Course: IT Project Management

# Lecture 6: Project Schedule Management

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# Learning Objectives

- - Memahami konsep dan pentingnya Project Schedule Management
- - Menguasai proses-proses dalam Schedule Management menurut PMBOK Guide 7 & 6
- - Mampu membuat schedule network diagram dan Gantt chart
- - Mengaplikasikan teknik estimasi duration dan effort
- - Mengoptimalkan jadwal dengan critical path method
- - Mengendalikan schedule performance secara efektif

# Definisi Project Schedule Management

- PMBOK Guide 7: "Proses untuk mengelola penyelesaian proyek tepat waktu" (PMI,2021)
- Tujuan: Menjamin proyek selesai dalam waktu yang telah ditentukan
- Fokus: Aktivitas, urutan, durasi, sumber daya, dan ketergantungan
- **Konsep Dasar Effort vs Duration:**
  - Effort: Waktu kerja aktual yang dibutuhkan (jam orang)
  - Duration: Total kalender waktu untuk menyelesaikan tugas
  - Contoh:
- - Effort: 40 jam kerja
- - Duration: 5 hari (dengan 8 jam/hari)
  - Elapsed Time: Waktu kalender termasuk weekend dan holiday

# Pentingnya Schedule Management di Proyek TI

- Time-to-Market: Kecepatan sebagai competitive advantage
- Resource Optimization: Efisiensi penggunaan developer dan infrastruktur
- Stakeholder Expectation: Memenuhi komitmen waktu kepada client
- Cost Control: Mencegah biaya tambahan akibat keterlambatan (Kerzner, 2022)

- **Hubungan dengan Knowledge Area Lainnya:**
  - Scope Management: Work packages menjadi aktivitas
  - Cost Management: Durasi mempengaruhi biaya
  - Resource Management: Ketersediaan sumber daya mempengaruhi jadwal
  - Risk Management: Buffer time untuk risiko

# Metodologi dan Pendekatan Scheduling

  - Predictive (Waterfall): Jadwal detail di awal proyek
  - Adaptive (Agile): Iterative scheduling dengan time-boxed sprints (Cohn, 2020)
  - Hybrid: Kombinasi keduanya untuk proyek TI kompleks

- **Tools Schedule Management Modern**:
  - Scheduling Software: Microsoft Project, Jira, Asana
  - Agile Tools: Azure DevOps, Trello, Monday.com
  - Collaboration: Slack, Teams integrated dengan calendar
  - Monitoring: Real-time dashboards dan burndown charts

# Tantangan Schedule Management di Proyek TI

- Requirements Volatility: Perubahan requirement selama development
- Technical Uncertainty: Teknologi baru dan kompleksitas teknis
- Resource Dependency: Ketergantungan pada spesialis tertentu
- Integration Complexity: Integrasi multiple systems dan APIs

- Prinsip Schedule Management PMBOK:
  - Tailoring: Menyesuaikan pendekatan dengan konteks proyek
  - Stakeholder Engagement: Melibatkan stakeholder dalam perencanaan
  - System Thinking: Memandang jadwal secara holistik
  - Adaptation: Beradaptasi dengan perubahan

# Plan Schedule Management - Overview

- Definisi: Proses menetapkan kebijakan, prosedur, dan dokumentasi untuk perencanaan jadwal
- Output: Schedule Management Plan
- Tujuan: Menyediakan panduan dan arah untuk aktivitas scheduling

- **Komponen Schedule Management Plan:**
  - Scheduling Methodology: Pendekatan yang digunakan (critical path, agile, dll)
  - Level of Accuracy: Tingkat akurasi estimasi yang diharapkan
  - Units of Measure: Satuan yang digunakan (jam, hari, story points)
  - Control Thresholds: Batasan variance yang dapat diterima

# Tools dan Techniques Planning

- Expert Judgment: Konsultasi dengan senior developers dan architects
- Analytical Techniques: What-if analysis, simulation, optimization
- Meetings: Scheduling workshops dengan tim dan stakeholder

- **Scheduling Tools Selection:**
  - Enterprise Tools: Microsoft Project, Oracle Primavera
  - Agile Tools: Jira Software, Azure Boards
  - Collaborative Tools: Smartsheet, ClickUp
  - Considerations: Integration capabilities, learning curve, cost

# Schedule Model Development

  - Scheduling Software: Konfigurasi tools yang dipilih
  - Calendar Definition: Working days, holidays, shifts
  - Resource Calendars: Availability tim development
  - Project Code Structure: WBS integration

- **Format Laporan Schedule:**
  - Gantt Charts: Visual timeline dengan dependencies
  - Milestone Charts: Titik pencapaian penting
  - Network Diagrams: Diagram precedence relationships
  - Agile Artifacts: Sprint burndown, release burnup

