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UNIT 10
PROJECT MANAGEMENT PROCESSES

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1. PROJECT PLANNING

1.1 Meaning and Objectives

Concept	Textbook Definition	Simplified Explanation
Meaning of Planning	The process of establishing project objectives, identifying the activities required to achieve them, determining the resources needed, and defining the sequence and schedule of these activities.	Deciding what to do, how to do it, who will do it, and when it needs to be finished, all *before* starting the work.
Objectives	To provide a roadmap for execution, ensure the optimal allocation of resources, identify potential risks, establish a baseline for performance measurement, and align all stakeholders.	To create a clear, agreed-upon guide that prevents surprises, waste, and confusion during execution.

1.2 Process of Planning

The planning process is iterative and includes:

1. **Defining Scope:** Determining the project boundaries and deliverables.
2. **Creating the Work Breakdown Structure (WBS):** Decomposing the major deliverables into smaller, manageable tasks.
3. **Activity Definition:** Identifying the specific tasks needed to produce the deliverables.
4. **Sequence and Dependency Determination:** Establishing the order in which tasks must be performed.
5. **Resource Estimation:** Determining the types and quantities of resources (people, equipment, materials) needed.
6. **Time Estimation:** Forecasting the duration of each activity.
7. **Schedule Development:** Creating the project timetable (e.g., using CPM/PERT).
8. **Budgeting:** Calculating the necessary costs.
9. **Risk Planning:** Identifying and planning responses to potential threats and opportunities.

1.3 Components of a Good Plan

A robust project plan typically includes:

- **Scope Statement:** Clear definition of deliverables and boundaries.
- **Work Breakdown Structure (WBS):** A hierarchical decomposition of work.
- **Project Schedule (Gantt/Network Diagram):** The sequence and timing of activities.
- **Budget/Cost Baseline:** The approved total funding required.
- **Resource Management Plan:** How resources will be acquired and managed.
- **Risk Register:** List of identified risks and planned mitigation actions.
- **Communication Plan:** Who needs what information, when, and how.

2. PROJECT ORGANIZATION

2.1 Meaning of Organizational Structure

The organizational structure defines how reporting relationships, roles, and responsibilities are formally arranged within an organization to manage and execute a project. It determines the flow of authority and communication.

2.2 Traditional (Functional) Organization

- The project team is structured within the existing functional departments (e.g., Engineering, Marketing, Finance). The functional manager has full authority, and the project manager (if one exists) has little to no power.
- **Pros:** Maximum flexibility in the use of staff; deep technical expertise readily available.
- **Cons:** Project manager has almost no authority; project goals are secondary to functional goals; slow decision-making.

2.3 Line-Staff Organization

- A hybrid where functional staff (Line) perform the core tasks, and specialized staff (Staff) provide expert advice or support. In a project context, the project manager acts as a "staff" advisor to the functional line managers.
- **Pros:** Clear hierarchy and reporting lines; specialized support available.
- **Cons:** Staff managers have advisory roles, not direct command; potential conflicts between line authority and staff advice.

2.4 Product (Projectized) Organization

- The entire organization is structured around projects. The project manager has full authority over the resources and staff, who are dedicated solely to that specific project.
- **Pros:** Clear and rapid decision-making; highly effective for large, complex, or time-critical projects; strong project focus.
- **Cons:** Resources are often duplicated across projects; staff members may feel insecure about their next assignment ("what happens when the project ends?").

2.5 Matrix Organization

- A structure where team members report to two bosses: the functional manager (who controls *who* and *technical competence*) and the project manager (who controls *what*, *when*, and *performance*).
- It's a compromise designed to get the best of both the functional and projectized worlds. You keep your functional home (for deep skills) but also report to the project boss (for focus and delivery).
- **Types:**
  - **Weak Matrix:** Functional manager has most authority.
  - **Balanced Matrix:** Functional and Project managers share power equally.
  - **Strong Matrix:** Project manager has most authority and dedicated resources.
- **Cons: "Two Bosses" problem**—potential for high conflict and confusion over priorities.

3. PROJECT STAFFING

3.1 Characteristics of Project Staffing Environment

- **Temporary Nature:** Staff members are typically assigned temporarily; the team disbands upon project completion.
- **Interdisciplinary:** Teams require diverse skill sets from various functional areas (e.g., engineering, marketing, legal).
- **High Uncertainty:** Requires adaptability and quick problem-solving skills from team members.

3.2 Mechanics of Staffing Process

1. **Skills Requirement Identification:** Defining the necessary technical and soft skills (based on the WBS).
2. **Acquisition:** Recruiting, negotiating for internal resources, or hiring external contractors.
3. **Team Building:** Developing relationships and trust among diverse team members.
4. **Training and Development:** Ensuring the team has the skills to perform new tasks.
5. **Performance Appraisal:** Evaluating and providing feedback to team members.

