Chapter 8: Resource Allocation

What is Resource Allocation

Up till now, the activities have been identified using various techniques.

1. Using activity network analysis, we were able to identify

when the activities should take place.

2. Using PERT technique, we were able to forecast a range of

expected dates by which activities would be completed.

- In both cases, the availability of resources was not taken into consideration.

- When we allocate resources to the identified activities . This process is considered resource allocation.

What is Resource Allocation

- **The allocation of resources to activities will lead to:**
– the review and
– modification of the ideal activity plan.
- **Resource allocation may lead to:**
– Revising a stage.
– Revising project completion dates.
– Narrowing activity time spans.

Resource Nature

Resources will fall into one of seven categories:

Labour (the project manager, system analysts, software developers……).

Equipment: used items (workstations, office equipment, desks, chairs…).

Materials (Consumed items – floppy disks, paper, printer ink…..).

Space : for additional staff recruited or contracted (Rooms, Cubicles).

Services (Telecommunication services, Cleaning services………..).

Time (The most rigid item of all).

- Extended if other resources are reduced and
- Reduced if other resources are increased.

Money (Secondary resource).

- Used to buy other resources,
- Is consumed while other resources are being used.

Identifying Resource Requirements

- **Resource allocation plan:**
- **The first step is to prepare the resource requirement list:**
- A list of the resources that will be required.
- Along with the expected level of demand.
- **Normally this will be done by considering each activity in turn.**
- **But there could be resources that are not activity specific.**
- **Resources that are part of the project infrastructure:**
- Project manager.
- **Resources required to support other resources.**
- Office space required to house contract software developers.

Example

Activity	Estimated duration (days)	Activity	Estimated duration (days)
Specify overall system	34	Design module C	4
Specify module A	20	Design module D	4
Specify module B	15	Code/test module A	30
Specify module C	25	Code/test module B	28
Specify module D	15	Code/test module C	15
Check specification	2	Code/test module D	25
Design module A	7	System integration	6
Design module B	6		

Precedence Network
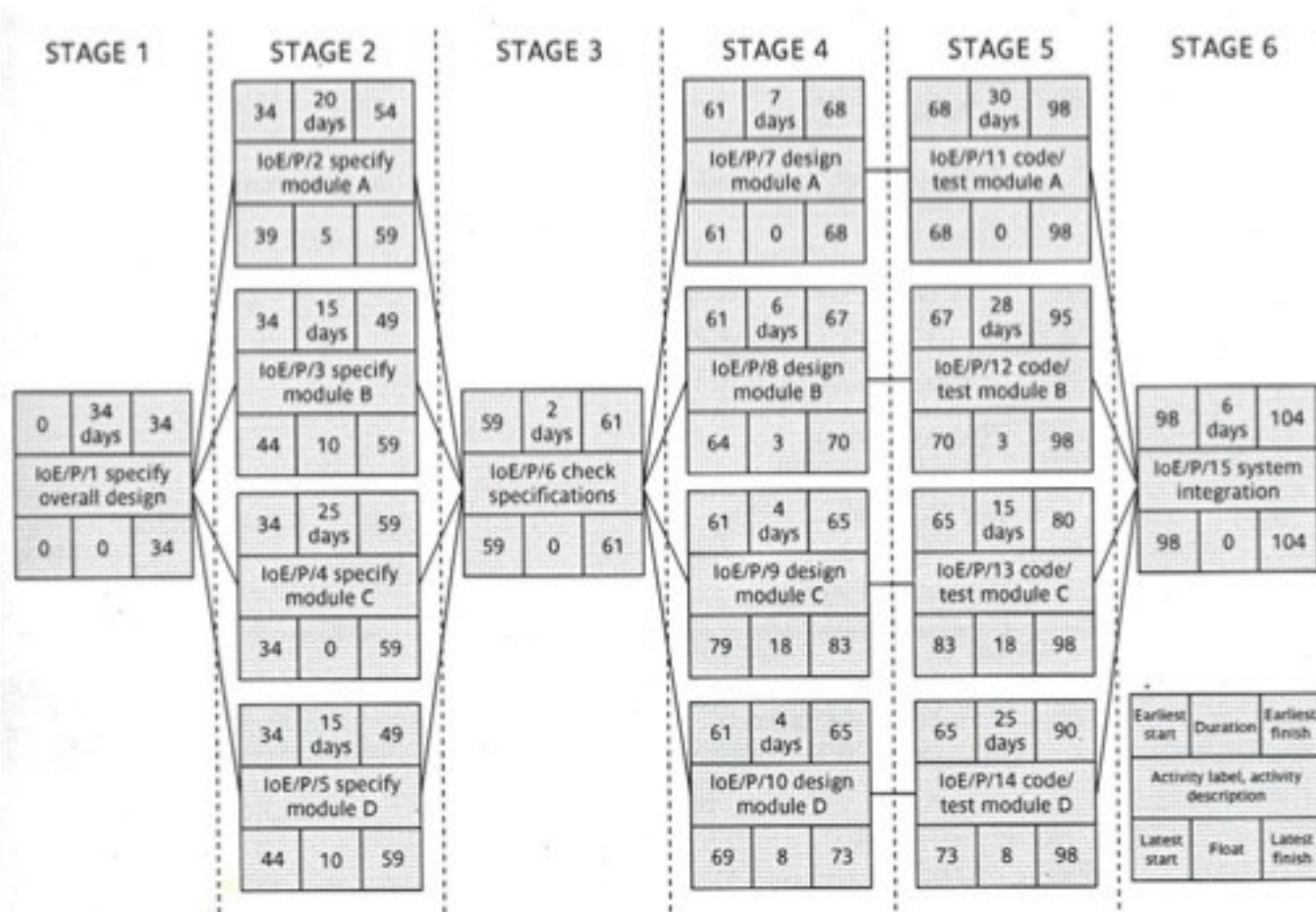
Resource Requirement List Example

