Project Management Foundations

Project management fundamentals provide the essential vocabulary and concepts for understanding the discipline.

Core Concepts

A **project** is a temporary endeavor with a defined beginning and end, undertaken to create a unique product, service, or result. This is distinct from **operations**, which are ongoing and repetitive.

A **program** is a group of related projects managed in a coordinated way to obtain benefits not available from managing them individually.

The **Triple Constraint** refers to the interrelationship between a project's **Scope**, **Time**, and **Cost**. A change in one of these elements will likely affect at least one of the others.

Project Selection & Financial Metrics

Before a project is approved, its financial viability is often assessed using these metrics:

- **Net Present Value (NPV):** A metric that represents the value of future cash flows in today's dollars. When comparing projects, the one with the higher NPV is generally the better financial choice.
- **Return on Investment (ROI):** A performance measure used to evaluate the efficiency or profitability of an investment.
- **Internal Rate of Return (IRR):** The discount rate at which the NPV of a project becomes zero.
- **Total Cost of Ownership (TCO):** An estimate of all the direct and indirect costs associated with an asset over its entire life.

People & Organizations

How an organization is structured and the roles people play are critical to a project's success.

Organizational Structures

- **Project-Oriented (Projectized):** The project manager has the most authority in this structure. Team members report directly to the PM, and organizational resources are primarily focused on project work.
- **Functional:** A traditional structure where staff are grouped by department (e.g., IT, Marketing). The project manager has the least authority in this model.
- **Matrix:** A hybrid structure where team members report to both a functional manager and a project manager. This can create challenges in loyalty and priority setting. A **strong matrix** grants more power to the project manager, while a **weak matrix** keeps more authority with the functional manager.

Key Governance Roles

- **Executive Sponsor:** Champions the project, secures funding, and ensures it aligns with business strategy. The sponsor is ultimately accountable for the project's success.
- **Steering Committee:** A group of senior stakeholders that provides high-level guidance, oversight, and strategic decision-making for the project.

Team Concepts

- **Virtual Team:** A team whose members are located in different countries or locations, working across time and space using communication technology.
- **Conflict Resolution Techniques:** Common methods include Collaborate/Problem Solve, Force/Direct, and Smooth/Accommodate. Scope creep is a source of conflict, not a resolution technique.

Project Methodologies & Frameworks

Choosing the right project approach is a critical early decision.

Predictive (Waterfall)

The **Predictive**, or **Waterfall**, model is a traditional, sequential approach where each phase is completed before the next one begins. It's best suited for projects with clear, stable requirements, as most of the planning is done upfront before execution begins.

Agile & Adaptive Frameworks

- **Agile:** A flexible approach focused on iterative development, customer collaboration, and adapting to change. It values delivering functional components in small increments.
- **Scrum:** An Agile framework that uses short, time-boxed periods called **sprints** to complete work. The formal role of a "Project Manager" does not exist in Scrum.
- **Kanban:** A visual workflow framework that uses a board with columns to manage tasks and show progress.
- **Lean:** A methodology focused on minimizing waste and maximizing value in a process.

Key Agile Concepts

- **Agile Events:**
  - **Sprint Planning:** The event where the team creates the **Sprint Backlog** by forecasting the work to be done in the upcoming sprint.
  - **Sprint Review:** An informal meeting where the team demonstrates completed work to stakeholders to gather feedback.
  - **Sprint Retrospective:** A meeting for the team to inspect its own process and identify improvements for the next sprint.
- **Agile Artifacts & Concepts:**
  - **Product Backlog:** A prioritized list of all desired features and requirements for the product, managed by the Product Owner.
  - **Definition of Done (DoD):** A checklist of criteria that a piece of work must meet to be considered complete, ensuring quality and consistency.
  - **User Story:** A short description of a feature from an end-user's perspective, often following the format: "As a <user>, I want <goal> so that <reason>.".

Hybrid and Other Life Cycles

- **Hybrid:** Combines a predictive and an adaptive life cycle, useful when some project elements are fixed and others are evolving.
- **Iterative Life Cycle:** Develops the product through a series of repeated cycles, allowing for progressive refinement and management of complexity.
- **Incremental Life Cycle:** Delivers a complete, usable portion of the product in each increment, successively adding functionality.

The Five Project Management Process Groups & Key Documents

The project life cycle is organized into five groups that guide a project from start to finish.

1. Initiating

This phase formally authorizes a new project. Its completion is marked by the approval of the **Project Charter**.

- **Project Charter:** Officially authorizes the project, defines high-level scope and objectives, and grants the project manager authority to assign resources.
- **Stakeholder Register:** Lists all stakeholders and analyzes their interests, influence, and engagement strategy.

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2. Planning

This phase establishes the total scope and creates the detailed roadmap for the project.

