - Product risks affect the quality or performance of the software being developed
  - Business risks affect the organisation developing or procuring the software

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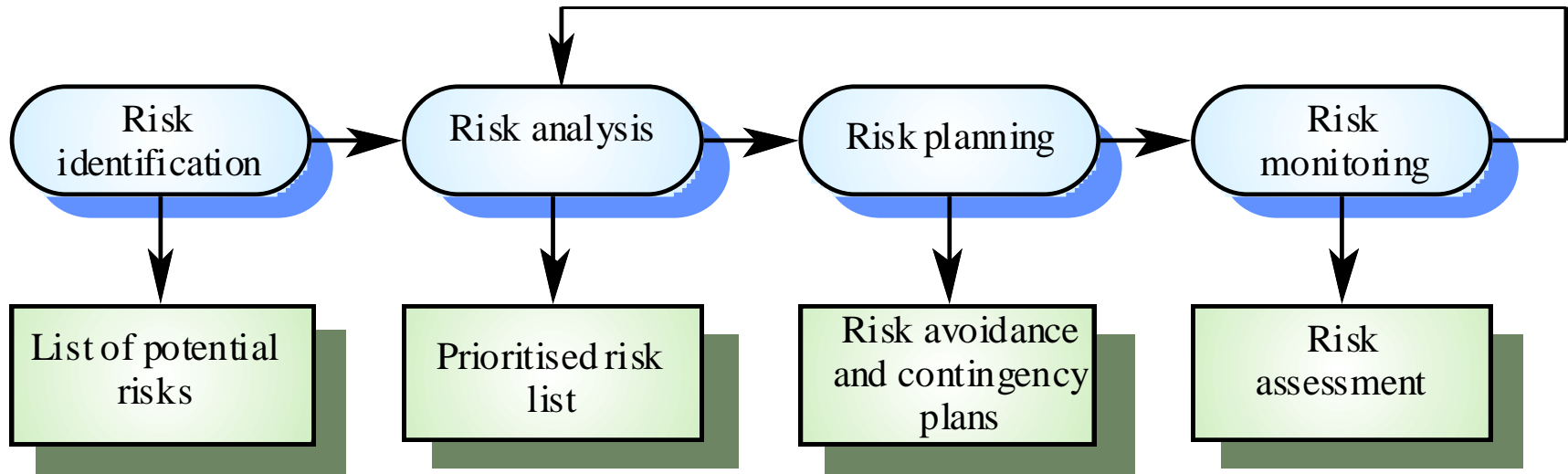
Software risks

Risk	Risk type	Description
Staff turnover	Project	Experienced staff will leave the project before it is finished.
Management change	Project	There will be a change of organisational management with different priorities.
Hardware unavailability	Project	Hardware which is essential for the project will not be delivered on schedule.
Requirements change	Project and product	There will be a larger number of changes to the requirements than anticipated.
Specification delays	Project and product	Specifications of essential interfaces are not available on schedule
Size underestimate	Project and product	The size of the system has been underestimated.
CASE tool under-performance	Product	CASE tools which support the project do not perform as anticipated
Technology change	Business	The underlying technology on which the system is built is superseded by new technology.
Product competition	Business	A competitive product is marketed before the system is completed.

The risk management process

- Risk identification
  - Identify project, product and business risks
- Risk analysis
  - Assess the likelihood and consequences of these risks
- Risk planning
  - Draw up plans to avoid or minimise the effects of the risk
- Risk monitoring
  - Monitor the risks throughout the project

The risk management process

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Risk                Risk analysis  ──►  Risk planning  ──►   Risk
identification ──►                                          monitoring
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Risk identification → List of potential risks

Risk analysis → Prioritised risk list

Risk planning → Risk avoidance and contingency plans

Risk monitoring → Risk assessment

Risk identification

- Technology risks
- People risks
- Organisational risks
- Requirements risks
- Estimation risks

