

How2guide: Resource Scheduling

Introduction	When do you use this guide		
A key element of the planning mix is always resources, whether they are human or otherwise. We focus here on human resources and their effort needed to carry out the activities within the plan. When first planning the project, stage or sequence of effort required to deliver products within work packages it is normal to ignore constraints imposed by resources. To have a realistic plan we must recognise resource availability, productivity and cost. There should always be a risk provision for any project or programme linked to the availability of resources. This guide looks at the concepts of resource planning and management and introduces techniques that will help to minimise the risk of resource problems.	In the lifecycle of a project or programme, this level of detail will occur during the Design stage, when the detailed planning will occur. However, the principles will apply much earlier as the development and analysis work will also involve resource scheduling. It is during the Delivery phase where failure to manage resources effectively will have the maximum effect. Of the planning techniques, resource scheduling will be undertaken in collaboration with the work on estimation and scheduling as a number of the techniques are complementary. This guide provides a worked example using the concepts of: • Resource smoothing • Resource levelling Resource smoothing deals with time limited resource scheduling whilst resource levelling deals with resource limited scheduling.		
Resource Scheduling One of the elementary mistakes often made is an assumption that resources are available on demand, and that they are all equal. As part of planning it is useful to plan for 'normal' competences but make provision for 'experts' (perhaps 150% productivity) or 'learners' (perhaps 75% productivity). A second common error is assuming that personnel are available 'every day'. A good resource planner will recognise that there may be 52*5 weekdays = 260 days, but there should be deductions for: • Personal holidays say 30 days • Public holidays say 10 days • Training say 10 days • Sickness say 10 days Therefore 100% availability would be only 200 days (or an average of 4 days a week). The other issue to consider is productivity as not all individuals are the same, so the creating of an "average" output from an individual is difficult. In a large team it will be possible to average this out over bigger groups, but with smaller teams the productivity can be more volatile. <table border="1" data-bbox="181 1257 2065 1390"><tr><td data-bbox="181 1257 1133 1390">Scheduling human resources ensures: • Efficient and effective utilisation • Confidence that the schedule is realistic • Early identification of resource capacity bottlenecks and conflicts. </td><td data-bbox="1133 1257 2065 1390">Resource scheduling covers 3 steps: • Allocation • Aggregation • Scheduling </td></tr></table>		Scheduling human resources ensures: • Efficient and effective utilisation • Confidence that the schedule is realistic • Early identification of resource capacity bottlenecks and conflicts.	Resource scheduling covers 3 steps: • Allocation • Aggregation • Scheduling
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Allocation involves identifying what resources are needed to complete the work. In the case of consumable resources it is simply the quantity required. In the case of re-usable resources it is the total effort required and the number of individual resources.

Aggregation. Once time scheduling and resource allocation are complete, the resources can be aggregated on a daily, weekly or monthly basis as appropriate. The aggregated data is usually presented in a histogram that illustrates the fluctuating use of resources against time.

Few re-usable resources are limitless, so the time scheduling has to be adjusted to take into account the limited availability of resources over time. There are two ways of achieving reconciling resource limits and time constraints, resource smoothing and resource levelling.

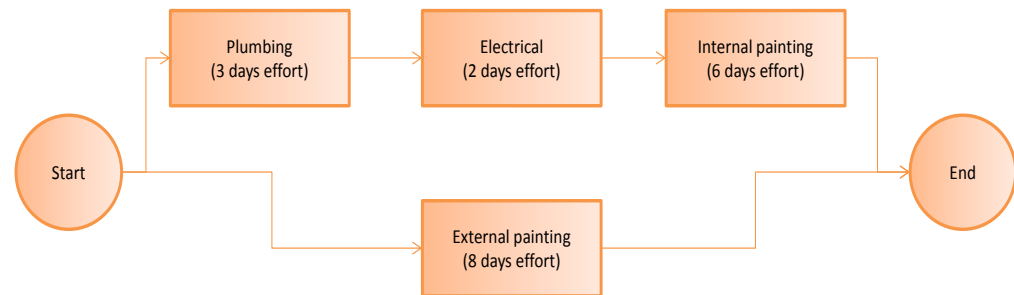
Simple Activity Network and Schedule

Firstly look at a simple project to refurbish a property prior to selling it. The scope may include plumbing, electrical work and both interior and exterior painting. The logical sequence of activities may look like the activity network shown opposite.

In this simple example of decorating a house, there are tasks that are sequential and depend on skills whilst others don't. The resource effort is based on the sequence of tasks that have been identified. The "Identifying the Outputs" and "Scheduling" How2guides outline how you build your plan to the point where you would have the information to create the Resource Plan.

We cannot plan effectively unless we understand the availability of resources and their skills. We may find that we must finish within a time window – implying that we may need to add extra resources; or we may have restricted access to resources – implying that we must not exceed those allocated, and as a result the tasks may take a longer duration.

