A1 Introduction to Project Management

Project Management = Applying knowledge, skills, tools, and techniques to meet project requirements and objectives.

Core Knowledge Areas:
- **Scope** (what work is included/excluded)
- **Time** (scheduling and deadlines)
- **Cost** (budgeting and financial control)
- **Quality** (standards and deliverables)
- **Risk** (identifying and mitigating threats)

Key Principles:
- Projects are temporary (defined start and end)
- Projects create unique products/services
- Progressive elaboration (details refined over time)
- Stakeholder engagement is critical

Project vs. Operations:
- Projects → temporary, unique deliverables
- Operations → ongoing, repetitive activities

A2 Agile vs Waterfall Methodologies

Waterfall = Sequential, phase-based approach:
1. Requirements gathering
2. Design
3. Implementation
4. Testing
5. Deployment
6. Maintenance

Pros: Clear structure, easy to understand, good for stable requirements
Cons: Inflexible, late testing, difficulty adapting to changes

Agile = Iterative, incremental approach:
- Work in sprints (1-4 weeks)
- Continuous feedback and adaptation
- Regular delivery of working software
- Collaboration over documentation

Pros: Flexible, fast feedback, customer satisfaction
Cons: Less predictability, requires discipline, scope creep risk

When to use:
- Waterfall: Fixed requirements, regulated industries
- Agile: Evolving requirements, innovation projects

A3 Project Scope Management

Scope = The work that must be performed to deliver a product/service with specified features.

Scope Definition Process:
1. **Collect Requirements**: Stakeholder interviews, surveys, workshops
2. **Define Scope**: Create scope statement (deliverables, boundaries, assumptions)
3. **Create WBS**: Work Breakdown Structure (hierarchical decomposition)
4. **Validate Scope**: Formal acceptance of deliverables
5. **Control Scope**: Monitor and manage changes

Scope Creep = Uncontrolled expansion of scope without adjusting time/cost/resources.

Prevention techniques:
- Clear requirements documentation
- Change control process
- Regular stakeholder communication
- Formal approval for changes

A4 Project Charter and Initiation

Project Charter = Formal document that authorizes a project.

Key Contents:
- Project purpose and justification
- High-level requirements
- Summary budget
- Success criteria
- Assigned project manager and authority level
- Sponsor signature

Project Initiation Steps:
1. Develop business case
2. Conduct feasibility study
3. Create project charter
4. Identify stakeholders
5. Hold kickoff meeting

Why it matters:
- Establishes project authority
- Secures resources and budget
- Aligns stakeholders on goals
- Provides clear mandate to PM

B1 Risk Assessment Techniques

Risk = Uncertain event that could impact project objectives (positive or negative).

Risk Assessment Process:
1. **Identify**: Brainstorming, checklist, SWOT analysis
2. **Analyze**: Probability × Impact matrix
3. **Prioritize**: Focus on high-probability, high-impact risks
4. **Plan Response**: Avoid, transfer, mitigate, accept
5. **Monitor**: Track and review throughout project

Risk Matrix:
- **High Probability + High Impact** = Critical priority
- **Low Probability + Low Impact** = Monitor only
- **High Impact + Low Probability** = Contingency plan
- **High Probability + Low Impact** = Mitigate early

Common project risks:
- Resource availability
- Technical complexity
- Requirement changes
- Budget constraints

B2 Stakeholder Communication

Stakeholder = Individual/group affected by or can affect the project.

Communication Planning:
- **Who**: Identify all stakeholders (sponsor, team, customers, users)
- **What**: Information needs (status reports, decisions, issues)
- **When**: Frequency (daily, weekly, monthly)
- **How**: Method (email, meeting, dashboard, report)

Communication Methods:
- **Interactive**: Meetings, calls, video conferences
- **Push**: Email, memos, reports (one-way)
- **Pull**: Intranet, knowledge base (self-service)

Stakeholder Analysis:
- **High Power + High Interest** = Manage closely
- **High Power + Low Interest** = Keep satisfied
- **Low Power + High Interest** = Keep informed
- **Low Power + Low Interest** = Monitor

Best Practices:
- Tailor message to audience
- Use clear, concise language
- Document important decisions
- Follow up on action items

B3 Quality Management Principles

Quality = Degree to which deliverables meet requirements and satisfy customers.

Quality Planning:
- Define quality standards (industry, organizational, regulatory)
- Identify quality metrics (defect rate, customer satisfaction)
- Plan quality assurance and control activities

Quality Assurance (QA) vs. Quality Control (QC):
- **QA** = Process-focused, preventive (audits, process improvement)
- **QC** = Product-focused, detective (testing, inspections)

Cost of Quality:
- **Prevention Costs**: Training, process documentation
- **Appraisal Costs**: Testing, inspections, reviews
- **Failure Costs**: Rework, warranty, customer complaints
- Principle: Invest in prevention to reduce failure costs

Continuous Improvement:
- Plan-Do-Check-Act (PDCA) cycle
- Root cause analysis
- Lessons learned documentation

C1 Budget Planning Fundamentals

Budget = Financial plan allocating resources to project activities.

Cost Estimation Techniques:
1. **Analogous**: Use historical data from similar projects
2. **Parametric**: Mathematical model (e.g., cost per square foot)
3. **Bottom-up**: Estimate each work package, roll up
4. **Three-point**: (Optimistic + 4×Most Likely + Pessimistic) / 6

Budget Components:
- **Direct Costs**: Labor, materials, equipment
- **Indirect Costs**: Overhead, admin, facilities
- **Contingency Reserve**: Known risks (5-10% typical)
- **Management Reserve**: Unknown risks (5-15% typical)

Cost Baseline:
- Time-phased budget used to measure performance
- Approved version of the budget
- Only changed through formal change control

C2 Cost Control Strategies

Cost Control = Monitoring budget vs. actual spending to prevent overruns.

Earned Value Management (EVM):
- **Planned Value (PV)**: Budgeted cost of scheduled work
- **Earned Value (EV)**: Budgeted cost of completed work
- **Actual Cost (AC)**: Actual cost of completed work

Key Metrics:
- **Cost Variance (CV)** = EV - AC (positive = under budget)
- **Schedule Variance (SV)** = EV - PV (positive = ahead of schedule)
- **Cost Performance Index (CPI)** = EV / AC (>1.0 = efficient)
- **Schedule Performance Index (SPI)** = EV / PV (>1.0 = on track)

Corrective Actions:
- Review spending patterns weekly
- Identify cost drivers
- Negotiate with vendors
- Optimize resource allocation
- Consider scope reduction if needed
- Fast-track or crash critical path (if schedule is the issue)

C3 Resource Allocation and Management

Resource = People, equipment, materials, or facilities needed to complete project activities.

Resource Planning:
1. **Estimate**: Determine types and quantities needed
2. **Acquire**: Obtain resources (hire, procure, contract)
3. **Assign**: Allocate to specific activities
4. **Level**: Optimize to avoid overallocation
5. **Control**: Monitor utilization and adjust

Resource Optimization Techniques:
- **Resource Leveling**: Extend schedule to avoid overallocation
- **Resource Smoothing**: Optimize within fixed schedule
- **Fast Tracking**: Parallel activities to compress schedule
- **Crashing**: Add resources to critical path

Common Challenges:
- Limited availability of skilled resources
- Competing priorities across projects
- Resource conflicts and bottlenecks
- Underestimating effort required

Solutions:
- Cross-training team members
- Flexible resource pools
- Clear prioritization criteria
- Regular capacity planning