Risks and risk types

Risk type	Possible risks
Technology	The database used in the system cannot process as many transactions per second as expected. Software components which should be reused contain defects which limit their functionality.
People	It is impossible to recruit staff with the skills required. Key staff are ill and unavailable at critical times. Required training for staff is not available.
Organisational	The organisation is restructured so that different management are responsible for the project. Organisational financial problems force reductions in the project budget.
Tools	The code generated by CASE tools is inefficient. CASE tools cannot be integrated.
Requirements	Changes to requirements which require major design rework are proposed. Customers fail to understand the impact of requirements changes.
Estimation	The time required to develop the software is underestimated. The rate of defect repair is underestimated. The size of the software is underestimated.

Risk analysis

- Assess probability and seriousness of each risk

- Probability may be very low, low, moderate, high or very high

- Risk effects might be catastrophic, serious, tolerable or insignificant

Risk analysis

Risk	Probability	Effects
Organisational financial problems force reductions in the project budget.	Low	Catastrophic
It is impossible to recruit staff with the skills required for the project.	High	Catastrophic
Key staff are ill at critical times in the project.	Moderate	Serious
Software components which should be reused contain defects which limit their functionality.	Moderate	Serious
Changes to requirements which require major design rework are proposed.	Moderate	Serious
The organisation is restructured so that different management are responsible for the project.	High	Serious
The database used in the system cannot process as many transactions per second as expected.	Moderate	Serious
The time required to develop the software is underestimated.	High	Serious
CASE tools cannot be integrated.	High	Tolerable
Customers fail to understand the impact of requirements changes.	Moderate	Tolerable
Required training for staff is not available.	Moderate	Tolerable
The rate of defect repair is underestimated.	Moderate	Tolerable
The size of the software is underestimated.	High	Tolerable
The code generated by CASE tools is inefficient.	Moderate	Insignificant

Risk planning

- Consider each risk and develop a strategy to manage that risk

- Avoidance strategies
  - The probability that the risk will arise is reduced

- Minimisation strategies
  - The impact of the risk on the project or product will be reduced

- Contingency plans
  - If the risk arises, contingency plans are plans to deal with that risk

Risk management strategies

Risk	Strategy
Organisational financial problems	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
Recruitment problems	Alert customer of potential difficulties and the possibility of delays, investigate buying-in components.
Staff illness	Reorganise team so that there is more overlap of work and people therefore understand each other's jobs.
Defective components	Replace potentially defective components with bought-in components of known reliability.
Requirements changes	Derive traceability information to assess requirements change impact, maximise information hiding in the design.
Organisational restructuring	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
Database performance	Investigate the possibility of buying a higher-performance database.
Underestimated development time	Investigate buying in components, investigate use of a program generator.

Risk monitoring

- Assess each identified risks regularly to decide whether or not it is becoming less or more probable

- Also assess whether the effects of the risk have changed

- Each key risk should be discussed at management progress meetings

Risk factors

Risk type	Potential indicators
Technology	Late delivery of hardware or support software, many reported technology problems
People	Poor staff morale, poor relationships amongst team member, job availability
Organisational	organisational gossip, lack of action by senior management
Tools	reluctance by team members to use tools, complaints about CASE tools, demands for higher-powered workstations
Requirements	many requirements change requests, customer complaints
Estimation	failure to meet agreed schedule, failure to clear reported defects

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.

- Risks may be project risks, product risks or business risks

- Risk management is concerned with identifying risks which may affect the project and planning to ensure that these risks do not develop into major threats

Planning

- Pre determine course of action.

- Represents goal and

    activities to achieve these goals.

- Planning is an ongoing organizational function that provides the framework for operational activities and decision making.

- The organizational mission is translated into operational objectives through an organizational hierarchy of planning activities.

- Focuses on energies and activities of the organization on achievement of its objective

Reason for planning system.