3.3 Selection of Project Manager and his Qualities

The Project Manager is the single point of responsibility for the project's success or failure. The quality required from a project manager are as follows:

- **Leadership and Vision:** Ability to inspire and set clear goals.
- **Technical Credibility:** Understanding the project's core technology/deliverables.
- **Conflict Management:** Skill in resolving disputes, particularly in Matrix environments.
- **Communication Skills:** Effective communication across all levels (stakeholders, team, sponsors).
- **Decision-Making:** Ability to make timely, sound judgments under pressure.

3.4 Setting up of the Project Office

The Project Office (or Project Management Office - PMO) is the central administrative hub or organizational structure that standardizes the project governance processes. It serves as a central repository for documentation, maintaining standards, providing training, and monitoring overall project performance.

4. PROJECT BUDGETING

4.1 Types of Estimating Proceeds (Cost Estimation Methods)

1. **Analogous Estimating (Top-Down):** Using data from a previous, similar project as a basis for estimating the current project. **(Quick but least accurate)**.
2. **Parametric Estimating:** Using a statistical relationship between historical data and other variables (e.g., cost per square foot for a building). **(Relatively accurate, depends on quality of historical data)**.
3. **Bottom-Up Estimating:** Estimating the cost of every individual work package in the WBS and then aggregating them up to get the total project cost. **(Most accurate but time-consuming)**.
4. **Three-Point Estimating:** Using three figures—Optimistic (O), Pessimistic (P), and Most Likely (M)—to calculate a weighted average estimate (often used in PERT).

4.2 Budgeting Process

1. **Cost Estimation:** Calculating the likely cost of resources, labour, and materials.
2. **Cost Aggregation:** Summing up the costs of individual work packages into the budget baseline.
3. **Contingency Reserve:** Adding a buffer for "known-unknown" risks (risks identified in the register).
4. **Management Reserve:** Adding a separate buffer for "unknown-unknown" risks (used for scope changes or unexpected events, requiring approval).
5. **Budget Approval:** Gaining formal acceptance of the total budget by the sponsor.

4.3 Pricing the Projects

Pricing involves setting the price a client will pay for the project, which is different from the project's internal cost (budget).

- **Cost-Plus Pricing:** Price = Total Cost + a predetermined percentage or fixed fee for profit. (Client bears most risk).
- **Fixed-Price Pricing:** Price is set upfront, regardless of the cost incurred. (Contractor bears most risk).
- **Time and Materials (T&M):** Price is based on the actual time spent and materials used, often with a ceiling.

4.4 Budgeting Techniques

- **Zero-Based Budgeting (ZBB):** Requires every line item of the budget to be approved, rather than just approving changes from the previous budget. It starts from zero every time.
- **Activity-Based Costing (ABC):** Allocates costs to project activities based on the resources consumed by the activity, providing a more accurate understanding of cost drivers.

5. PROJECT SCHEDULING

5.1 Meaning of Project Scheduling

Project scheduling is the determination of the start and finish dates of project activities. It specifies the sequence of activities and when each task should be carried out, often represented visually (e.g., Gantt Chart or Network Diagram).

5.2 Program Evaluation and Review Technique (PERT)

- It is a network analysis technique used for projects where activity durations are uncertain. It uses a probabilistic approach to estimate time.
- Calculation: Uses three time estimates (Optimistic, Pessimistic, Most Likely) to calculate the Expected Duration (Te) for each activity.
- $Te = O + M + P$
- Since you don't know exactly how long a new, complex task will take (e.g., R&D), PERT gives you the most likely average time based on a weighted average, acknowledging that the actual time can vary.

5.3 Gantt Charts

- It is a bar chart that illustrates a project schedule. Tasks are listed vertically, and time is displayed horizontally. The length of the bar represents the duration of the task.
- **Pros:** Excellent for quickly communicating the project timeline and status (which tasks are active).
- **Cons:** Poor at showing task dependencies and the Critical Path.

5.4 Critical Path Method (CPM)

- **Concept:** A network analysis technique used to determine the longest path of activities in a project network diagram, which represents the shortest possible time in which the project can be completed.
- **Critical Path:** The sequence of activities that have zero **slack** (or float). Any delay in a critical activity will delay the entire project.
- **Slack/Float:** The amount of time an activity can be delayed without delaying the subsequent activity or the project finish date.
- CPM finds the bottleneck path. If you have two paths to the finish line, one taking 10 days and one taking 15 days, the 15-day path is the Critical Path. If the 10-day path gets delayed by 2 days, the project is still fine, but if the 15-day path gets delayed by 1 day, the whole project is late.