Stage	Activity	Resource	Days	Quantity	Notes
ALL		Project manager	104 F/T		
1	All	Workstation	–	1	Check software availability
	IoE/P/1	Senior analyst	34 F/T		
2	All	Workstation	–	4	One per person essential
	IoE/P/2	Analyst/designer	20 F/T		
	IoE/P/3	Analyst/designer	15 F/T		
	IoE/P/4	Analyst/designer	25 F/T		
	IoE/P/5	Analyst/designer	15 F/T		Could use analyst/programmer
3	All	Workstation	–	2	
	IoE/P/6	Senior analyst*	2 F/T		
4	All	Workstation	–	4	As stage 2
	IoE/P/7	Analyst/designer	7 F/T		
	IoE/P/8	Analyst/designer	6 F/T		
	IoE/P/9	Analyst/designer	4 F/T		
	IoE/P/10	Analyst/designer	4 F/T		
5	All	Workstation	–	4	One per programmer
	All	Office space	–		If contract programmers used
	IoE/P/11	Programmer	30 F/T		
	IoE/P/12	Programmer	28 F/T		
	IoE/P/13	Programmer	15 F/T		
	IoE/P/14	Programmer	25 F/T		
6	All	Full system access	–		Approx. 16 hours for full system test
	IoE/P/15	Analyst/designer	6 F/T		

Resource Scheduling

- After all the **required resources** have been **identified,** they need to be **scheduled** effectively.

- So we need to **map the resources** to **the activity plan** to asses the distribution of the resources over the duration of the project.

- This mapping is best done by representing <u>the activity plan as a bar chart</u> and using a **resource histogram** for each resource.