1. To offset uncertainty:

   Aside from the uncertainty of business operations and the resulting need for better forecasting information, the special need for a system plan is evident because of advancing computer technology and its widespread effect on business operations. Both s/w and h/w have become so complete that the job of selection and utilization is much more difficult. As a result, the majority of organizations have fallen for short of their potential to use computers for processing the information necessary to manage the company effectively.

   A master plan may not remove the uncertainty, but it will almost surely place the firm in a better position to deal with the unknowns and to take advantage of development as they occur.

2. To improve economy of operations:

   Planning the overall approach to an integrated system is also economical when one job or function is automated; the need for design and automation of contiguous functions frequently becomes obvious. Money can be saved and performance improved by an effective linking together of these neighboring functions through a good plan for integrated system design.

Cont..

3. To focus on objectives:

   A good plan for system development also serves to focus on company and system objectives. Planning cannot proceed in any area of endeavor until adequate objectives have been first set. It follows that development of a master system plan forces examination and definition of objectives.

4. To provide a device for control of operations:

   Control: control is the activity which measures deviation from planned performance and initiates corrective action. System development, implementation and operations are among the most difficult of activities within the company to control. A major advantage of the development of system effort under a predetermined plan is that the plan provides a means for subsequent plan.

Project plans activities:

The following items should certainly be included in every project plan:

1. Negotiate scopes:

Scope defines the boundaries of a project and included in the statement of work, a narrative description of the work to be performed as part of a project.

All parties must agree to the project scope before any attempt is made to identify and schedule tasks or to assign resources (people) to those tasks.

2. Identity tasks:

Tasks identify the work to be done. Typically, this work is defined in a top-down, outline manner. A work breakdown structure (WBS) is a hierarchical decomposition of the project into tasks and sub-tasks. Some tasks represent the completion of milestones or the completion of major deliverables during a project.

3. Estimate task duration:

Duration of any tasks is a random variable subject to factors such as the size of team, number of users, availability of users, aptitudes of users, complexity of the business system, information technology architecture, experiences of team personal, time committed to other projects, and experiences with other projects.

4. Given the duration estimates for all tasks, we can begin to develop a project schedule. The project schedule depends not only on task duration but also on intertask dependencies.

The start or completion of individual tasks may be dependent on the start or completion of other tasks. These dependencies impact the completion of any project.

There are four types of intertask dependencies:

Finish-to-start (FS) - the finish of one task triggers the start of another task.

Start-to-start (SS) - the start of one task triggers the start of another task.

Finish-to-finish (FF) – two tasks must finish at the same time.

Start-to-finish (SF) – the start of one task signifies the finish of another task.

5. Assign resources:

The following resources may impact a project schedule:

People, services, facilities and equipment, supplies and materials and money.

