Top Ten Scheduling Mistakes and How to Avoid Them

Session PS.10

Seattle

June 28 - July 1, 2009 at the Sheraton Seattle Hotel

TCM: Improving Decision Making in a Green World

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AACE International’s 53rd Annual Meeting Seattle, Washington
Joe Lukas Biography

- **Degree**: BS in Chemical Engineering, 1974
- **University**: Syracuse University
- **Years of Experience**: 35 years
- **Professional Field**: Project Management
- **Something you do not know about me**:
  - Scuba Diver (Cozumel, BVI, Florida Keys)
  - Used to race motorcycles (before kids)
  - Sky-diving (before kids)
  - Used to have a full-head of blond hair
What Will Be Covered?

• Top ten list of mistakes people make when preparing project schedules based on my experiences in reviewing project schedules.

• Recommended procedure to follow when preparing project schedules.
**Top Ten List of Scheduling Mistakes:**

10. Not using the project summary task, header, footer and legend

9. Not Using Start & Complete Milestones

8. Linking Summary Tasks

7. Confusing Duration and Work

6. Misuse of Constraints
Top Ten List of Scheduling Mistakes:

5. Missing Task Relationships ("Hangers")
4. Lack of Schedule Contingency
3. Incorrect Schedule Logic
2. Inappropriate Level of Detail
1. Lack of Scheduling Knowledge
Scheduling Mistakes: #1
Lack of Scheduling Knowledge

• Problem: difficult to prepare a correct and efficient schedule without knowing Critical Path Method:
  – Forward and backward pass.
  – Critical Path determination.
  – Float calculation:
    • Free Float (Free Slack)
    • Total Float (Start Slack)
Scheduling Mistakes: #2
Inappropriate Level of Detail

• Use 20/80 Rule – not 8/80 (which can lead to excessive # of tasks).
• Use sub-project schedules (such as detailed design schedule) & link to your project schedule.
• Use progressive elaboration during project life to build each successive phase of your schedule.
Scheduling Mistakes: #2
Inappropriate Level of Detail

This Includes the Structure of Project Tasks and Proper Naming of Deliverables & Activities

- Major Deliverables
- Deliverables
  - Work Package Deliverables
  - Activities

Defined as “tasks” in scheduling software

Use 20/80 Rule

May not be needed for small or medium projects, probably >1 level for large projects

Lowest level for control

Steps needed to create the deliverable
Scheduling Mistakes: #2
Inappropriate Level of Detail

✓ Data Flow Diagram
✓ Risk Management Plan
✓ Training Manual Outline
✓ Test Plan

✓ Conduct unit test for program 21A
✓ Review requirements document
✓ Prepare report specification draft
✓ Write script for interface module
Scheduling Mistakes: #3
Incorrect Schedule Logic

• **Gantt View:** not useful for checking schedule logic (hard to follow relationships).

• **Network Diagram:** not useful since can’t easily see/follow entire schedule on screen.

• **BEST PRACTICE:**
  – Plot the schedule on one large sheet (many copy vendors can plot schedules).
  – Tape on a wall and track the logic.
Scheduling Mistakes: #3
Incorrect Schedule Logic

• **Common Problem:** incorrect use of SS with lag instead of FF with lag.

• Example:
  – Task A = Equipment Layout Drawing (5 days).
  – Task B = Detailed Piping Drawings (7 days).
  – Can start detailed drawings once equipment layout drawing started.
Scheduling Mistakes: #3
Incorrect Schedule Logic

- Task A duration increased to 10 days.
- Task B still shows completion in 10 Days!
**Scheduling Mistakes: #3**

Better Schedule Logic

- Task A duration increased to 10 days.
- Task B now shows completion in 15 Days!
Scheduling Mistakes: #3
Checking Schedule Logic

- Default task box is not useful for checking schedule logic.
- Change task box style to show early & late start, early & late finish so you can check schedule calculations.