Bar chart and resource histogram for analyst/designers
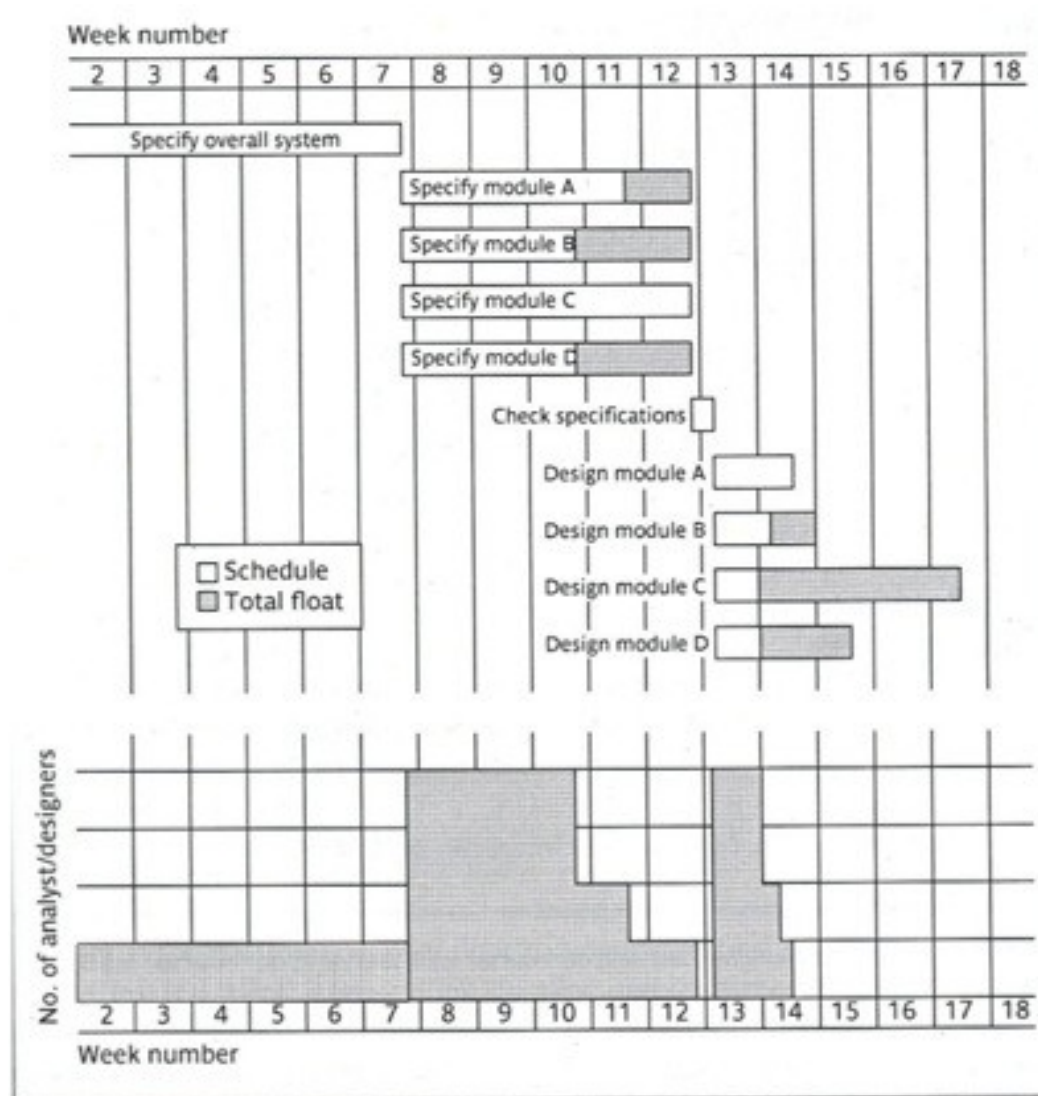
Resource Scheduling

- Allocating a resource (a member of the project team) to an activity limits the flexibility for resource allocation and scheduling of other activities.
  - Since each activity has a start and an end date this team member will not be available for the other activities for that period.
- Due to the above it is a good idea to <u>prioritize the activities</u> so that resources can be allocated to completing activities in a rational order.

Prioritizing Activities

- **Total Float Priority**
- Activities with the smallest total float are given highest priority.
- Thus Activities are allocated resources in ascending order of total float.
- It is desirable to recalculate floats as the scheduling proceeds. Why?

Prioritizing Activities (cont'd)

- **Ordered List Priority**

  Activities that can proceed at the same time are ordered according to a set of simple criteria such as:

Burman's priority list :

1. Shortest critical activity.

2. Critical activities.

3. Shortest non-critical activity.

4. Non-critical activity with least float.

5. Non-critical activities.

Critical Paths

- Resource scheduling will almost always change the activity network.
- The changes often result in changes to the critical path.
- Delaying an activity due to lack of resources will cause that activity to become critical after it uses up all its float.

Staff Allocation Issues

In allocating individuals to tasks, a number of factors need to be taken into account.

- **Availability**
– Whether a particular individual will be available when needed.
– Investigate the risks that can prevent that from happening.
- **Criticality**
– Allocating more experienced personnel to critical activities often:
- Shortens the project duration
- Or at least reduces the risk of overrun.
- **Risk**
– Allocating the most experienced staff to the highest-risk activities is

likely to have the greatest effect in reducing overall project uncertainties.