# Contingency Reserve

- Time Reserve: Buffer untuk ketidakpastian
- Calculation Methods: Percentage of duration, quantitative analysis
- Management Reserve: Buffer untuk unknown-unknowns
- Allocation Strategy: Distributed vs centralized reserves

- **Contoh Schedule Management Plan untuk Proyek Agile:**
  - Sprint Duration:2-week timeboxes
  - Planning Horizon: Release planning 3-6 bulan
  - Estimation Unit: Story points dengan velocity tracking
  - Progress Reporting: Daily stand-ups, sprint reviews

# Define Activities - Overview

- Definisi: Proses mengidentifikasi dan mendokumentasi tindakan spesifik untuk menyelesaikan work packages
- Input: Scope baseline, WBS, WBS dictionary
- Output: Activity list, activity attributes, milestone list

- **Dari Work Packages ke Activities:**
  - Work Packages: Deliverable-oriented (apa)
  - Activities: Action-oriented (bagaimana)
  - Contoh TI:

- - Work Package: User authentication module
- - Activities: Design login UI, develop backend API, write unit tests

# Teknik Define Activities

- Decomposition: Memecah work packages menjadi activities
- Rolling Wave Planning: Progressive elaboration untuk work detail
- Expert Judgment: Input dari senior developers dan tech leads
- Templates: Activity lists dari proyek sejenis

- **Activity List Components:**
  - Activity ID: Identifier unik
  - Activity Description: Penjelasan jelas dan spesifik
  - Activity Attributes: Resource requirements, constraints, assumptions
  - Predecessor/Successor: Ketergantungan dengan activities lain

# Milestone Planning

- Definition: Titik signifikan dalam proyek tanpa duration
- Types: Mandatory, optional, delivery milestones
- Examples: Requirements complete, design approval, code complete, UAT sign-off
- Benefits: Progress tracking, stakeholder communication

- **Activity Sequencing Consideration:**
  - Mandatory Dependencies: Hubungan wajib (hard logic)
  - Discretionary Dependencies: Hubungan pilihan (soft logic)
  - External Dependencies: Ketergantungan pada pihak eksternal
  - Internal Dependencies: Ketergantungan dalam tim

# Contoh Activity List: Pengembangan Fitur E-Commerce

- Activity ID: FE-001
- Description: Develop product catalog frontend component
- Predecessors: BE-001 (Backend API ready)
- Successors: FE-002 (Shopping cart development)
- Resource: Frontend Developer
- Estimated Effort: 24 jam

- **Best Practice Define Activities:**
  - Appropriate Granularity: Tidak terlalu detail, tidak terlalu tinggi
  - Clear Definition: Setiap activity harus jelas dan dapat diukur
  - Consistent Approach: Metode konsisten untuk seluruh proyek
  - Stakeholder Review: Validasi dengan tim dan stakeholder

# Sequence Activities - Overview

- Definisi: Proses mengidentifikasi dan mendokumentasikan hubungan antara activities
- Tujuan: Menentukan urutan logis eksekusi activities
- Output: Project schedule network diagrams

- **Type of Dependencies:**
  - Finish-to-Start (FS): Activity B mulai setelah Activity A selesai
  - Start-to-Start (SS): Activity B mulai setelah Activity A mulai
  - Finish-to-Finish (FF): Activity B selesai setelah Activity A selesai
  - Start-to-Finish (SF): Activity B selesai setelah Activity A mulai

# Precedence Diagramming Method (PDM)

  - Nodes: Merepresentasikan activities
  - Arrows: Merepresentasikan dependencies
  - Advantages: Visual jelas, mudah dipahami
  - Software Support: Didukung oleh kebanyakan scheduling tools

- **Lead dan Lag Time:**
  - Lead Time: Waktu percepatan dari dependency
  - Lag Time: Waktu penundaan dari dependency
  - Contoh Lead: Development dapat mulai 2 hari sebelum design selesai
  - Contoh Lag: Testing mulai 1 hari setelah deployment selesai

## Network Diagram Development

- Forward Pass: Menghitung early start dan early finish dates
- Backward Pass: Menghitung late start dan late finish dates
- Float Calculation: Menentukan total float dan free float
- Critical Path Identification: Jalur dengan zero float

## Contoh Network Diagram Sistem Login

- Activities:
  - A: Design UI (5 hari)
  - B: Develop Frontend (8 hari) - FS A
  - C: Develop Backend API (6 hari) - SS A
  - D: Integration Testing (3 hari) - FS B,C
- Critical Path: A-B-D = 16 hari

# Dependencies dalam Agile Projects

- Sprint Dependencies: Ketergantungan antar sprint
- Feature Dependencies: Ketergantungan antar fitur
- Team Dependencies: Ketergantungan antar tim
- External Dependencies: API pihak ketiga, vendor deliverables

