Lecture 5 - Project Scheduling

Comprehensive Note on Project Schedule Management

Project Schedule Management is a critical component of project management that ensures the timely completion of a project. It involves six key processes that guide the planning, development, management, and control of the project schedule. These processes are:

1. **Plan Schedule Management**

2. **Define Activities**

3. **Sequence Activities**

4. **Estimate Activity Durations**

5. **Develop Schedule**

6. **Control Schedule**

These processes work together to create a realistic and adaptable schedule that aligns with the project's scope, resources, and constraints.

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1. Key Concepts in Project Schedule Management

- **Purpose of Scheduling**:

  - Provides a detailed plan showing **how** and **when** the project will deliver its products, services, and results as defined in the project scope.

  - Acts as a **communication tool** to manage stakeholder expectations and serves as a basis for **performance reporting**.

- **Scheduling Methods**:

  - The project management team chooses a method, such as the **Critical Path Method (CPM)** for predictive life cycles or an **Agile approach** for adaptive life cycles.

- **Flexibility**:

  - The schedule should remain adaptable throughout the project to incorporate new knowledge, better risk understanding, and value-added activities.

2. Trends and Emerging Practices

- **Iterative Scheduling with a Backlog**:

  - Used in **adaptive life cycles** (e.g., agile).

  - A form of **rolling wave planning**, where work is planned iteratively based on a prioritized backlog.

- **On-Demand Scheduling**:

  - Common in **Kanban systems**.

  - Based on the **theory of constraints** and **pull-based scheduling** from lean manufacturing, limiting work in progress to balance demand with team capacity.

3. Tailoring Considerations

When customizing schedule management for a project, consider:

- **Life Cycle Approach**: Predictive (e.g., waterfall) or adaptive (e.g., agile).

- **Resource Availability**: Skills and availability of team members and physical resources.

- **Project Dimensions**: Size, complexity, and constraints.

- **Technology Support**: Availability of scheduling software and tools.

4. Considerations for Agile/Adaptive Environments

- **Short Cycles**: Work is performed in iterations (e.g., sprints), enabling rapid feedback and adaptation.

- **Iterative and On-Demand Scheduling**: Scheduling is flexible, with work pulled from a backlog as capacity allows.

- **Focus on Feedback**: Short cycles allow for continuous review and adjustment of plans and deliverables.

5. The Six Processes of Project Schedule Management

5.1 Plan Schedule Management

- **Purpose**: Establish the policies, procedures, and documentation needed to plan, develop, manage, and control the project schedule.

- **Inputs**:

  - **Project Charter**: Defines high-level objectives and constraints.

  - **Project Management Plan**: Provides the overall framework.

  - **Enterprise Environmental Factors**:

    - Organizational culture and structure

    - Resource availability (team and physical)

    - Scheduling software

    - Guidelines for tailoring processes

    - Commercial databases (e.g., estimating data)

  - **Organizational Process Assets**:

    - Historical information and lessons learned

    - Policies, procedures, and templates

    - Monitoring and reporting tools

- **Tools and Techniques**:

  - **Expert Judgment**: Insights from experienced professionals in scheduling and the specific industry.

  - **Data Analysis**: Evaluating options and approaches.

- **Meetings**: Collaborative planning with stakeholders.
- **Outputs**:
   - **Schedule Management Plan**: A key document that outlines:
      - How the schedule model will be developed
      - Release and iteration length (in agile)
      - Level of accuracy required
      - Units of measure (e.g., hours, days)
      - Links to organizational procedures
      - Maintenance and control thresholds
      - Performance measurement rules (e.g., earned value)
      - Reporting formats

5.2 Define Activities

- **Purpose**: Identify and document the specific actions required to produce the project deliverables.
- **Inputs**:
   - **Project Management Plan**:
      - Schedule management plan
      - Scope baseline (scope statement, WBS, deliverables)
   - **Enterprise Environmental Factors**
   - **Organizational Process Assets**
- **Tools and Techniques**:
   - **Expert Judgment**
   - **Decomposition**: Breaking down work packages into smaller, manageable activities.
   - **Rolling Wave Planning**: Progressive elaboration of near-term activities while deferring details for later phases.

- - **Meetings**
- **Outputs**:
    - **Activity List**: A detailed list of all activities.
    - **Activity Attributes**: Additional details about each activity (e.g., dependencies, resources).
    - **Milestone List**: Key events or checkpoints.
    - **Change Requests**
    - **Project Management Plan Updates**

5.3 Sequence Activities

- **Purpose**: Identify and document relationships between project activities to determine their logical order.
- **Inputs**:
    - **Project Management Plan**
    - **Project Documents**:
        - Activity attributes
        - Activity list
        - Assumption log
        - Milestone list
    - **Enterprise Environmental Factors**
    - **Organizational Process Assets**
- **Tools and Techniques**:
    - **Precedence Diagramming Method (PDM)**: A visual method using four dependency types:
        - **Finish-to-Start (FS)**: Activity A must finish before B starts (most common).
        - **Finish-to-Finish (FF)**: A must finish before B finishes.

