Introduction to Project Management (PM101)
Section 8 – Effective Budgets & Schedules
Effective Budgets & Schedules
Effective Budgets & Schedules

The Basic Steps in Scheduling

- Place the deliverable and activities in proper sequence.
- Estimate the resources.
- Estimate the work & calculate the duration.
- Develop the schedule.
- Analyze the schedule.
- Negotiate changes to the triangle.
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- Sequencing - is the process of ordering the deliverables, activities or tasks defined the WBS.

- Sequencing is NOT process diagramming
  - There are no decision gates
  - Usually do not use alternate flows
  - Focused only on defined tasks or activities
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- Potential Methods for Activity Sequencing:
  - Precedence Diagramming Method (PDM)
  - Arrow Diagramming Method (ADM)
  - Conditional Diagramming Method

- Most common is Precedence Method.

- PDM uses limited & defined relationships between activities.
Effective Budgets & Schedules
Sequencing
Finish to Start

Task A

Task B

Task (A) must finish before the next task, task (B) can begin. This is the most common method.

In MS Project
Effective Budgets & Schedules
Sequencing
Start to Start

Task A & B may start at the same time but (B) can’t begin until the first task (A) has started.
Effective Budgets & Schedules
Sequencing
Finish to Finish

Task A & B may end at the same time but (B) can’t finish until the first task (A) has finished.

In MS Project

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Sequencing
Start to Finish

Task A

Task B

Task (A) must start before Task (B) can finish. This method is seldom used.

In MS Project
1. Shows a diverging point.
2. C to E shows a finish to finish activity.
3. F to G shows a start to start activity.
4. Shows a convergence point
Effective Budgets & Schedules
Resource Estimating

- Expert judgment
- Alternatives analysis
- Published estimating data
- Project management software
- Bottom up estimating
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Responsibility Assignment Matrix (RAM)

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Bob</th>
<th>Sue</th>
<th>Jim</th>
<th>Joan</th>
<th>Karen</th>
<th>Frank</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Design</td>
<td>P</td>
<td>A</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Database Design</td>
<td>S</td>
<td>A</td>
<td>P</td>
<td>P</td>
<td></td>
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</tr>
<tr>
<td>Homepage</td>
<td>S</td>
<td>R</td>
<td>A</td>
<td>I</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Login System</td>
<td>R</td>
<td>S</td>
<td>A</td>
<td>P</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Communication Plan</td>
<td></td>
<td>S</td>
<td>P</td>
<td>I</td>
<td>A</td>
<td>P</td>
</tr>
</tbody>
</table>

P = Participant  A = Accountable  R = Review Required
I = Input Required  S = Sign-off Required
Effective Budgets & Schedules

Duration Estimating

- Purpose – Determine the start and finish dates for project deliverables. Then determine the project’s critical path.
- The Most Important Part of Duration Estimating is...

BE REALISTIC!
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The Critical Formula

- Duration – The amount of time a deliverable will take in terms of calendar time.
- Work – The amount of effort expressed in hours it will take to produce the deliverable.
- Efficiency – The amount of work a person can get can actually complete in an hour of time. This is Units in Microsoft Project.

\[ \text{Duration} = \frac{\text{Work}}{\text{Efficiency}} \]
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Efficiency vs. Availability

- Availability is how much people are accessible for work. If a person spends 20% of their time on leave, vacation, training, or other non-work effort and there are 160 hours in the month then they are only 80% available or 128 hours.
Efficiency vs. Availability

- Efficiency answers the question of how much can they get done in an eight-hour day. If you take into account meetings, e-mail, side conversations, the best expectation is about 70% efficient.
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Efficiency vs. Availability

- The total amount of work that can be completed is (total hours * Availability) * Efficiency or (160 * .80) * .70 = 89.6 hours of work completed in a month.