Staff Allocation Issues

- **Training**

  Allocate junior staff to appropriate non critical activities, so there will be enough slack for them to train and develop skills.

- **Team Building**

  The selection of individuals in the project team must take account of :
  - the final shape of the project team,
 - the way they will work together.

Cost Scheduling

- **A detailed cost schedule will be created:**

– Showing weekly or monthly costs over the life of the project.

- **Broad Categories**

– Staff.

– Overheads (Office Space, Interest charges, Travel Costs,

Insurance and so on).

– Usage charges (for external resources or contractors, leased/rental equipment).

Work Schedule
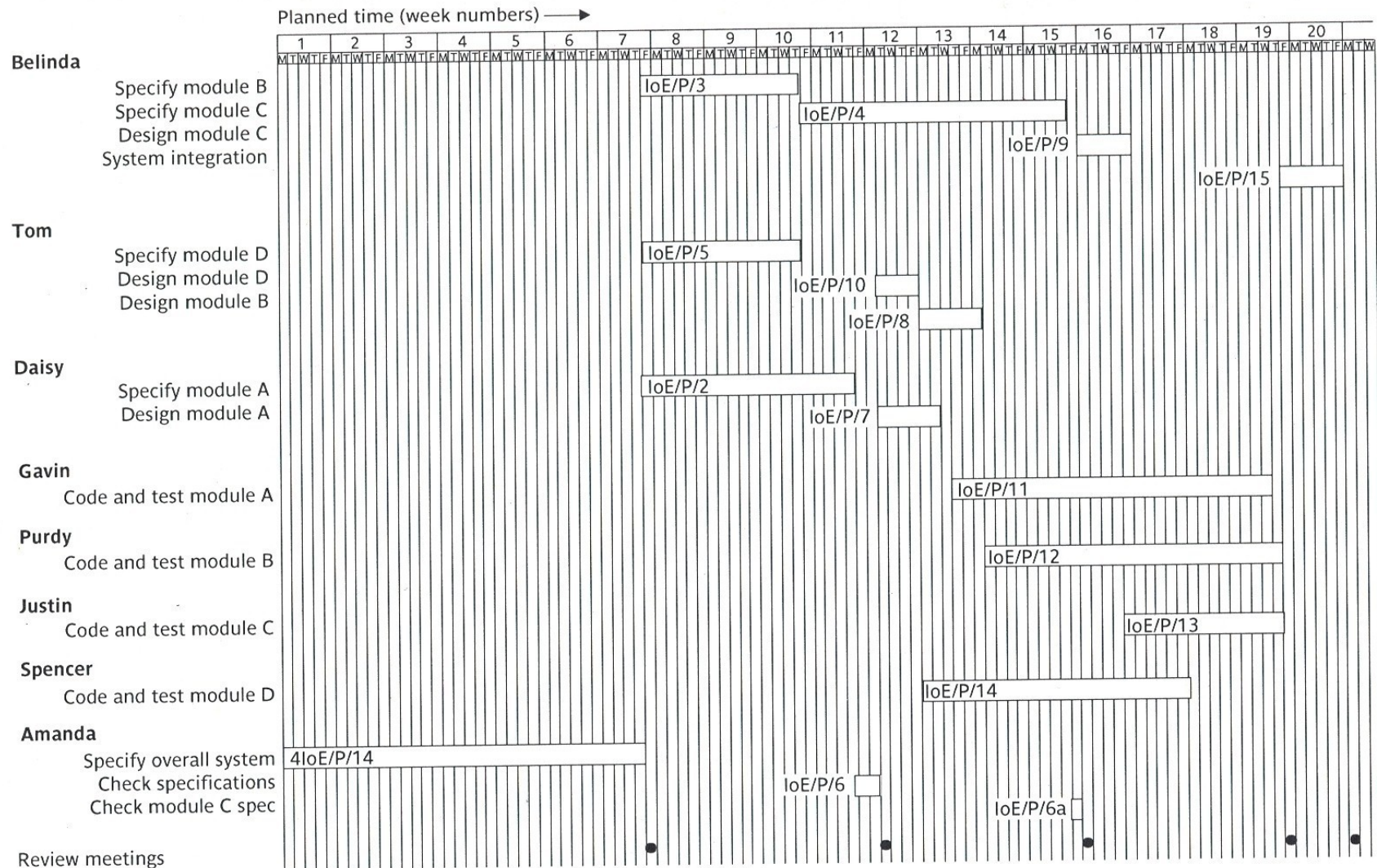
The Project Scheduling Sequence