<table>
<thead>
<tr>
<th>Integrated Project Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start: 12/11/06</td>
</tr>
<tr>
<td>ID: 36</td>
</tr>
<tr>
<td>Finish: 12/29/06</td>
</tr>
<tr>
<td>Dur: 15 days</td>
</tr>
<tr>
<td>Res: Henry Jones[27%], Sally Ferr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ES</th>
<th>ID</th>
<th>EF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon 12/11/0</td>
<td>36</td>
<td>Fri 12/29/06</td>
</tr>
<tr>
<td>Integrated Project Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mon 12/11/0</td>
<td>15 days</td>
<td>Fri 12/29/06</td>
</tr>
</tbody>
</table>

Default Task Box Style

Recommended Task Box Style
Scheduling Mistakes: #4
Lack of Schedule Contingency

- Adjust the project contingency task duration up or down based on actual progress:
  - Result => project completion date stays constant.
  - Project completion date only changes when the Project Team deems it appropriate.
Scheduling Mistakes: #4
Lack of Schedule Contingency

- Use a contingency log and drawdown graph (below) to track remaining schedule contingency.

![Project Timeline Diagram]

- Schedule Contingency Start = 15 days
- Status Date
- EAC = 0 days
Scheduling Mistakes: #5
Missing Task Relationships

All tasks should have at least one predecessor (except the Project Start milestone).

All tasks should have at least one successor (except the Project Complete milestone).

Activity H is a Hanger – an unintended break in the network path.
Scheduling Mistakes: #5
How to Check for Hangers

- Add Successor column to Gantt Chart View.
- Scroll Predecessor and Successor columns for missing links.
- **Exception**: Summary Level Tasks should not be linked.

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Predecessors</th>
<th>Successors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build, Configure &amp; Integrate</td>
<td>90 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database and Conversion Programs Build</td>
<td>40 days</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Time Tracking Application Configuration</td>
<td>15 days</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Unit Test Time Tracking Application</td>
<td>15 days</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>PeopleSoft Interface Module Build</td>
<td>30 days</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Unit Test PeopleSoft Interface</td>
<td>20 days</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Weekly Reports Build</td>
<td>10 days</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Unit Test Weekly Reports</td>
<td>10 days</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Module Tests</td>
<td>10 days</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Systems Integration Test</td>
<td>5 days</td>
<td>76</td>
<td></td>
</tr>
</tbody>
</table>

**These are NOT hangers – see schedule mistake #8**

**Hangers**
Scheduling Mistakes: #6
Misuse of Constraints

• Constraint Types
  – Flexible
  – Inflexible
  – Semi-flexible

• Constraint Rules

• Negative Slack
• Deadlines
**Scheduling Mistakes: #6**

**Misuse of Constraints**

- **Flexible Constraint:** Schedule software can change the task start & finish date.

- Default constraint type used:
  - *As Soon As Possible (ASAP):* default constraint type applied to tasks when scheduling from the project start date.
  - *As Late As Possible (ALAP):* default constraint type applied to all new tasks when scheduling from the project finish date.
• **Inflexible Constraint**: task *must* begin or end on a given date. Called ‘hard constraint’:

  – **Must Start On (MSO)**: Task must start on an exact date.
  – **Must Finish On (MFO)**: Task must finish on an exact date.

**KEY POINT**: You should only use an inflexible constraint if the task start or finish date is fixed by factors beyond the control of the project team!
• **Semi-flexible Constraint:** task has a start or finish date boundary & schedule can move dates within the boundary - ‘soft’ constraint:
  
  – **Start No Earlier Than (SNET):** task will not start *before* a specific date.
  
  – **Start No Later Than (SNLT):** task will not start *after* a specific date.
  
  – **Finish No Earlier Than (FNET):** task will not finish before *a specific date.*
  
  – **Finish No Later Than (FNLT):** task will not finish after *a specific date.*
• Entering a Finish date for a task (for example, in the **Finish** Column) applies an FNET constraint to the task.

• Entering a Start date for a task (for example, in the **Start** Column) applies an SNET constraint to the task.