- This is only 56% effectiveness!!!
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Project Evaluation & Review Technique (PERT)
Effective Budgets & Schedules

Project Evaluation & Review Technique (PERT)

\[ \text{PERT Weighted Average} = \frac{4 \times \text{Most Likely} + \text{Optimistic} + \text{Pessimistic}}{6} \]

\[ \text{PERT Standard Deviation} = \frac{\text{Pessimistic} - \text{Optimistic}}{6} \]
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PERT Example

\[
\text{PERT Weighted Average} = \frac{6 + (4 \times 12) + 15}{6} = \frac{6 + 48 + 15}{6} = \frac{69}{6} = 11.5
\]

Best Case = 6
Most Likely = 12
Worst Case = 15

PERT Standard Deviation = 1.5

Best Case = 6
Worst Case = 15

\[
\text{PERT Weighted Average} = \frac{69}{6} = 11.5
\]

Best Case = 6
Most Likely = 12
Worst Case = 15

PERT Standard Deviation = 1.5
Effective Budgets & Schedules

Stages for Budget Development:

- Rough Order of Magnitude –/+50% A rough initial estimate of what the project will cost.
- The Budget –/+10% The final, approved project budget.
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Estimating Techniques

- **Analogous Estimating** – also called top-down estimating means using actual costs from a previous, similar project. Used when you don’t have a lot of detail.

- **Parametric Modeling** – uses project characteristics in a mathematical model.

- **Bottom-up Estimating** – uses the costs of individual activities or work packages and then rolls them up.
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Don’t Back into Your Schedule

- You are more focused on the deadline than what needs to get done.
- Time estimates are based upon what you can allow the deliverable to take rather than how long they actually take.
- The order in which you perform the deliverables may not be the most effective one.
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Critical Path Method (CPM)

- The Critical Path is the project path which will be the longest or where all deliverables or activities have zero float.

- The Critical Path does not necessarily have the greatest risk.
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The Critical Path Method
- ES or Early Start is the soonest a task or activity can begin.
- DUR or Duration is how long the task or activity will take.
- LS or Late Start is the latest a task or activity can begin without impacting the Critical Path.
- Float is the difference between the Late Finish and Early Finish.
- LF or Late Finish is the latest a task can finish without impacting the Critical Path.

ES  DUR  EF
Deliverable
LS  Float  LF
The Critical Path Method

- **ES** = **EF**
- **DUR** = **LS** – **DUR**
- **Float** = **LF** – **EF** or **LS** – **ES**

**Effective Budgets & Schedules**

The Critical Path Method

- **EF** = **ES** + **DUR**
- **LS** = **LF** – **DUR**
- **Float** = **LF** – **EF** or **LS** – **ES**

Deliverable A

Deliverable B

Deliverable C

Deliverable D

Deliverable E
Effective Budgets & Schedules
The Critical Path Method

- LS = LF – DUR
- EF = ES + DUR
- Float = LF – EF or LS - ES

Deliverable A
0 0 2

Deliverable B
2 0 6

Deliverable C
2 3 6

Deliverable D
5 1 8

Deliverable E
6 0 8

Deliverable F
8 2 10

ES  DUR  EF
Deliverable LS  Float  LF
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To Decrease Your Schedule

- A schedule can only be reduced by reducing the critical path.
- Only two ways:
  - Crashing – Increasing the number hours worked via, more resources or overtime. Potential for increased cost.
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Are more resources the answer?
Questions and Answers
Review Questions:

1. Which of the following is one of the major techniques for activity sequencing?
   A. Program Evaluation and Review Technique
   B. Precedence Diagramming Method (PDM)
   C. Graphical Diagramming Method
   D. Earned Value

2. Which of the following major techniques for activity sequencing is most common?
   A. Arrow Diagramming Method (ADM)
   B. Conditional Diagramming Method
   C. Graphical Diagramming Method
   D. Precedence Diagramming Method (PDM)

3. Which of the following is NOT a defined relationship used in PDM?
   A. Ending to Start
   B. Start to Finish
   C. Finish to Finish
   D. Start to Start

4. Which of the following defined relationships is the most common PDM type seen?
   A. Start to Start
   B. Finish to Start
   C. Finish to Finish
   D. Start to Finish