- **Project Management Plan:** The master document that integrates and consolidates all subsidiary plans (scope, schedule, cost, etc.) and baselines.
- **Scope Statement:** Describes what is in and out of scope, major deliverables, assumptions, and constraints. It contains the formal **acceptance criteria**.
- **Work Breakdown Structure (WBS):** A hierarchical decomposition of all project work. The lowest level is the **work package**.
- **WBS Dictionary:** Provides detailed information about each component in the WBS.
- **Schedule Management Plan:** A subsidiary plan that outlines how the schedule will be developed, monitored, and controlled.
- **Communications Management Plan:** Details how, when, and by whom project information will be shared.
- **Risk Management Plan:** Details how project risks will be managed.

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3. Executing

This is where the project plan is put into action and the majority of the budget and effort is consumed.

- **Issue Log:** Tracks project issues, their status, and resolution.
- **Change Log:** Documents all requested or approved project changes.

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4. Monitoring & Controlling

This group tracks progress against the plan and manages changes.

- **Performance Reports:** Communicate project status on scope, schedule, and budget.
- **Variance Reports:** Show deviations from baseline plans using metrics like CPI and SPI.
- **Forecasts:** Predict future performance using metrics like Estimate at Completion (EAC) and Estimate to Complete (ETC).
- **Validate Scope: The process of formalizing acceptance of completed project deliverables from stakeholders.**

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5. Closing

This phase provides an orderly end to the project by finalizing all activities.

- **Final Project Report:** Summarizes project outcomes and performance.
- **Lessons Learned Register:** Captures insights for future projects. This information is archived to form the organization's **historical database**.
- **Final Deliverables Sign-Off:** Formal acceptance from the customer or sponsor that the work is complete.

Deep Dive into Key Knowledge Areas

These topics require more detailed understanding for the exam.

Estimating Techniques

- **Analogous:** Uses historical data from a similar past project.
- **Parametric:** Uses a statistical relationship between data to calculate an estimate (e.g., cost per unit). Multiplying a known quantity (e.g., 1000 meters of cable) by a known cost per unit (e.g., $5 per meter) is a classic example.
- **Bottom-Up:** Aggregates detailed estimates of lower-level work packages. Bottom-up estimating builds the total estimate from the ground up — task by task.
- **Three-Point:** Uses optimistic, pessimistic, and most likely estimates to calculate an expected value.

Schedule Management

- **Critical Path:** The longest path of dependent tasks that determines the shortest possible project duration. Tasks on this path have zero **float** or **slack**.
- **Float (or Slack):** The amount of time a task can be delayed without delaying the project's finish date.
- **Milestone:** A significant point or event in the project that is represented as having **zero duration**.
- **Schedule Compression:**
    - **Crashing:** Adds resources to critical path activities to shorten their duration, which usually increases cost. Authorizing overtime is a common example.
    - **Fast Tracking:** Performs activities in parallel that would normally be done in sequence, which can increase risk.
- **Resource Leveling:** Adjusts task schedules to resolve resource conflicts, often by shifting tasks within their available float.

Cost Management & EVM

- **Cost Budgeting:** The process of aggregating the estimated costs of individual activities to establish an authorized cost baseline.
- **Reserve Analysis:** Establishing reserves for risk, including **contingency reserves** for known risks and **management reserves** for unknown risks.
- **Earned Value Management (EVM):** A technique to measure project performance by integrating scope, schedule, and cost data.

Risk Management

- **Risk vs. Issue:** A **risk** is a potential future event, while an **issue** is a current problem that must be addressed.
- **Opportunity vs. Threat:** A positive risk is an **opportunity**, while a negative risk is a **threat**.
- **Risk Register:** A central document used to track identified risks, their probability, impact, and response plans.
- **Qualitative Risk Analysis:** Prioritizes risks based on their probability and impact, often using a **Probability and Impact Matrix**.
- **Quantitative Risk Analysis:** Numerically analyzes the effect of identified risks, using techniques like a **Monte Carlo simulation**.

Quality Management

- **Quality Assurance (QA):** A process-oriented activity focused on *preventing* defects by improving processes. Peer code reviews are an example.
- **Quality Control (QC):** A product-oriented activity focused on *identifying* and fixing defects in deliverables.
- **Key Quality Concepts:**
    - **Plan-Do-Check-Act (PDCA):** A continuous improvement cycle used in quality management.
    - **User Acceptance Testing (UAT):** A final phase of testing where end-users validate that the system meets their business requirements before acceptance.

Procurement Management

- **Contract Types:**
    - **Fixed-Price:** Sets a fixed total price for the work. This places the most risk on the **seller**.
    - **Cost-Plus-Fixed-Fee:** Reimburses the seller for allowable costs and pays a fixed fee as profit. This places most of the risk on the **buyer**.

Governance, Compliance, & IT Security

Governance provides the framework of rules and practices to guide a project.

