Schedule Management

CS413 - Software Engineering Project Management

Department of Computer Engineering, Bilkent University

Dr. Mustafa Değerli
Key Terms

- **Project Schedule.** An output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources.

- **Project Schedule Management.** Project Schedule Management includes the processes required to manage the timely completion of the project.
Key Terms

- **Project Schedule Network Diagram.** A graphical representation of the logical relationships among the project schedule activities.
Software Engineering Project Management

Schedule Management

Examples of Project Schedule Presentations

- Activity List
- Bar Chart
- Network Diagram
Key Terms

- **Schedule Baseline.** The approved version of a schedule model that can be changed using formal change control procedures and is used as the basis for comparison to actual results.

- **Schedule Compression.** A technique used to shorten the schedule duration without reducing the project scope.
Key Terms

• **Schedule Data.** The collection of information for describing and controlling the schedule

• **Schedule Forecasts.** Estimates or predictions of conditions and events in the project's future based on information and knowledge available at the time the schedule is calculated
Key Terms

- **Schedule Management Plan.** A component of the project or program management plan that establishes the criteria and the activities for developing, monitoring, and controlling the schedule.
Key Terms

• **Schedule Model.** A representation of the plan for executing the project's activities including durations, dependencies, and other planning information, used to produce a project schedule along with other scheduling artifacts.
Key Terms

- **Schedule Network Analysis.** A technique to identify early and late start dates, as well as early and late finish dates, for the uncompleted portions of project activities.
Key Terms

• **Schedule Performance Index (SPI)**. A measure of schedule efficiency expressed as the ratio of earned value to planned value.
Key Terms

• Schedule Variance (SV). A measure of schedule performance expressed as the difference between the earned value and the planned value
Key Terms

- **Scheduling Tool.** A tool that provides schedule component names, definitions, structural relationships, and formats that support the application of a scheduling method.
Key Concepts

- Project scheduling provides a detailed plan that represents how and when the project will deliver the products, services, and results defined in the project scope.
Key Concepts

• The project schedule is used as a tool for communication, managing stakeholder expectations, and a basis for performance reporting
Key Concepts

- When possible, the detailed project schedule should remain flexible throughout the project to adjust for knowledge gained, increased understanding of the risk, and value-added activities
Project Schedule Management

• Includes the processes required to manage the *timely completion* of the project
Schedule Management Processes

- 1 Plan Schedule Management

- The process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule
Schedule Management Processes

• 2 Define Activities
• The process of identifying and documenting the specific actions to be performed to produce the project deliverables
Schedule Management Processes

- 3 Sequence Activities
- The process of identifying and documenting relationships among the project activities
Schedule Management Processes

- **4 Estimate Activity Durations**
- The process of estimating the number of work periods needed to complete individual activities with the estimated resources
Schedule Management Processes

- 5 Develop Schedule
- The process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model for project execution and monitoring and controlling
Schedule Management Processes

• 6 Control Schedule
• The process of monitoring the status of the project to update the project schedule and manage changes to the schedule baseline
Plan Schedule Management

**Inputs**
1. Project charter
2. Project management plan
   - Scope management plan
   - Development approach
3. Enterprise environmental factors
4. Organizational process assets

**Tools & Techniques**
1. Expert judgment
2. Data analysis
   - Alternatives analysis
3. Meetings

**Outputs**
1. Schedule management plan
Schedule Management

4.1 Develop Project Charter
- Project charter

Project Management Plan
- Project management plan
- Scope management plan
- Development approach

6.1 Plan Schedule Management
- Schedule management plan

Enterprise/Organization
- Enterprise environmental factors
- Organizational process assets

Project Management Plan
Software Engineering Project Management

Schedule Management

**Define Activities**

**Inputs**
- .1 Project management plan
  - Schedule management plan
  - Scope baseline
- .2 Enterprise environmental factors
- .3 Organizational process assets

**Tools & Techniques**
- .1 Expert judgment
- .2 Decomposition
- .3 Rolling wave planning
- .4 Meetings

**Outputs**
- .1 Activity list
- .2 Activity attributes
- .3 Milestone list
- .4 Change requests
- .5 Project management plan updates
  - Schedule baseline
  - Cost baseline
Software Engineering Project Management

Schedule Management

6.2 Define Activities

- Activity list
- Activity attributes
- Milestone list

4.6 Perform Integrated Change Control

- Change requests

Project Management Plan

- Project management plan updates
  - Schedule baseline
  - Cost baseline

Project Documents

Enterprise/Organization

- Enterprise environmental factors
- Organizational process assets

Project Management Plan

- Schedule management plan
- Scope baseline
**Sequence Activities**

**Inputs**
1. Project management plan
   - Schedule management plan
   - Scope baseline
2. Project documents
   - Activity attributes
   - Activity list
   - Assumption log
   - Milestone list
3. Enterprise environmental factors
4. Organizational process assets