6. One of the most important dimensions of directing the team effort is the supervision of people.

7. Assess project result and experiences:

This final activity involves soliciting feedback from project team members (including customers) concerning their project experiences and suggestions aimed at improving the project (and process) management of the organization.
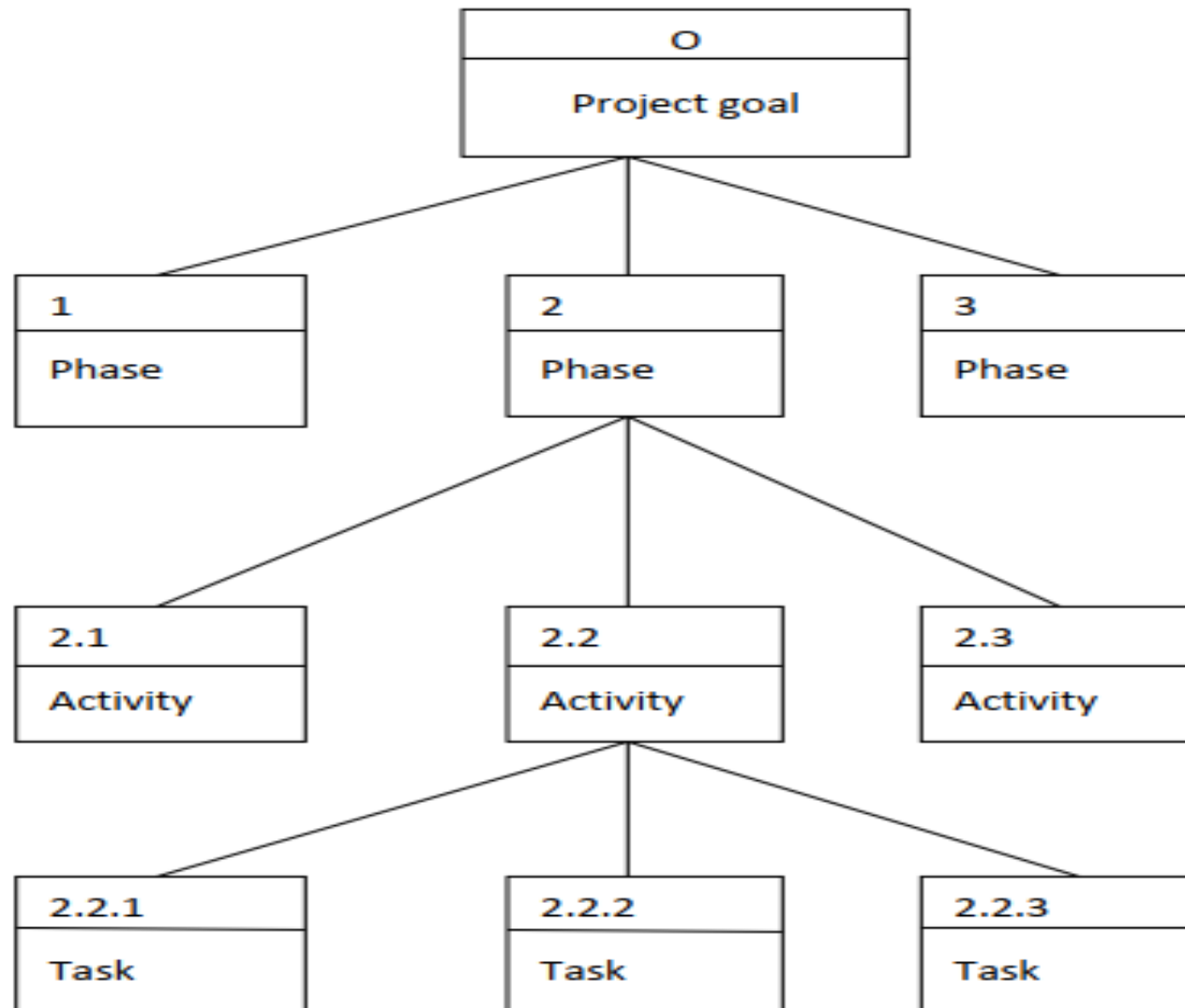
Planning techniques:

1. Work breakdown structure:

   A fundamental concept in project management is the work breakdown structure (WBS). A work breakdown structure is a hierarchical decomposition of the project into phases, activities, and tasks.

   Or

   -system to subsystem

   -subsystem to task

   - Task to subtask

   -subtask to word package.