5.5 Resource Loading and Resource Leveling

- **Resource Loading:** The amount of resources that a schedule requires during a specific time period. It shows the resource requirement profile over time.
- **Resource Leveling:** A technique used to adjust a project schedule to ensure that resource requirements do not exceed available capacity, often by shifting non-critical activities (those with slack) to periods when the required resource is available.
- Loading tells you if you need 10 engineers next week. Leveling smooths out the peaks and valleys. If you need 10 engineers next week and 2 the week after, leveling might use the slack available to shift some tasks so you only need 6 engineers each week, thus avoiding temporary overload.

6. PROJECT MONITORING AND CONTROL

6.1 Need for Monitoring and Control

- Monitoring is the process of collecting, recording, and reporting project performance information.
- Control is achieved using the monitoring data to take corrective action, keep the project on track, and ensure objectives are met.
- Monitoring and control is required in project management to prevent small deviations from turning into project failure; to ensure the project remains aligned with the scope, schedule, and budget baselines.

6.2 Monitoring-Control Cycle

1. **Setting Standards/Baselines:** Defining what is expected (from the plan/budget/schedule).
2. **Measuring Performance:** Collecting data on actual progress.
3. **Comparing Actual vs. Planned:** Identifying variances (schedule delays, cost overruns).
4. **Analyzing Variance:** Determining the root cause of the deviation.
5. **Taking Corrective Action:** Implementing changes to bring the project back on track.

6.3 Design of a Project Information System for Monitoring

A Project Information System (PIS) is the system (often software-based) used to gather, integrate, and disseminate the outputs of project management processes. A PIS should provide timely reports on status, forecasts, resource utilization, and risk status. It should be easy to use and generate relevant data for various stakeholders (detailed for the PM, summarized for the sponsor).

6.4 Performance Measurement (Earned Value Management - EVM)

A standard industry technique for integrating project scope, cost, and schedule to assess performance. There are three key metrics to performance measurement.

- **Planned Value (PV):** The authorized budget assigned to scheduled work.
- **Earned Value (EV):** The value of the work actually performed, expressed in terms of the approved budget.
- **Actual Cost (AC):** The total cost incurred for the work performed.

EVM answers three critical questions simultaneously:

- **How much work did we plan to do?** (PV);
- **How much work did we actually complete?** (EV);
- **How much did that completed work cost?** (AC).

6.5 Project Control

The process of influencing the factors that cause project changes and controlling actual changes as they occur. It is proactive and reactive.

6.6 Types of Project Control

- **Change Control:** Managing and approving all requests to change the project baselines (scope, schedule, cost).
- **Scope Control:** Ensuring that only approved changes are implemented and preventing **Scope Creep** (the gradual expansion of project scope without adjustments to time or cost).
- **Schedule Control:** Managing variances from the schedule baseline (e.g., crashing or fast-tracking).
- **Cost Control:** Monitoring expenditures and managing variances from the cost baseline.

6.7 Features of a Good Control System

- **Timeliness:** Provides information quickly enough to take meaningful corrective action.
- **Relevance:** Focuses on the critical areas that need management attention.
- **Economical:** The cost of the control system should not exceed the value it provides.
- **Flexibility:** Adaptable to changes in project scope or environment.

7. PROJECT TERMINATION

7.1 Issues in Project Termination

Termination often involves complex managerial, psychological, and legal issues.

- **Emotional Issues:** Fear of unemployment (for projectized teams), loss of affiliation, demotivation, and "blacklisting" if the project failed.
- **Staffing Issues:** Reassignment of staff and equipment.
- **Documentation:** Ensuring all final reports and lessons learned are compiled.

7.2 Methods of Project Termination

1. **Termination by Extinction:** The project is completed or suddenly stopped. The work is done, or the project is deemed a failure/no longer necessary.
2. **Termination by Addition:** The project is successfully completed, and its output (e.g., a new product division or system) is absorbed into the parent organization as a permanent functional unit.
3. **Termination by Integration:** The project's resources (people, systems) are simply distributed back into the existing functional units of the parent organization.
4. **Termination by Starvation:** Slowly cutting off the project's budget or resources until it quietly dies—a poor method, often used to avoid announcing failure.

7.3 Process of Project Termination

The formal process ensures a clean and well-documented close:

1. **Completion of Deliverables:** Ensuring all scope elements are finalized and accepted by the customer.
2. **Contract Closure:** Finalizing all administrative and contractual agreements with vendors and suppliers.
3. **Final Report:** Documenting performance against baselines, analyzing variances, and confirming customer sign-off.
4. **Lessons Learned:** Conducting a post-mortem review to document what worked well and what could be improved for future projects.
5. **Releasing Resources:** Disbanding the project team and reassigning resources to other functional areas or projects.