**Tools & Techniques**
1. Precedence diagramming method
2. Dependency determination and integration
3. Leads and lags
4. Project management information system

**Outputs**
1. Project schedule network diagrams
2. Project documents updates
   - Activity attributes
   - Activity list
   - Assumption log
   - Milestone list
**Software Engineering Project Management**

**Schedule Management**

- **Project Management Plan**
  - Project management plan
  - Schedule management plan
  - Scope baseline

- **Project Documents**
  - Project documents
  - Activity attributes
  - Activity list
  - Assumption log
  - Milestone list

- **Enterprise/Organization**
  - Enterprise environmental factors
  - Organizational process assets

- **6.3 Sequence Activities**
  - Project schedule network diagrams

- **Project Documents**
  - Project documents updates
  - Activity attributes
  - Activity list
  - Assumption log
  - Milestone list
Software Engineering Project Management

Schedule Management

Activity A \[\rightarrow\] Finish to Start (FS) \[\rightarrow\] Activity B

Activity A \[\rightarrow\] Start to Start (SS) \[\rightarrow\] Activity B

Activity A \[\rightarrow\] Finish to Finish (FF) \[\rightarrow\] Activity B

Activity A \[\rightarrow\] Start to Finish (SF) \[\rightarrow\] Activity B
Schedule Management

- Complete Punch List
  - FS with 2 Weeks (Lead)
  - Landscape Building Lot

- Write Draft
  - SS with 15 Days (Lag)
  - Edit Draft
Software Engineering Project Management

Schedule Management

[Diagram of a project schedule network with tasks labeled A, B, C, D, E, H, F, G, I, J, K, L, and End, showing dependencies and time adjustments]
## Software Engineering Project Management

### Schedule Management

#### Estimate Activity Durations

<table>
<thead>
<tr>
<th><strong>Inputs</strong></th>
<th><strong>Tools &amp; Techniques</strong></th>
<th><strong>Outputs</strong></th>
</tr>
</thead>
</table>
| 1. Project management plan  
  - Schedule management plan  
  - Scope baseline  
  - Assumption log  
  - Lessons learned register  
  - Milestone list  
  - Project team assignments  
  - Resource breakdown structure  
  - Resource calendars  
  - Resource requirements  
  - Risk register  
  - Enterprise environmental factors  
  - Organizational process assets  | 1. Expert judgment  
  2. Analogous estimating  
  3. Parametric estimating  
  4. Three-point estimating  
  5. Bottom-up estimating  
  6. Data analysis  
    - Alternatives analysis  
    - Reserve analysis  
  7. Decision making  
    - Voting  
  8. Meetings  | 1. Duration estimates  
  2. Basis of estimates  
  3. Project documents updates  
    - Activity attributes  
    - Assumption log  
    - Lessons learned register |

---

*Image and text content from the provided document.*
Software Engineering Project Management

Schedule Management

Develop Schedule

**Inputs**
1. Project management plan
   - Schedule management plan
   - Scope baseline
2. Project documents
   - Activity attributes
   - Activity list
   - Assumption log
   - Basis of estimates
   - Duration estimates
   - Lessons learned register
   - Milestone list
   - Project schedule network diagrams
   - Project team assignments
   - Resource calendars
   - Resource requirements
   - Risk register
3. Agreements
4. Enterprise environmental factors
5. Organizational process assets

**Tools & Techniques**
1. Schedule network analysis
2. Critical path method
3. Resource optimization
4. Data analysis
   - What-if scenario analysis
   - Simulation
5. Leads and lags
6. Schedule compression
7. Project management information system
8. Agile release planning

**Outputs**
1. Schedule baseline
2. Project schedule
3. Schedule data
4. Project calendars
5. Change requests
6. Project management plan updates
   - Schedule management plan
   - Cost baseline
7. Project documents updates
   - Activity attributes
   - Assumption log
   - Duration estimates
   - Lessons learned register
   - Resource requirements
   - Risk register
Software Engineering Project Management

Schedule Management

- Project Management Plan
  - Project management plan
  - Schedule management plan
  - Scope baseline

- Project Documents
  - Project documents
  - Activity attributes
  - Activity list
  - Assumption log
  - Basis of estimates
  - Duration estimates
  - Lessons learned register
  - Milestone list
  - Project schedule network diagrams
  - Project team assignments
  - Resource calendars
  - Resource requirements
  - Risk register

- 6.5 Develop Schedule
  - Change requests

- 4.6 Perform Integrated Change Control
  - Project schedule
  - Schedule data
  - Project calendars

