8.Resource allocation

The final result of resource allocation will normally be a number of schedules, including:

- an activity schedule indicating the planned start and completion dates for each activity;
- a resource schedule showing the dates on which each resource will be required and the level of that requirement;
- a cost schedule showing the planned cumulative expenditure incurred by the use of resources over time.

The Nature of Resources

A resource is any item or person required for the execution of the project. This covers many things – from paper clips to key personnel – and it is unlikely that we would wish to itemize every resource required, let alone draw up a schedule for their use. Stationery and other standard office supplies, for example, need not normally be the concern of the project manager – ensuring an adequate supply is the role of the office manager. The project manager must concentrate on those resources which, without planning, might not be available when required.

In general, resources will fall into one of seven categories.

- **Labour** The main items in this category will be members of the development project team such as the project manager, systems analysts and software developers. Equally important will be the quality assurance team and other support staff and any employees of the client organization who might be required to undertake or participate in specific activities.
- **Equipment** Obvious items will include workstations and other computing and office equipment. We must not forget that staff also need basic equipment such as desks and chairs.
- **Materials** are items that are consumed, rather than equipment that is used. They are of little consequence in most software projects but can be important for some – software that is to be widely distributed might, for example, require supplies of disks to be specially obtained.
- **Space** For projects that are undertaken with existing staff, space is normally readily available. If any additional staff (recruited or contracted) should be needed then office space will need to be found.
- Services Some projects will require procurement of specialist services – development of a wide area distributed system, for example, requires scheduling of telecommunications services.
- **Time** is the resource that is being offset against the other primary resources – project timescales can sometimes be reduced by increasing other resources and will almost certainly be extended if they are unexpectedly reduced.
- **Money** is a secondary resource – it is used to buy other resources and will be consumed as other resources are used. It is similar to other resources in that it is available at a cost – in this case interest charges.

Identifying Resource Requirements

The first step in producing a resource allocation plan is to list the resources that will be required along with the expected level of demand. This will normally be done by considering each activity in turn and identifying the resources required. It is likely, however, that there will also be resources required that are not activity specific but are part of the project's infrastructure (such as the project manager) or required to support other resources (office space, for example, might be required to house contract software developers)

Scheduling Resources

Having produced the resource requirements list, the next stage is to map this on to the activity plan to assess the distribution of resources required over the duration of the project. This is best done by representing the activity plan as a bar chart and using this to produce a resource histogram for each resource

In practice, resources have to be allocated to a project on an activity-by-activity basis and finding the 'best' allocation can be time consuming and difficult. As soon as a member of the project team is allocated to an activity, that activity acquires a scheduled start and fi nish date and the team member becomes unavailable for other activities for that period. Thus, allocating a resource to one activity limits the flexibility for resource allocation and scheduling of other activities.

It is therefore helpful to prioritize activities so that resources can be allocated to competing activities in some rational order. The priority must almost always be to allocate resources to critical path activities and then to those activities that are most likely to affect others. In that way, lower-priority activities are made to fi t around the more critical, already scheduled activities.

Various ways of prioritizing activities, two are described below.

- **Total float priority** Activities are ordered according to their total fl oat, those with the smallest total float having the highest priority. In the simplest application of this method, activities are allocated resources in ascending order of total float. However, as scheduling proceeds, activities will be delayed (if resources are not available at their earliest start dates) and total floats will be reduced. It is therefore desirable to recalculate floats (and hence reorder the list) each time an activity is delayed.
- **Ordered list priority** With this method, activities that can proceed at the same time are ordered according to a set of simple criteria
    1. shortest critical activity;
    2. critical activities;
    3. shortest non-critical activity;
    4. non-critical activity with least float;
    5. non-critical activities.

Creating Critical Paths

Scheduling resources can create new critical paths. Delaying the start of an activity because of lack of resources will cause that activity to become critical if this uses up its float. Furthermore, a delay in completing one activity can delay the availability of a resource required for a later activity. If the later one is already critical then the earlier one might now have been made critical by linking their resources.