- **Best Practices Sequencing:**
  - Minimize Dependencies: Mengurangi kompleksitas
  - Identify Critical Dependencies: Fokus pada high-impact dependencies
  - Document Assumptions: Asumsi dalam menentukan sequences
  - Validate dengan Tim: Konfirmasi urutan dengan development team

# Estimate Activity Durations - Overview

- Definisi: Proses memperkirakan jumlah work periods needed untuk menyelesaikan activities
- Input: Activity list, resource calendars, risk register
- Output: Duration estimates, basis of estimates

- Faktor yang mempengaruhi durasi:
  - Resource Capability: Skill dan experience developers
  - Resource Availability: Waktu yang dapat dialokasikan
  - Technical Complexity: Tingkat kesulitan teknis
  - External Constraints: Ketergantungan pihak eksternal

## Teknik Estimasi: Expert Judgment

- Delphi Technique: Estimasi anonim beriterasi
- Planning Poker: Estimasi kolaboratif dengan story points (Rubin, 2012)
- Wideband Delphi: Variasi structured delphi technique
- Reference: Historical data dari proyek sejenis

## Teknik Estimasi: Analogous Estimating

- Top-down Estimating: Berdasarkan proyek serupa
- Accuracy: ±25% untuk high-level estimates
- When to Use: Early planning, feasibility studies
- Benefits: Cepat dan tidak membutuhkan detail

## Teknik Estimasi: Parametric Estimating

- Statistical Relationship: Durasi berdasarkan parameter
- Contoh TI:
  - Function Points: Berdasarkan complexity functions
  - Story Points: Berdasarkan relative sizing
  - Lines of Code: Berdasarkan historical productivity
- Accuracy: Lebih akurat daripada analogous

## Teknik Estimasi: Three-Point Estimating

- PERT Formula: (O + 4M + P) / 6
- Triangular Distribution: (O + M + P) / 3
- Optimistic (O): Best-case scenario
- Most Likely (M): Realistic estimate
- Pessimistic (P): Worst-case scenario

# Estimasi dalam Agile Projects

- Relative Sizing: Story points berdasarkan complexity relatif
- Velocity: Average story points per sprint
- Planning Poker: Collaborative estimation technique
- Ideal Days: Estimasi dalam hari ideal tanpa interruptions

- **Basis of Estimates Documentation:**
  - Assumptions: Asumsi yang digunakan dalam estimasi
  - Constraints: Batasan yang mempengaruhi estimasi
  - Risks: Risiko yang dipertimbangkan
  - Range: Confidence level dari estimasi

# Develop Schedule - Overview

- Definisi: Proses menganalisis activity sequences, durations, resources untuk membuat model jadwal
- Tujuan: Menghasilkan schedule baseline yang realistis
- Output: Project schedule, schedule baseline, schedule data

# Critical Path Method (CPM)

- Definition: Jalur terpanjang dalam network diagram
- Float/Slack: Waktu yang dapat ditunda tanpa mempengaruhi project finish date
- Near-Critical Path: Jalur dengan float kecil
- Importance: Fokus management attention

- **CPM Calculation Example:**
  - Activities: A(3), B(5), C(4), D(6), E(4)
  - Dependencies: A->B->D, A->C->E, D->E
  - Critical Path: A-B-D-E = 18 hari
  - Float Analysis: Activity C memiliki float 3 hari

## Resource Optimization Techniques

- Resource Leveling: Menyeimbangkan resource demand
- Resource Smoothing: Mengoptimalkan within float boundaries
- Overallocation Resolution: Mengatasi resource conflicts
- Team Capacity Planning: Mempertimbangkan developer availability

## Schedule Compression Techniques

- Crashing: Menambah resources untuk mempercepat critical path
- Fast Tracking: Melakukan activities paralel yang sebelumnya sequential
- Trade-off Analysis: Mempertimbangkan cost vs time benefits
- Risks: Increased cost, quality issues, burnout

# Agile Scheduling Approach

- Release Planning: High-level timeline untuk multiple sprints
- Sprint Planning: Detail planning untuk sprint berikutnya
- Velocity-Based Forecasting: Berdasarkan historical team velocity
- Buffer Management: Risk buffer untuk uncertainty

# Schedule Baseline Establishment

- Approval Process: Formal approval dari sponsor dan stakeholder
- Change Control: Proses untuk modifikasi baseline
- Performance Measurement: Baseline sebagai referensi progress
- Communication: Komunikasi baseline kepada semua stakeholder

# Schedule Visualization Tools

- Gantt Charts: Traditional bar charts dengan dependencies
- Milestone Charts: Focus pada significant events
- Network Diagrams: Logical relationships visualization
- Burn-down Charts: Agile progress tracking

# Control Schedule - Overview

- Definisi: Proses memantau status project activities untuk update project progress
- Tujuan: Mengelola changes terhadap schedule baseline
- Continuous Process: Dilakukan throughout project lifecycle