- **Project Management Office (PMO):** A department that standardizes project-related governance processes and maintains project management standards within an organization.
- **Change Control Process:** A formal procedure to manage changes:
  - **Submission:** A formal change request is submitted.
  - **Impact Analysis:** The team evaluates the impact on the project's scope, schedule, and budget.
  - **Approval/Rejection:** A **Change Control Board (CCB)** or sponsor reviews the request and approves or rejects it.
  - **Implementation:** If approved, the project plan is updated, and the change is implemented.
- **Governance & IT Frameworks:**
  - **ITIL (Information Technology Infrastructure Library):** A set of best practices for IT service management (ITSM).
  - **COBIT:** An IT governance framework that maps business requirements to IT processes and controls.
- **IT Security & Compliance:**
  - **CIA Triad:** A foundational information security model standing for **Confidentiality**, **Integrity**, and **Availability**.
  - **Security Controls:** Measures can be **physical** (e.g., key cards for data center access) or **logical/technical** (e.g., firewalls, passwords, encryption).
  - **Compliance:** Projects must often adhere to regulations like **GDPR** (General Data Protection Regulation), **HIPAA** (Health Insurance Portability and Accountability Act), and **SOX** (Sarbanes-Oxley Act).

Essential Tools, Charts, & Diagrams

Chart / Diagram	Purpose / What It Shows
Gantt Chart	A visual timeline of project tasks, showing start/end dates, durations, and dependencies.
PERT Chart	Shows task dependencies and time and activity estimates (Optimistic, Pessimistic, Most Likely) to estimate project duration.
WBS	A hierarchical decomposition of project deliverables into smaller, manageable tasks.
RACI Matrix	A responsibility matrix showing who is Responsible, Accountable, Consulted, and Informed for tasks.
Fishbone (Ishikawa)	A cause-and-effect diagram used to identify the root causes of problems.
Pareto Chart	A bar and line graph combo that identifies the most significant causes of problems (the 80/20 Rule).

Flowchart	Illustrates the sequential steps in a process, helping to define workflows and identify bottlenecks.
Burndown Chart	Used in Agile to show the amount of remaining work over time.
Resource Histogram	A bar chart showing resource usage over time, helping to spot over- or under-utilization.
Control Chart	Used in quality management to monitor process stability and variation over time.

Quick Reference: Acronyms & Formulas

Abbreviation	Meaning
AC	Actual Cost
BAC	Budget at Completion
CPI	Cost Performance Index
EAC	Estimate at Completion
ETC	Estimate to Complete
EV	Earned Value
EVM	Earned Value Management
NPV	Net Present Value
PMO	Project Management Office
PV	Planned Value
RACI	Responsible, Accountable, Consulted, Informed
SLA	Service Level Agreement
SOW	Statement of Work
SPI	Schedule Performance Index
WBS	Work Breakdown Structure

Formula	Description
CV = EV - AC	**Cost Variance:** A negative result indicates a cost overrun.
SV = EV - PV	**Schedule Variance:** A negative result indicates a schedule delay.
CPI = EV / AC	**Cost Performance Index:** A value less than 1 indicates the project is over budget.
SPI = EV / PV	**Schedule Performance Index:** A value less than 1 indicates the project is behind schedule.
EAC = BAC / CPI	**Estimate at Completion:** Predicts the final project cost based on current performance.

S-curve plots cumulative actual and planned cost for trend analysis.

Perform Quality Assurance audits processes to verify adherence to quality standards.

Monitoring & Controlling includes quality audits and process checks to ensure quality standards.

Trend analysis examines performance data to predict future schedule outcomes.

Monte Carlo uses random sampling and distributions to forecast risk impact on objectives.

Monte Carlo simulation is a quantitative technique that uses computer models to simulate the potential impact of risks on project objectives. It runs many iterations to provide a probability distribution of possible outcomes, such as project completion dates or costs.

New stakeholders often emerge during Execution, so the register is updated accordingly.

Network diagrams sequence activities and show dependencies to derive a schedule.

Burn-up charts plot completed work against total scope to visualize progress.

An information security policy defines controls to protect confidentiality, integrity, and availability.

The sponsor provides direction, secures funding, and is ultimately accountable for project success.

Conduct Procurements solicits bids and awards contracts to vendors.

A PERT (network) diagram shows dependencies and identifies the critical path.

A disaster recovery plan provides steps to restore IT services after a disruption.

COBIT provides a framework for IT governance to ensure IT aligns with business strategies and objectives.

Value delivery focuses on aligning projects and programs with strategic objectives.

Claims administration and contract change management handle disputes during procurement control.

Cost Budgeting is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline. This baseline includes all authorized budgets, but excludes management reserves.

A buffer, or contingency reserve, is time or money added to the project plan to deal with identified risks (known unknowns). This is a proactive risk management strategy to protect the project's schedule or budget objectives.

Perform Integrated Change Control reviews and manages all change requests.

Risk identification process is focused on identifying, analyzing, and planning for potential project risks

TCPI indicates required future cost performance to meet the BAC in Earned Value Management

Procurement audits assess contract performance and identify best practices and improvements.

The performance baseline is the integrated scope-schedule-cost baseline for tracking.

A contract is a legally binding document defining terms, deliverables, and acceptance conditions.

The Work Breakdown Structure (WBS) Its primary purpose is to break down the project scope into manageable pieces, showing the hierarchy of deliverables.