- Project Documents
  - Project documents updates
  - Activity attributes
  - Assumption log
  - Duration estimates
  - Lessons learned register
  - Resource requirements
  - Risk register

- 12.2 Conduct Procurements
  - Agreements

- Enterprise/Organization
  - Enterprise environmental factors
  - Organizational process assets

- Project Management Plan
  - Schedule baseline
  - Project management plan updates
  - Schedule management plan
  - Cost baseline
NOTE: This example uses the accepted convention of the project starting on day 1 for calculating start and finish dates. There are other accepted conventions that may be used.
Software Engineering Project Management

Schedule Management

Normal

Fast Tracking

Crashing

1 2 3 4 5

6 7 8 9 10

11 12 13 14 15

High Risk

High Cost

$ $
Software Engineering Project Management

Schedule Management

**Product vision** drives product roadmap

**Product roadmap** drives release plans

**Release plan** establishes the iterations

**Iteration plans** schedules feature development

Prioritized features delivered by user stories (estimated in story points)

Tasks (estimated in hours) created to deliver user stories

---

**Release Plan**

- Iteration 0
- Iteration 1
- Iteration 2
- Iteration 3
- Iteration n

**Iteration Plan**

- Feature A (User Story 1)
- Feature A (User Story 2)
- Feature B (User Story 3)
- Feature C (User Story 4)
- Feature D (User Story 5)

- Task A: 5 Hours
- Task B: 8 Hours
- Task C: 4 Hours
- Task D: 12 Hours
# Software Engineering Project Management

## Schedule Management

### Milestone Schedule

<table>
<thead>
<tr>
<th>Activity Identifier</th>
<th>Activity Description</th>
<th>Calendar units</th>
<th>Project Schedule</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.MB</td>
<td>Begin New Product Z</td>
<td>0</td>
<td>Diamond</td>
<td></td>
</tr>
<tr>
<td>1.1.1.M1</td>
<td>Complete Component 1</td>
<td>0</td>
<td></td>
<td>Diamond</td>
</tr>
<tr>
<td>1.1.2.M1</td>
<td>Complete Component 2</td>
<td>0</td>
<td></td>
<td>Diamond</td>
</tr>
<tr>
<td>1.1.3.M1</td>
<td>Complete Integration of Components 1 &amp; 2</td>
<td>0</td>
<td></td>
<td>Diamond</td>
</tr>
<tr>
<td>1.1.3.MF</td>
<td>Finish New Product Z</td>
<td>0</td>
<td></td>
<td>diamond</td>
</tr>
</tbody>
</table>

### Summary Schedule

<table>
<thead>
<tr>
<th>Activity Identifier</th>
<th>Activity Description</th>
<th>Calendar units</th>
<th>Project Schedule</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Develop and Deliver New Product Z</td>
<td>120</td>
<td></td>
<td>Shaded</td>
</tr>
<tr>
<td>1.1.1</td>
<td>Work Package 1: Component 1</td>
<td>67</td>
<td></td>
<td>Shaded</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Work Package 2: Component 2</td>
<td>53</td>
<td></td>
<td>Shaded</td>
</tr>
<tr>
<td>1.1.3</td>
<td>Work Package 3: Integrated Components 1 &amp; 2</td>
<td>53</td>
<td></td>
<td>Shaded</td>
</tr>
</tbody>
</table>
Software Engineering Project Management

Schedule Management

<table>
<thead>
<tr>
<th>Activity Identifier</th>
<th>Activity Description</th>
<th>Calendar units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.MB</td>
<td>Begin New Product Z</td>
<td>0</td>
</tr>
<tr>
<td>1.1</td>
<td>Develop and Deliver Product Z</td>
<td>120</td>
</tr>
<tr>
<td>1.1.1</td>
<td>Work Package 1: Component 1</td>
<td>67</td>
</tr>
<tr>
<td>1.1.1.D</td>
<td>Design Component 1</td>
<td>20</td>
</tr>
<tr>
<td>1.1.1.B</td>
<td>Build Component 1</td>
<td>33</td>
</tr>
<tr>
<td>1.1.1.T</td>
<td>Test Component 1</td>
<td>14</td>
</tr>
<tr>
<td>1.1.1.M1</td>
<td>Complete Component 1</td>
<td>0</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Work Package 2: Component 2</td>
<td>53</td>
</tr>
<tr>
<td>1.1.2.D</td>
<td>Design Component 2</td>
<td>14</td>
</tr>
<tr>
<td>1.1.2.B</td>
<td>Build Component 2</td>
<td>28</td>
</tr>
<tr>
<td>1.1.2.T</td>
<td>Test Component 2</td>
<td>11</td>
</tr>
<tr>
<td>1.1.2.M1</td>
<td>Complete Component 2</td>
<td>0</td>
</tr>
<tr>
<td>1.1.3</td>
<td>Work Package 3: Integrated Components 1 and 2</td>
<td>53</td>
</tr>
<tr>
<td>1.1.3.G</td>
<td>Integrate Components 1 and 2 as Product Z</td>
<td>14</td>
</tr>
<tr>
<td>1.1.3.T</td>
<td>Complete Integration of Components 1 and 2</td>
<td>32</td>
</tr>
<tr>
<td>1.1.3.M1</td>
<td>Test Integrated Components as Product Z</td>
<td>0</td>
</tr>
<tr>
<td>1.1.3.P</td>
<td>Deliver Product Z</td>
<td>7</td>
</tr>
<tr>
<td>1.1.3.MF</td>
<td>Finish New Product Z</td>
<td>0</td>
</tr>
</tbody>
</table>
## Software Engineering Project Management