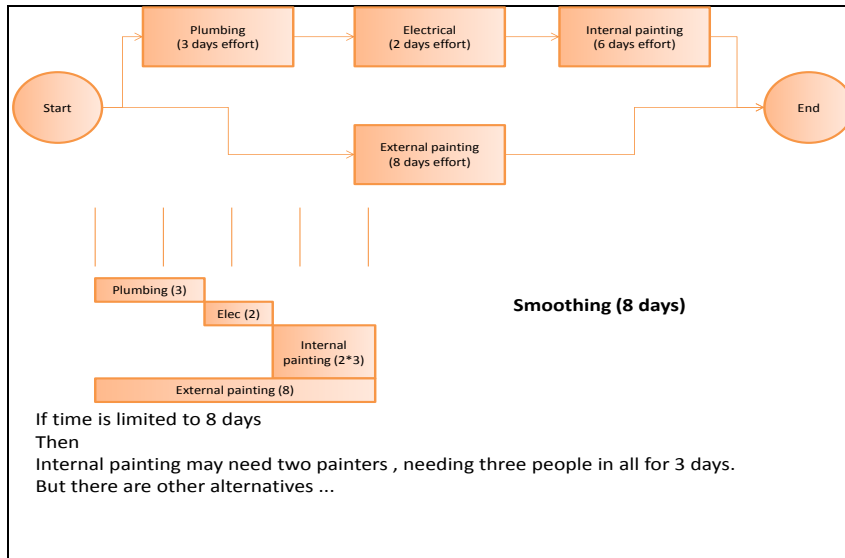
In this example, the renovation will take 14 days to complete using dedicated resources for each skill: 3 days of a plumber, 2 days of an electrician, and a painter for 14 days (8 days on the exterior and 6 days on the interior).



Sequencing

Networking starts with a sequence of activities; adding estimates of work duration as we go.

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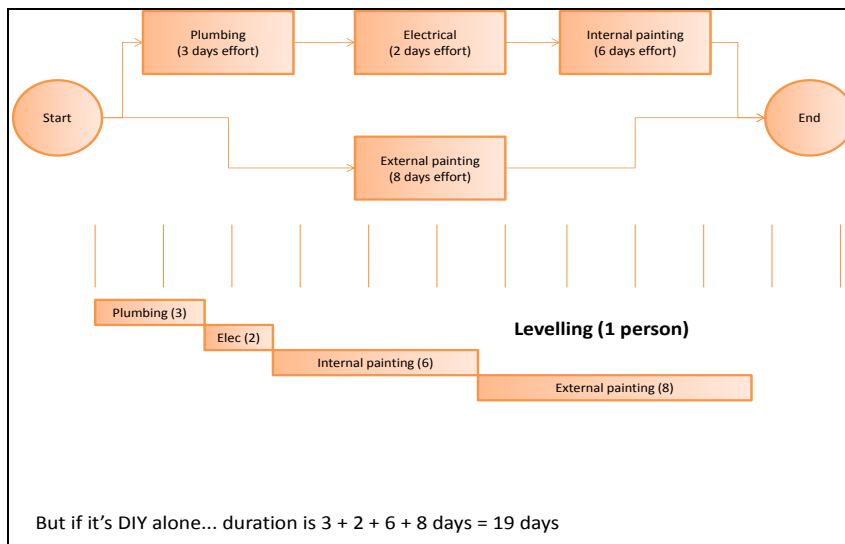
Resource Smoothing or Time-Limited Scheduling

Resource smoothing is used when the time constraint takes priority. The objective is to complete the work by the required date while avoiding peaks and troughs of resource demand.

A smoothed resource profile will be achieved by delaying some work. This will remove some flexibility from the schedule and its ability to deal with unavoidable delays, but the advantage is usually a more efficient and cost-effective use of resources.

If the timetable for the project is fixed and we must complete our refurbishment within 8 days we will need to add resources.

To achieve this, the internal painting cannot be started until the plumbing and electrical work is completed and the external painter will not be occupied for 8 days. 6 days of painter effort that will need to be achieved in 3 days, so 2 more painters will be required - we will now need three.



Resource Leveling or Resource Limited Scheduling

Resource leveling is used when limits on the availability of resources are paramount. It addresses the duration of the work taking into account the resources that are available.

In this example there is only one person available to do the work (could be a DIY job), so each package is delivered on consecutive days by one multi-skilled person who can do all the tasks.

The effect of this is that the task will now take 19 days.

This not only increases the time it will take, but the amount of risk because you are now dependent on one person with a unique set of skills, so if they become unavailable the whole project will come to an end.

If a second multi-tasking person were added to the team, one person could do the plumbing and electrical work and 3 days of painting which totals 9 days, whilst the other is undertaking the external painting taking 8 days. If they work together on the last day, the job would be completed in 8.5 days.