

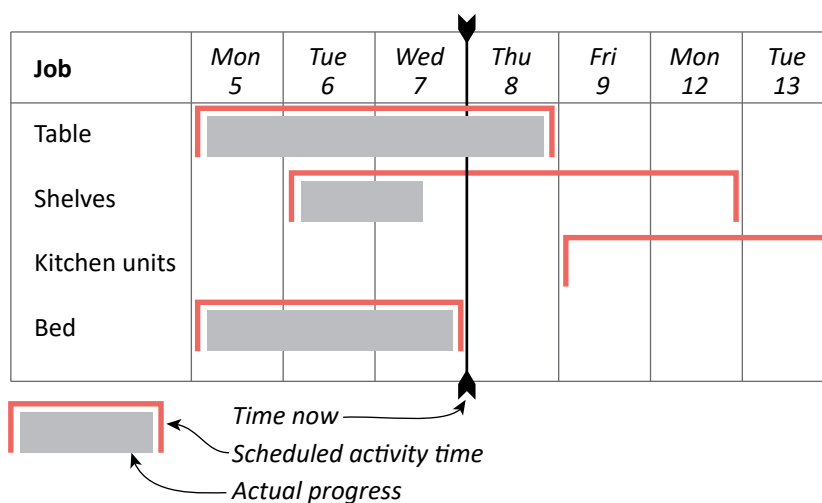
2 Gantt charts

2.1 Gantt charts

Henry Gantt (1861–1919) was one of the pioneers of scientific management, an approach to production management that emphasised the importance of analysing tasks into sub-tasks and measuring them in terms of resource usage. He has given his name to a type of chart that measures the progress of project activities over time. Often, both actual progress and scheduled progress are indicated, so that any time overruns are immediately apparent.

A good example of a simple Gantt chart is shown in Slack, Chambers and Johnston (*Operations Management*), illustrating work undertaken by a small specialist furniture manufacturer: Figure 12.6.

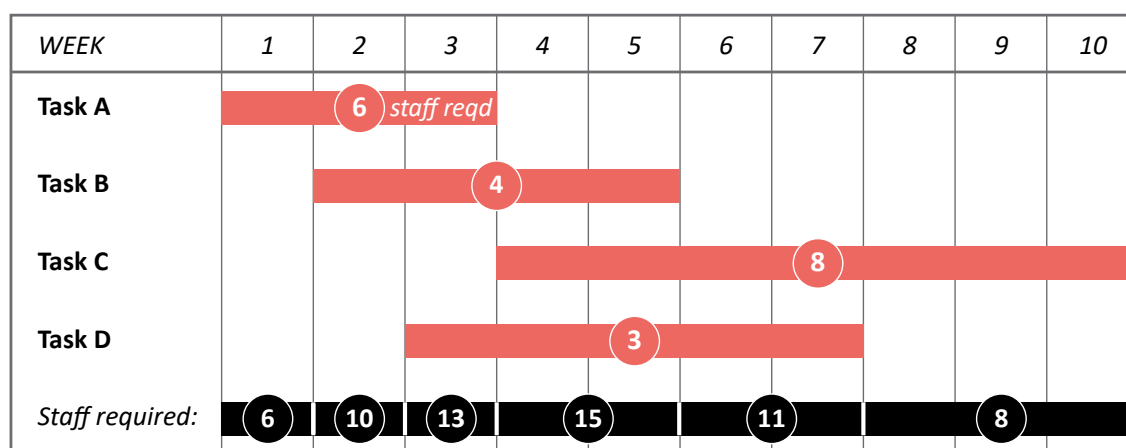
Figure 12.6 Gantt chart for job progress



The vertical line indicates that it is now close of business on Wednesday 7th. The table is already complete (indicated by the complete shaded region), which means the manufacturer is a day ahead of schedule. By contrast, the shelves are behind schedule (the shaded area should reach as far as the present time, but in fact falls short of that). Scheduled work has not yet begun on the kitchen units. The bed has been completed on schedule.

The use of Gantt charts can be extended beyond this very simple illustration. For example, a scheme of colour coding can be used to indicate what types of resource are in use on particular days (blue to represent an electrician, brown for a carpenter etc). Or there may be a resource chart at the foot of the Gantt chart. This would indicate the number of units of a particular resource expected to be needed on a particular day. This has obvious relevance to resource planning: by shifting tasks from one day to another we may be able to even out demand for particular resources, avoiding days when the resource is overloaded and days when it is not utilised in full.

For example, the number of staff (or other resources) required for each task can be written below each line or bar of the chart. Where a 5-person task overlaps with a 3-person task, it is easy to see that, for the duration of the overlap, 8 people will be required. An extra item line can therefore be drawn for the whole duration of the project, divided into segments identifying resource requirements: Figure 12.7.

Figure 12.7 Gantt Chart showing resource requirements

In this example, you can see that at the peak period of the project, when activities B, C and D are running concurrently, you will need 15 staff – while in other weeks, you will have idle time. You could smooth out your resource requirements, for greater efficiency, in various ways (depending on the relationship between the various tasks).

- You may be able to start Task D earlier or later. (You may like to try this, and recalculate the staff requirements line at the bottom of the chart.)
- If this chart reflects the critical path network, on the other hand, you may choose to keep 10 or 11 people on your project team and draft in extra staff for the peak period, minimising idle time.

2.2 Baselines

In risk management, baselines are sets of assumptions and methods that are used as the base evaluation of risk. In project management, a baseline is the project's original plan: that is, the 'starting' schedules and milestones. This allows progress to be measured against the original project plan – highlighting cumulative deviation and variances – as well as against updated or edited versions of the plan, as the project develops.

Some Gantt chart software and project management software applications offer the option of:

- Highlighting the baseline plan, so that it can easily be compared with the current version of the plan
- 'Locking' the baseline plan, so that it does not change when the schedule is edited.

2.3 Optimising resource allocation

There may be two main problems with resource allocations.

- Resources may be *over-allocated*, or over-stretched (eg an individual with an unrealistic daily or weekly work load, or a shortage of technicians): the quantity of resource required by the project plan exceeds its availability. This is a significant source of worker stress, and project delays. Solutions to the problem include redeploying staff from other tasks; subcontracting; using temporary agency staff; or increasing productivity (eg through improved training or use of ICT).

- Resources may be *under-allocated*, or under-utilised (eg a project team with insufficient work to do): people or equipment has been assigned to the project, but insufficient task-related work is available or assigned. This may be tolerated in the short term, or in the interest of flexibility, but represents poor value for money (especially if the idle or under-utilised resource is paid a high daily rate). Options include: matching of assignments and tasks as closely as possible; part-time, flexible and short-contract working; accelerating the project schedule, taking advantage of available resources; or re-assigning underutilised resources (eg to preparatory work on future tasks).

Often, project plans (such as Gantt charts) will indicate unavoidable peaks and troughs in the requirement for resources from one task or week to the next, and this creates the challenge of **resource smoothing**, or **resource levelling**: deploying resources efficiently across the life of the project, to avoid under- or over-allocation as far as possible. The most obvious approach to this is manipulating the timing of non-critical tasks (within available float times, so that overall deadlines are not affected), to smooth out peaks and troughs of resource requirements.