### Schedule Management

#### Control Schedule

<table>
<thead>
<tr>
<th><strong>Inputs</strong></th>
<th><strong>Tools &amp; Techniques</strong></th>
<th><strong>Outputs</strong></th>
</tr>
</thead>
</table>
| .1 Project management plan  
  - Schedule management plan  
  - Schedule baseline  
  - Scope baseline  
  - Performance measurement baseline  
 .2 Project documents  
  - Lessons learned register  
  - Project calendars  
  - Project schedule  
  - Resource calendars  
  - Schedule data  
 .3 Work performance data  
 .4 Organizational process assets | .1 Data analysis  
  - Earned value analysis  
  - Iteration burndown chart  
  - Performance reviews  
  - Trend analysis  
  - Variance analysis  
  - What-if scenario analysis  
 .2 Critical path method  
 .3 Project management information system  
 .4 Resource optimization  
 .5 Leads and lags  
 .6 Schedule compression | .1 Work performance information  
 .2 Schedule forecasts  
 .3 Change requests  
 .4 Project management plan updates  
  - Schedule management plan  
  - Schedule baseline  
  - Cost baseline  
  - Performance measurement baseline  
 .5 Project documents updates  
  - Assumption log  
  - Basis of estimates  
  - Lessons learned register  
  - Project schedule  
  - Resource calendars  
  - Risk register  
  - Schedule data |
Software Engineering Project Management

Schedule Management

- Project Management Plan
  - Project management plan
    - Schedule management plan
    - Schedule baseline
    - Scope baseline
    - Performance measurement baseline

- Project Documents
  - Project documents
    - Lessons learned register
    - Project calendars
    - Project schedule
    - Resource calendars
    - Schedule data

- 4.3 Direct and Manage Project Work
  - Work performance data

- 6.6 Control Schedule
  - Work performance information
  - Change requests
  - Schedule forecasts

- 4.5 Monitor and Control Project Work
  - Project management plan updates
    - Assumption log
    - Basis of estimates
  - Schedule management plan
  - Schedule baseline
  - Cost baseline
  - Performance measurement baseline

- 4.6 Perform Integrated Change Control
  - Project Documents
    - Project documents
    - Updates
      - Assumption log
      - Basis of estimates
    - Lessons learned register
    - Project schedule
    - Resource calendars
    - Risk register
    - Schedule data

- Enterprise/Organization
  - Organizational process assets
## Schedule Management

|----------------------------------|--------------------------|------------------------|-------------------------|------------------------------------------|-----------------------|
| 6. Project Schedule Management  | 6.1 Plan Schedule Management  
6.2 Define Activities  
6.3 Sequence Activities  
6.4 Estimate Activity Durations  
6.5 Develop Schedule |                        |                        |                                        |                       |
|                                  |                          |                        | 6.6 Control Schedule      |                                        |                       |
Tailoring Considerations

- **Life cycle approach**
- What is the most appropriate life cycle approach that allows for a detailed schedule?
Tailoring Considerations

• Duration and resource
• What are the factors influencing durations, such as the correlation between resource availability and productivity?
Tailoring Considerations

- Project dimensions
- How will the presence of project complexity, technological uncertainty, product novelty, pace or progress tracking, (such as earned value management, percentage complete, red-yellow-green (stop light) indicators) impact the desired level of control?
Tailoring Considerations

- **Technology support**
- Is technology used to develop, record, transmit, receive, and store project schedule model information and is it readily accessible?
References

• A guide to the project management body of knowledge (PMBOK guide), Sixth Edition, 2017 / Project Management Institute.
Schedule Management

CS413 - Software Engineering Project Management

Department of Computer Engineering, Bilkent University

Dr. Mustafa Değerli