- **Start-to-Start (SS)**: A must start before B starts.

- **Start-to-Finish (SF)**: A must start before B finishes (rare).

  - **Leads and Lags**:

    - **Lead**: Allows a successor activity to start earlier (e.g., landscaping begins 2 weeks before building completion).

    - **Lag**: Delays a successor activity (e.g., waiting for concrete to cure).

  - **Project Management Information System (PMIS)**: Software for scheduling.

- **Outputs**:

  - **Project Schedule Network Diagrams**: Visual representation of activity sequences and dependencies.

  - **Project Documents Updates**: Updates to activity attributes, list, assumption log, and milestone list.

Dependency Types:

- **Mandatory**: Required (e.g., pour foundation before erecting structure).

- **Discretionary**: Preferred by the team (e.g., fast-tracking).

- **External**: Relies on outside factors (e.g., vendor delivery).

- **Internal**: Within the team's control.

5.4 Estimate Activity Durations

- **Purpose**: Estimate the time (work periods) needed to complete each activity with the assigned resources.

- **Inputs**:

  - **Project Management Plan**

  - **Project Documents**:

    - Activity attributes

    - Activity list

- 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**

- **Tools and Techniques**:

  - **Expert Judgment**

  - **Analogous Estimating**: Uses historical data from similar projects.

  - **Parametric Estimating**: Uses statistical relationships (e.g., hours per unit).

  - **Three-Point Estimating**:

    - Formula: **tE = (tO + tM + tP) / 3**

    - tO = Optimistic, tM = Most Likely, tP = Pessimistic

  - **Bottom-Up Estimating**: Aggregates estimates of smaller tasks.

  - **Data Analysis**

  - **Decision Making**

  - **Meetings**

- **Outputs**:

  - **Duration Estimates**: Time required for each activity.

  - **Basis of Estimates**: Assumptions and methods used.

  - **Project Documents Updates**

Key Considerations:

- **Law of Diminishing Returns**: Adding more resources may yield smaller gains.

- **Resource Impact**: Doubling resources doesn't always halve time due to coordination or risk.

- **Technology Advances**: Can reduce durations.

- **Staff Motivation**: Beware of **Student Syndrome** (procrastination) and **Parkinson's Law** (work expands to fill time).

5.5 Develop Schedule

- **Purpose**: Analyze activity sequences, durations, resource requirements, and constraints to create the project schedule model.

- **Inputs**:

  - **Project Management Plan**

  - **Project Documents**

  - **Agreements**: Contracts or commitments.

  - **Enterprise Environmental Factors**

  - **Organizational Process Assets**

- **Tools and Techniques**:

  - **Schedule Network Analysis**: Evaluates the network to determine the timeline.

  - **Critical Path Method (CPM)**: Identifies the longest path, determining the shortest project duration.

  - **Resource Optimization**: Adjusts resource allocation (e.g., leveling, smoothing).

  - **Schedule Compression**:

    - **Crashing**: Adds resources to shorten duration.

    - **Fast-Tracking**: Overlaps activities.

  - **Project Management Information System (PMIS)**

- **Outputs**:

- **Schedule Baseline**: The approved schedule for tracking progress.
- **Project Schedule**: Visual representation (e.g., Gantt chart).
- **Schedule Data**: Supporting details.
- **Project Calendars**: Define working days and holidays.
- **Change Requests**
- **Project Management Plan Updates**

5.6 Control Schedule

- **Purpose**: Monitor project status to update the schedule and manage changes to the baseline.
- **Inputs**:
  - **Project Management Plan**
  - **Project Documents**
  - **Work Performance Data**: Actual progress data.
  - **Organizational Process Assets**
- **Tools and Techniques**:
  - **Data Analysis**: Earned value, variance analysis.
  - **Critical Path Method**: Tracks critical path changes.
  - **Resource Optimization**
  - **Schedule Compression**
- **Outputs**:
  - **Work Performance Information**: Progress insights.
  - **Schedule Forecasts**: Predictions based on current status.
  - **Change Requests**
  - **Project Management Plan Updates**
  - **Project Documents Updates**

6. Practical Tools and Techniques

- **Precedence Diagramming Method (PDM)**: Visualizes dependencies.

- **Critical Path Method (CPM)**: Determines the project's minimum duration and float.

- **Leads and Lags**: Adjust timing for efficiency.

- **Estimating Techniques**:

    - **Analogous**: Quick, based on past projects.

    - **Parametric**: Formula-driven.

    - **Three-Point**: Balances uncertainty.

- **Gantt Charts**: Shows timelines and durations.

- **Network Diagrams**: Highlights dependencies and critical path.

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7. Summary

- **Project Schedule Management** ensures timely project delivery through six structured processes.

- It requires balancing detailed planning with flexibility to adapt to changes.

- Traditional tools (e.g., CPM) and agile practices (e.g., iterative scheduling) cater to different project needs.

- Key to success: Accurate estimates, logical sequencing, and proactive control.

This note provides a thorough understanding of Project Schedule Management, preparing you to study and apply its principles effectively.