5. Which of the following techniques for resource estimating is most common?
   A. Published estimating data
   B. Alternatives analysis
   C. Bottom up estimating
   D. Expert judgment

6. Which of the following is NOT an output of resource estimating?
   A. Scope changes
   B. Activity resource requirements
   C. Activity attributes
   D. Resource Breakdown Structure (RBS)
7. The most important part of Duration Estimating is:
   A. Aim high
   B. Get it right
   C. Don't take too long
   D. Be realistic

8. If you obtain estimates from a resource as shown below what is the PERT Weighted Average for these values?
   Best case = 4
   Most likely case = 7
   Worst case = 8
   A. 6.66
   B. 7.56
   C. 8.25
   D. 6.33

9. If you obtain estimates from a resource as shown below what is the PERT Weighted Average for these values?
   Best case = 4
   Most likely case = 8
   Worst case = 10
   A. 6.66
   B. 7.66
   C. 8.25
   D. 6.33

10. What does Float mean in regards to the Critical Path Method?
    A. The soonest a task or activity can begin
    B. The latest a task or activity can begin without impacting the Critical Path
    C. The difference between the Late Finish and Early Finish
    D. How long the task or activity will take

11. What is the range of a Rough Order of Magnitude estimate?
    A. +25%/-15%
    B. +100% / -50%
    C. +10% / -5%
    D. +75% / -25%
12. If a resource is available to work 90% of the hours in a month and is 70% efficient how many hours of work can they expect to complete in a 160 hour month?
   A. 112.00
   B. 144.00
   C. 100.80
   D. 97.65

13. If a resource is 70% efficient and has 24 hours of work to complete, how many days will it take for the resource to complete the work?
   A. 4.28 days
   B. 6.15 days
   C. 3 days
   D. 3.85 days

14. To reduce the schedule of a project there are two techniques. What are they?
   A. Compression and crashing
   B. Duration modeling and crashing
   C. Compression and fast tracking
   D. Crashing and fast tracking

15. According to Brooke's Law, adding additional external resources to a project team will cause an immediate what?
   A. Increase in productivity
   B. Decrease in productivity
   C. Stabilized productivity
   D. No impact on productivity as Brooke’s Law does not deal with productivity

16. Which of the following is the BEST definition for the critical path?
   A. The list of dependent tasks or deliverables that takes the most time or where slack or float is zero
   B. The list of most important tasks or deliverables
   C. The list of dependent tasks or deliverables that takes the most time
   D. The list of dependent tasks or deliverables where the slack or float is zero
17. Which of the following estimating techniques makes use of project characteristics and mathematical models?
   A. Parametric modeling
   B. Bottoms up estimating
   C. Top down estimating
   D. Analogous estimating
Answer Key:

1. B
   The Precedence Diagramming Method is the most common technique for activity sequencing.

2. D
   The Precedence Diagramming Method is the most common technique for activity sequencing.

3. A
   The defined relationships used in PDM are Start to Finish, Finish to Finish, Start to Start, and Finish to Start.

4. B
   The Finish to Start relationship is the most common PDM type seen.

5. C
   The Bottom up technique is the most common.

6. A
   Scope change is not an output of resource estimating.

7. D
   The most important part of Duration Estimating is to be realistic.

8. A
   PERT Weighted Average = Optimistic + (Most Likely * 4) + Pessimistic / 6

9. B
   PERT Weighted Average = Optimistic + (Most Likely * 4) + Pessimistic / 6

10. C
    The Float is the difference between the Late Finish and Early Finish.

11. B
    The range of a Rough Order of Magnitude estimate is +100%/-50%.

12. C
    Hours of work = Total hours * Availability * Efficiency
13. A
Here you would use the Critical formula: Duration = Work/Efficiency.

14. D
Crashing and fast tracking are the two techniques to reduce the schedule of a project.

15. B
According to Brooke's Law, adding additional external resources to a project team will cause an immediate decrease in productivity.

16. A
The Critical Path is the project path which will be the longest or where all deliverables or activities have zero float.

17. A
Parametric modeling uses project characteristics in a mathematical model.