RESOURCE LEVELING VS RESOURCE ALLOCATION

Resource Leveling:
- How to smooth resource demands?
- No problem with time or resources.
- Strategy?
- Method of moments?
- Method of double moments?
- Multi-Resources?
- Desired (best) profiles?

Example:
Two schedule alternatives have associated resource profiles as shown below, which alternative would you choose and why? Also calculate the total worker-weeks needed for both cases:

Mx =

My =
Resource Allocation:
- Allocate limited resources to top-priority activities.
- Strategy?
- Heuristic rules
- Inconsistency among existing software
- Excel Implementation
- EasyPlan Optimization

Floats?

Resource limit = 2 / day

Solution

Priority Rules:
Resource Allocation Example:

- Resource Limit = 2/day
- Each activity requires One resource / day

<table>
<thead>
<tr>
<th>Time</th>
<th>Eligible Activities</th>
<th>Resources (limit = 2)</th>
<th>Duration</th>
<th>Rule (ELS)</th>
<th>Decision</th>
<th>Finish Time</th>
</tr>
</thead>
</table>

Microsoft Project Solution?
Case of Multi-Resources? Case of Multi-Resources Multi-Skills?
MEETING DEADLINE

- Activity time-cost relationship? Linear vs Discrete (Cheap & Slow versus Fast & Expensive)
- Cost Slope?
- Project time-cost relationship?
- Strategy to meet deadline?

Example 1: Durations and cost slopes are shown. We need to meet a 12-day deadline.

Example 2: Normal and crash data for the tasks are shown. What is the optimum project duration? How can the project be finished in 20 days?
CASH FLOW ANALYSIS

Factors Affecting Interest Payment:
- Credit from suppliers
- Reporting Periods (payment frequency)
- Interest rate
- Subcontracting
- Mobilization payment
- Better scheduling
- Hold back percentage
- Bid Unbalancing

Terms Used Every Period:
- Cost = (Direct + Indirect) estimates
- Expenses ≤ Cost (if suppliers can give you a credit)
- Budget = Cost + Markup * Cost = Cost (1 + Markup)
- Income = Owner payment = Budget – Holdback

If Everything goes well:
- Expenses ≤ Cost
- Income = Budget
- Profit = Cost * Markup
Example: Overdraft Calculations

Data:
- Direct costs (evenly distributed) on the bar chart;
- Indirect costs = $5000 per month;
- Contractor's markup = 5%;
- Reporting period = monthly;
- Owner retainage = 10% (no retainage after work is 50% complete);
- Payments made 30 days after invoice made; and
- Interest rate is 1% monthly.

OVERDRAFT CALCULATIONS

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Direct cost</td>
<td>$25,000</td>
<td>$65,000</td>
<td>$75,000</td>
<td>$15,000</td>
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<tr>
<td>Indirect cost</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
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<tr>
<td>Subtotal</td>
<td>$30,000</td>
<td>$70,000</td>
<td>$80,000</td>
<td>$20,000</td>
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<tr>
<td>Markup</td>
<td>1,500</td>
<td>3,500</td>
<td>4,000</td>
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<tr>
<td>Total billed</td>
<td>$31,500</td>
<td>$73,500</td>
<td>$84,000</td>
<td>$21,000</td>
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<td>Retainage withheld</td>
<td>3,150</td>
<td>7,350</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Payment received</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$28,350 $66,150 $84,000 $31,500

Total cost to date: $30,000 $100,000 $180,000 $200,000 $200,000
Total amount billed to date: $31,500 $105,000 $28,350 $189,000 $210,000 $178,500 $210,000
Total paid to date: $30,000 $100,000 $152,953 $108,333 $25,416 $(-)5830
Overdraft end of month: $30,000 $100,000 $152,953 $108,333 $25,416 $(-)5830
Interest on overdraft balance: $300 $1,003 $1,530 $1,083 $254 $0
Total amount financed: $30,300 $101,303 $154,483 $109,416 $25,670

A simple illustration only. Most lenders would calculate interest charges more precisely on the amount/time involved employing daily interest factors.
If Markup = 10%, Retention = 5% and Indirect Cost = $100 /day, Draw the Cash Flow Chart. What is the effect of bid unbalancing?