# Performance Measurement

- Earned Value Management (EVM): Integrasi scope, cost, schedule
- Schedule Variance (SV): EV - PV
- Schedule Performance Index (SPI):EV / PV
- Trend Analysis: Performance patterns over time

# Variance Analysis

- Planned vs Actual: Membandingkan baseline dengan actual progress
- Root Cause Analysis: Mengidentifikasi penyebab variances
- Impact Assessment: Dampak pada overall project timeline
- Corrective Actions: Tindakan untuk bring project back on track

# Change Control Process

- Change Requests: Formal requests untuk schedule modifications
- Impact Analysis: Assessment efek pada dependencies dan resources
- Approval Authority: CCB atau project sponsor approval
- Baseline Updates: Modifikasi schedule baseline jika diperlukan

# Schedule Forecasting

- Estimate at Completion (EAC): Projected completion date
- Estimate to Complete (ETC): Sisa waktu yang dibutuhkan
- To-Complete Performance Index (TCPI): Performance required untuk memenuhi target
- Confidence Levels: Probability of meeting deadlines

# Agile Schedule Control

- Daily Stand-ups: Progress tracking harian
- Sprint Reviews: Demonstration dan feedback
- Burndown Charts: Visual progress tracking
- Velocity Tracking: Team capacity monitoring

# Schedule Reporting

- Status Reports: Regular progress updates
- Exception Reports: Hanya variances significant
- Forecast Reports: Future projections
- Stakeholder-Specific Reports: Customized untuk audience berbeda

# Best Practices Schedule Control

- Regular Monitoring: Consistent progress tracking
- Proactive Management: Anticipate potential delays
- Transparent Communication: Open sharing of status
- Continuous Improvement: Learn from variances

# Studi Kasus: Enterprise Software Implementation

- Project Scope: CRM implementation untuk 500 users
- Schedule Challenges: Multiple integration points, data migration complexity
- Solution: Phased rollout dengan parallel workstreams
- Results: Delivered 2 weeks ahead of schedule

# Studi Kasus: Mobile App Development

- Time Constraints: Launch untuk event spesifik
- Approach: Agile dengan fixed time, variable scope
- Techniques: Feature prioritization, minimal viable product
- Outcome: Successful launch dengan core features

# Template: Schedule Management Plan

- Introduction: Purpose dan objectives
- Scheduling Approach: Methodology dan tools
- Estimation Guidelines: Techniques dan accuracy levels
- Control Procedures: Monitoring dan change control

# Template: Activity List

- Standard Columns: ID, Description, Predecessors, Resources, Estimates
- Custom Fields: Complexity, Risks, Assumptions
- Version Control: Change history tracking
- Integration: Link ke WBS dan resource plans

# Software Tools Comparison

- -Microsoft Project: Comprehensive enterprise scheduling
- Jira: Agile project management dengan advanced reporting
- Asana: User-friendly untuk team collaboration
- Smartsheet: Spreadsheet-based dengan powerful features

# Common Scheduling Pitfalls

- Over-Optimism: Unrealistic estimates
- Student Syndrome: Procrastination sampai deadline mendekat
- Parkinson's Law: Work expands to fill available time
- Multitasking: Context switching inefficiencies

# Risk-Based Scheduling

- Risk-Adjusted Estimates: Incorporating uncertainty
- Monte Carlo Simulation: Probability-based scheduling
- Buffer Management: Strategic placement of time reserves
- Scenario Analysis: Planning for multiple possibilities

# Team Velocity Optimization

- Stable Teams: Consistent velocity patterns
- Capacity Planning: Realistic workload allocation
- Technical Debt Management: Balancing speed dan quality
- Continuous Improvement: Retrospective actions

# Distributed Team Scheduling

- Time Zone Considerations: Overlapping work hours
- Communication Protocols: Regular sync meetings
- Cultural Factors: Holiday calendars, work styles
- Tool Configuration: Shared calendars dan tracking

# Metrics dan KPI Schedule Management

- Schedule Variance: Actual vs planned progress
- On-Time Completion Rate: Percentage of milestones met
- Estimate Accuracy: Planned vs actual durations
- Critical Path Stability: Frequency of critical path changes

# Continuous Improvement

- Lessons Learned: Documentation dari setiap proyek
- Process Refinement: Berdasarkan experience dan feedback
- Tool Enhancement: Regular evaluation dan upgrade
- Training Development: Skill improvement untuk tim

# Future Trends Schedule Management

- AI-Powered Forecasting: Machine learning untuk predictions
- Real-Time Analytics: Live dashboard dengan predictive alerts
- Automated Scheduling: AI-driven resource allocation
- Integration dengan Development Tools: Seamless workflow integration

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# Thank You!

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