**RECOMMENDATION:** *Never* enter dates - let the schedule software calculate dates!
Scheduling Mistakes: #6
Misuse of Constraints

- In this case a ‘Must Finish On’ 8/4 was added to the Project Complete milestone (was 8/11).
- The start & end dates for the preceding tasks don’t change (note the 5 days of negative float), but successor tasks end dates would change.

![Diagram showing scheduling mistake](image-url)

Not showing reality!
Scheduling Mistakes: #6 Misuse of Constraints

- Example of constraints overuse:

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Constraint Type</th>
<th>Constraint Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Pilot Testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Journal History Pilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Run Test Plan</td>
<td>Finish No Later Than</td>
<td>Tue 9/20/05</td>
</tr>
<tr>
<td>8 End User Testing</td>
<td>Start No Later Than</td>
<td>Tue 9/20/05</td>
</tr>
<tr>
<td>9 Code Changes</td>
<td>Finish No Later Than</td>
<td>Fri 10/21/05</td>
</tr>
<tr>
<td>10 Retest</td>
<td>Finish No Later Than</td>
<td>Mon 10/31/05</td>
</tr>
<tr>
<td>11 Refining Pilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Run Test Plan</td>
<td>Finish No Later Than</td>
<td>Tue 9/20/05</td>
</tr>
<tr>
<td>13 End User Testing</td>
<td>Start No Later Than</td>
<td>Tue 9/20/05</td>
</tr>
<tr>
<td>14 Code Changes</td>
<td>Finish No Later Than</td>
<td>Fri 10/21/05</td>
</tr>
<tr>
<td>15 Retest</td>
<td>Start No Later Than</td>
<td>Fri 10/21/05</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Constraints limit scheduling flexibility!
• Example: You have a five-day task that you want to finish by Friday, October 13th:
  – Today is October 3rd.
  – You add a ‘Must Finish On’ constraint to the task.
  – Schedule software will move the start date out to Monday, October 9th so you finish on October 13th.
  – Even if task can be started/finished earlier, scheduling software will not reschedule the task to start earlier!
• **Deadline:** an option to constraints! Deadline for a task indicates the latest date you want the task to be completed:
  - Notification if task scheduled completion date > deadline.
  - Deadline dates do **not** impact task logic.
**Definitions:**

- **Duration** = how long (the elapsed time) it will take to complete the task, *not* counting non-working time such as week-ends.
- **Work** = how many hours of effort (work) are needed to complete the task.
- **Resources** = specific people or work groups that will do the work of the task.
- **Availability** = what % of time each resource is available to work on the task.
Duration and Work Relationship:

- **Units** = the number of resources and the availability of those resources:
  - For example: if Helen is 100% available and Joe is 50% available to work on a task, the number of resource units is 1.50.

- Duration, Work and Resources/Availability are related – you can only specify two and scheduling software calculates the third value:

\[
\text{Duration} = \frac{\text{Work}}{\text{Units}}
\]
Duration and Work Relationship:

- Individual has 60 hours of effort to complete a task.
- The person has 50% availability due to other commitments.
- Result is 120 hours duration (D = W/U = 60/0.5).
• Schedule software allows you to decide on the **Task Type** for scheduling each task:

  – **Fixed Units**: resources and availability do not vary. If you change Work or Duration, the other value changes.

  – **Fixed Work**: required work amount does not vary. If you change Units or Duration, the other value changes.

  – **Fixed Duration**: time period does not vary. If you change Units or Work, the other value changes.
Task Type Relationships:

If the task type is:

<table>
<thead>
<tr>
<th></th>
<th>Duration</th>
<th>Units</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Duration</td>
<td>Work</td>
<td>Work</td>
<td>Units</td>
</tr>
<tr>
<td>Fixed Units</td>
<td>Work</td>
<td>Duration</td>
<td>Duration</td>
</tr>
<tr>
<td>Fixed Work</td>
<td>Units</td>
<td>Duration</td>
<td>Duration</td>
</tr>
</tbody>
</table>

Example - For Fixed Duration:

- Change the duration, work is recalculated.
- Change the units, work is recalculated.
- Change the work, units are recalculated.
When to Use Specific Task Types:

- **Use Fixed Duration:**
  - Resources not assigned to tasks.
  - For Program/Project summary schedules.