Graphical work breakdown structure

Or

1 Phase 1 of the project

1.1 Activity 1 of the phase 1
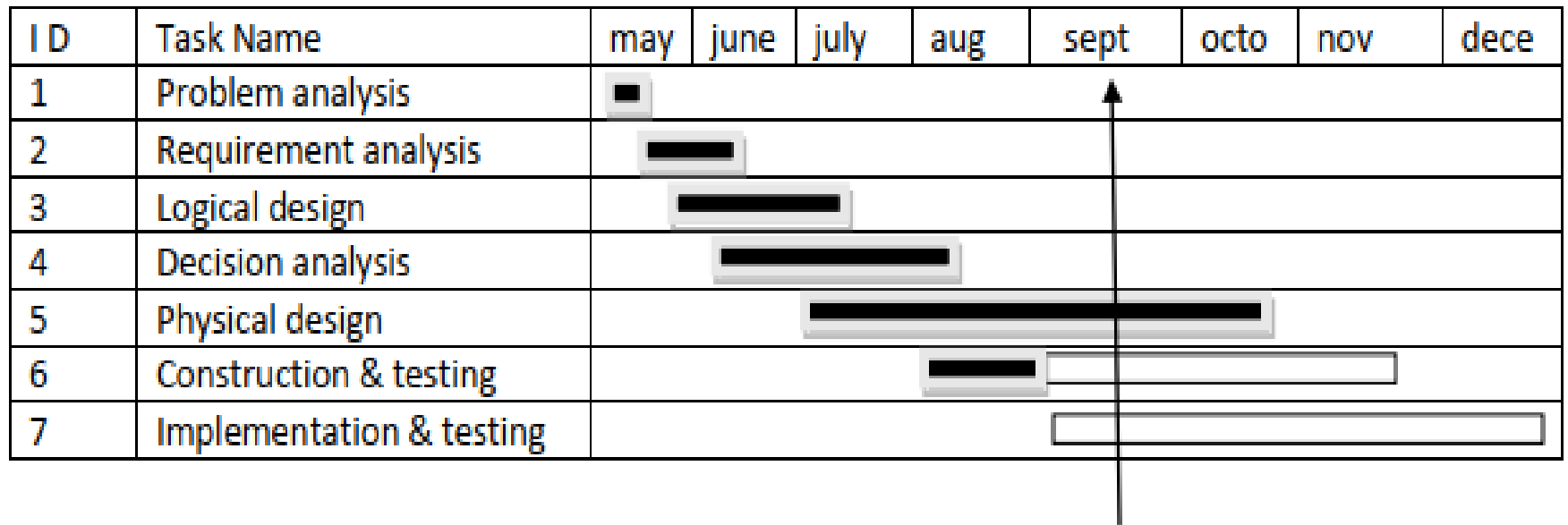
1.1.1 Task 1 of the activity 1 in the phase 1

1.1.2 Task 2 of activity 1 in the phase 1.

1.2 Task 2 of phase 1.

2 phase 2 of the project.

Gantt chart:

A Gantt chart depicts an overall picture of events and schedule of each task. It lists activities vertically downwards on the left most column while the time-periods in months, weeks or days, appear horizontally in the topmost row.

I D	Task Name	may	june	july	aug	sept	octo	nov	dece
1	Problem analysis	▬							
2	Requirement analysis		▬▬						
3	Logical design			▬▬					
4	Decision analysis				▬▬				
5	Physical design					▬▬▬			
6	Construction & testing					▬▢			
7	Implementation & testing						▢		

