MS Project: Resource allocation & levelling

S13

LARA TOOKEY
Project network times are not a schedule until resources have been assigned.

- The implicit assumption is that resources will be available in the required amounts when needed.

- A new project requires making realistic judgments of resource availability and project durations.
Resource Planning

- Determining what resources will be required (labour, equipment, material)
- What quantity for each resource will be required.
- When are resources available to perform project activities.
Resource Histogram

40 hrs

Week 1 Week 2 Week 3 Week 4 Week 5 Week 6 Week 7 Week 8

Resource ZZZ
Resource Histogram

- A bar chart showing the amount of time assigned to a resource for the time interval.
- Resource availability is depicted as a line for comparison purposes.
- Resources assigned more work than available hours are considered “over-allocated”.
Resource Conflict & Balancing

❖ Project calendar:
   ◦ defines the workable time periods for the project.
   ◦ defines the workable time periods for the specific resource.

❖ Conflicts in resource availability and schedule activity dates must be resolved to ensure the project will be completed according to accepted project objectives.
The Resource Problem
<table>
<thead>
<tr>
<th>TIME</th>
<th>RESOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A project that must be completed by an imposed date</td>
<td></td>
</tr>
<tr>
<td>◦ Time is fixed, resources are flexible: additional resources are required to ensure project meets schedule.</td>
<td></td>
</tr>
<tr>
<td>A project in which the level of resources available cannot be exceeded</td>
<td></td>
</tr>
<tr>
<td>◦ Resources are fixed, time is flexible: inadequate resources will delay the project.</td>
<td></td>
</tr>
</tbody>
</table>
Time

- Projects that must be completed by an imposed date

- Require the use of leveling techniques that focus on balancing or smoothing resource demands by using positive slack (delaying noncritical activities) to manage resource utilization over the duration of the project
  - Peak resource demands are reduced.
  - Fluctuation in resource demand is minimized.
Botanical Garden

A  Design
B  Layout & scarify
C  Walkways
D  Lighting
E  Irrigation
F  Fence & walls
G  Planting

0  2  4  6  8  10  12  14  16  18  20  22  24  26  28  30
2 Bh  1 Bh  1 Bh  2 Bh  3 Bh
Resource levelling for TIME

❖ Advantages

- Peak resource demands are reduced.
- Fluctuation in resource demand is minimized.

❖ Disadvantages

- Loss of flexibility that occurs from reducing slack
- Increases the criticality of all activities
Resource

- Projects that involve **resources** that are **limited** in quantity or by their availability
Splitting / Multitasking

- A scheduling technique used to get a better project schedule and/or increase resource utilization
  - Involves interrupting work on an activity to employ the resource on another activity, then returning the resource to finish the interrupted work
  - Is feasible when startup and shutdown costs are low
  - Is considered the major reason why projects fail to meet schedule
Splitting/Multitasking

Activity duration without splitting

Activity A       Activity B       Activity C

Activity duration split into three segments—A, B, C

Activity duration split with shutdown and start-up

Shutdown       Start-up
Resource Levelling

- Identifies under-allocated resources
- Different methods for resource leveling
- Project Manager analyzes effects on project objectives (time and cost) for resolving resource conflict.
Resource levelling methods
1. Do Nothing if over-allocation is within acceptable limits

- **Schedule/Time Impact**
  - None

- **Resource/Cost Impact**
  - None
2. Delay non-critical tasks within available float

❖ Schedule/Time Impact
  ◦ None

❖ Resource/Cost Impact
  ◦ None (except for inflation effects)
3. Extend non-critical task durations within the available float

- **Schedule/Time Impact**
  - None

- **Resource/Cost Impact**
  - None (except for inflation effects)
4. Add / Substitute resource of equal or greater capability

- **Schedule/Time Impact**
  - May need to consider learning curve for new resource. (Duration may shorten if resources are added – schedule crashing)

- **Resource/Cost Impact**
  - Cost impact if substitute resource has higher costs
5. Delay Critical Path tasks

- **Schedule/Time Impact**
  - Schedule impact equal to the delay

- **Resource/Cost Impact**
  - Cost impact due to project time extension and inflation costs
6. Extend Critical Path task durations

- **Schedule/Time Impact**
  - Schedule impact equal to the delay

- **Resource/Cost Impact**
  - Cost impact due to project time extension and inflation costs
7. Authorise Overtime

- **Schedule/Time Impact**
  - Could shorten schedule (schedule crashing)

- **Resource/Cost Impact**
  - Cost impact due to premium cost rates
8. Split the task into non-sequential pieces

- **Schedule/Time Impact**
  - Schedule impact if part of task extends beyond float (soft logic)

- **Resource/Cost Impact**
  - Cost impact due to project time extension and inflation costs and inefficiencies in splitting task
9. Modify the Scope

- **Schedule/Time Impact**
  - Could shorten schedule due to less work or quality of work being accomplished.

- **Resource/Cost Impact**
  - Could go either way.
<table>
<thead>
<tr>
<th>Task #</th>
<th>Task Name</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Generic Project</td>
<td>50d</td>
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<tr>
<td>2</td>
<td>Start</td>
<td>0d</td>
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<tr>
<td>3</td>
<td>Task A</td>
<td>20d</td>
</tr>
<tr>
<td>4</td>
<td>Task B</td>
<td>16d</td>
</tr>
<tr>
<td>5</td>
<td>Task C</td>
<td>25d</td>
</tr>
<tr>
<td>6</td>
<td>Task D</td>
<td>10d</td>
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<tr>
<td>7</td>
<td>Task E</td>
<td>20d</td>
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<tr>
<td>8</td>
<td>Task F</td>
<td>7d</td>
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<tr>
<td>9</td>
<td>Task G</td>
<td>14d</td>
</tr>
<tr>
<td>10</td>
<td>Task H</td>
<td>10d</td>
</tr>
<tr>
<td>11</td>
<td>Task J</td>
<td>15d</td>
</tr>
<tr>
<td>12</td>
<td>Finish</td>
<td>0d</td>
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</table>