In the ideal world, we would start with the activity plan and use this as the basis for our risk assessment. The activity plan and risk assessment would provide the basis for our resource allocation and schedule from which we would produce cost schedules
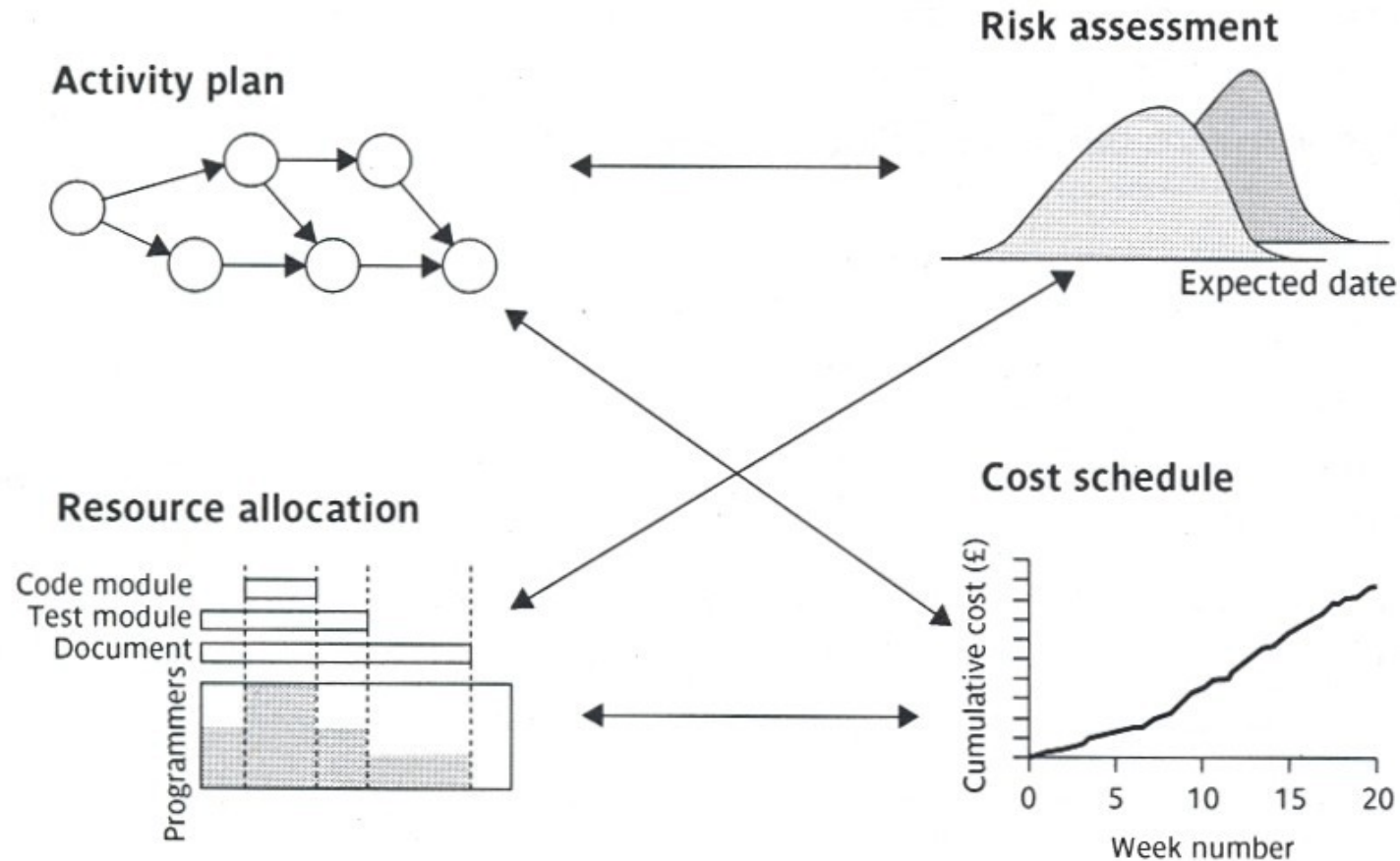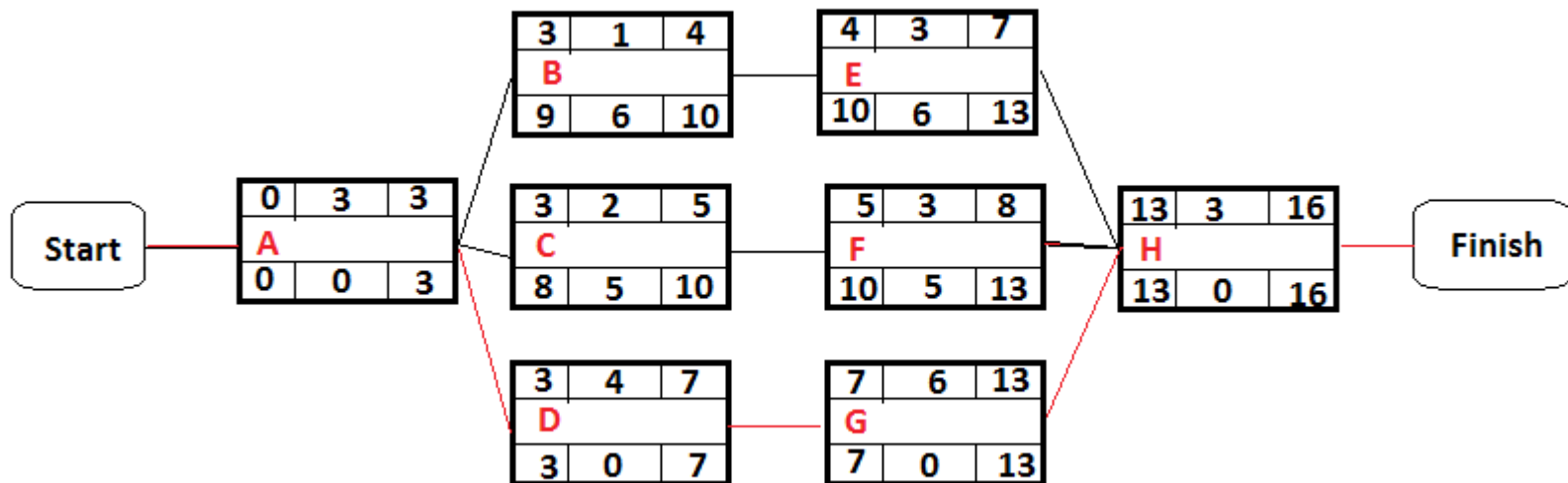
Exercise