Today

Legends

▬ Complete task

▢ Incomplete task

Fig: Gantt chart

Task D	
Tue2/20/01	7 days

Task A	
Tue2/5/01	3 days
Tue2/5/01	0 days

Task B	
Tue2/7/01	2 days
Tue2/7/01	0 days

Task C	
Tue2/3/01	7 days
Tue2/3/01	0 days

Task D	
Tue2/13/01	6days
Tue2/20/01	1 day

Task I	
Tue2/27/01	5 days
Tue2/27/01	0 days

Task F	
Tue2/14/01	3 days
Tue2/16/01	2 days

Task G	
Tue2/16/01	2 days
Tue2/20/01	2 days

Task H	
Tue2/15/01	1 day
Tue2/10/01	3 days
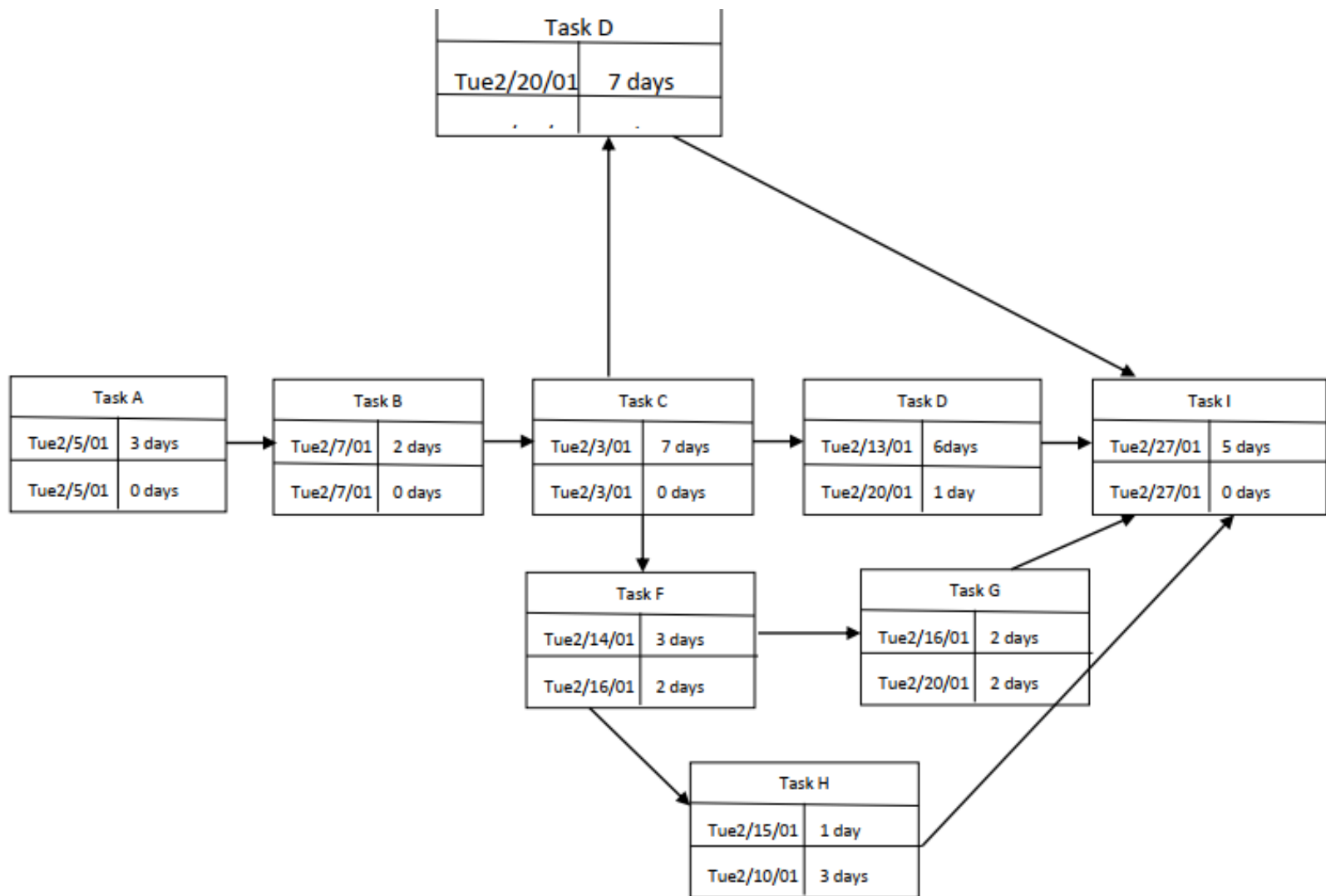
Suppose a project consists of the nine primitive tasks as shown in fig. The most likely duration (in days) for each task is recorded. There are four distinct sequences of tasks in a project. They are:

PATH 1: A →B →C →D →I

PATH 2: A→ B→C →E→I

PATH 3: A→B →C →F →G→I

PATH 4: A→B→ C→ F→ H→ I

The total of likely duration times for each path is calculated as follows:

PATH 1: 3+2+2+7+5=19

PATH 2: 3+2+2+6+5=18

PATH 3: 3+2+2+3+2+5=17

PATH 4: 3+2+2+3+1+5=16