- **Use Fixed Work:**
  - Work hours & resources assigned to tasks.
  - Resource availability can be varied.

- **Use Fixed Units:**
  - Work hours & resources assigned to tasks.
  - Resource availability is fixed.
Effort Driven Scheduling:

- Scheduling method where the task work remains constant regardless of the number of resources assigned.
- As resources are added to a task, the duration decreases, but the work remains the same and is distributed among the assigned resources.
- Effort driven scheduling adjusts the task duration only if you add or delete resources from a task!
• Effort Driven Scheduling Recommendation:
  – Leave effort driven scheduling checked.
  – Uncheck only for those very infrequent tasks where it doesn’t apply.

Located in the Task Information dialog box
Some people like to show linked phases (sample above), or will link summary tasks to other summary tasks or to lower level tasks.

**PROBLEM**: on many projects some phase tasks may be able to start before completion of the prior phase.

Linking phases means entire phase must be completed before next phase begins.
• On many projects some tasks can start before completion of the prior phase.
• Example: starting work on detailed specifications or obtaining price quotes while waiting for final funding approval.
Scheduling Mistakes: #8 Linking Summary Tasks

- Linking the Summary Level Planning and Execution Phase Tasks means no Execution Phase tasks can start until the Planning Phase is complete.

- In this example it pushes out the start date for Task E-1 by 10 days.
Scheduling Mistakes: #9
Lack of Start & Complete Milestones

- First task - **Project Start** Milestone.
- Last task - **Project Complete** Milestone.
- Helps ensure no ‘hangers’.
Scheduling Mistakes: #10
Project Summary Task

• For new projects: add **Project Summary Task**:
  – Go to ‘File’, ‘Properties’ and in the ‘Title’ field input your project name.
  – Go to ‘Tool’s, ‘Options’, ‘View’ tab and click on ‘Show Project Summary Task’.
Project Summary Task will be the first task listed in the Gantt View (task #0).

When you print the schedule, the legend field shows:
Scheduling Mistakes: #10
Header, Footer & Legend

• Common mistake: not using header, footer and legend leaving unknown Version (revision) number & Date.

• Go to ‘File’, ‘Page Set-up’ and click on the ‘Header’, ‘Footer’ and ‘Legend’ tabs.

• **BEST PRACTICE:** define a common template for projects (impress your clients).
Scheduling Mistakes: #10
Header, Footer & Legend

- **Header**: Project Title & Company Logo.

- **Footer**:  
  - Left: Date of update.  
  - Center: Page # of # Pages.  
  - Right: Updated by (or Project Manager).

- **Legend**:  
  - File name.  
  - Version (revision) number.
1. **Set-up Project Start and Project Summary Task:**
   - Set the task type to “Fixed Duration”.
   - Input the project start date.
   - Add the project summary task to your schedule.
   - On line 0 of your schedule (which is now the Project Summary Task), add your project name in the ‘Task Name’ column.
   - Add the header, footer and legend information.
2. Working from the Gantt chart view, enter tasks and establish relationships:
   – Enter the project start and complete milestones.
   – Enter the list of tasks for your project.
   – Establish the task relationships.
   – Enter the work (effort) for each task.
   – Enter a first guess of duration for each task.
3. Add each resource by name or work group to the Resource Sheet, along with availability.

4. From the Gantt chart view, split the screen and assign resources to tasks.
5. From the Gantt Chart, review the schedule and critical path and check for hangers.

6. Plot the schedule and do a final check for logic. Update the schedule based on this review.

7. Conduct a final check for overload of resources using the Resource Graph. Then, if desired, change the task type to “Fixed Work”.

8. Once the schedule is finalized, set this as your project baseline.
Conclusion

• Watch for the common scheduling mistakes outlined in this presentation!

• Follow the suggestions in this presentation when preparing schedules!
Questions?

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