Activity	Duration	Depends on	Resource type
A	3 days		SA
B	1 day	A	SD
C	2 days	A	SD
D	4 days	A	SD
E	3 days	B	SC
F	3 days	C	SC
G	6 days	D	SC
H	3 days	E,F,G	SA

SA = systems analyst; SD = systems designer; SC = software coder

Precedence Network

(1) Draw the precedence network by performing the forward and backward passes.

Exercise (cont'd)

(1) Produce a table showing the number of specialists of each type needed on each day of the project if every activity was started as soon as possible.

(2) How many of each type of resource (minimum) will need to be recruited for the project as a whole if the earliest finish date is to be preserved? (1 SA, 3 SD, 2 SC)

Exercise (cont'd)

- **What impact would there be on the project in slide 32 if there were only two system designers?**

Solution

- So if there were only two system designers, **the completion date of the project still will be 16 weeks and the critical path is still the same.**

- But now we have **5 staff members (1 SA, 2 SD, 2 SC) instead of 6 as before (1 SA, 3 SD, 2 SC) , which could result in reducing** the project expenditure (cost).

Exercise (cont'd)

- **What impact would there be on the project in slide 32 if there were only one system designer but you had three software coders?**

Solution

- So if there were only one system designer but you had three software coders, the completion date of the project still will be **16 weeks.**

- But now we have **5 staff** members (1 SA, 1 SD, 3 SC) instead of 6 as before (1 SA, 3 SD, 2 SC) , which could result in reducing the project expenditure (cost).

- Also now we have **2 critical paths** start A- D-G-H-finish" and "start A- D- G-H-finish", instead of only one critical path as before "start A- C- F-H-finish".