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Project Management

Teaching / scheme	Credits	Examination Scheme
Theory : 02 Hours/Week	02	CCE : 15 Marks End-Semester: 35 Marks

Course Objectives: Students will be familiarized with

1. Fundamental principles of project management
2. Project planning, organizing, and controlling the projects
3. Skills in project scheduling, budgeting, and resource allocation
4. Risk management, quality control, and stakeholder management in projects
5. Project management concepts to real-world scenarios

Course Outcomes: Upon successful completion of this course, students will be able to:

CO1: Explain the principles of project management, project planning and execution

CO2: Use project management concepts to real-world scenarios

CO3: Apply Agile Project Management

CO4: Discuss the importance of risk management, quality control, and stakeholder management in projects

Text Books:

1. "Project Management: The Managerial Process" by Erik W. Larson and Clifford F. Gray .
2. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" by Harold Kerzner
3. "Project Management for Engineering, Business, and Technology" by John M. Nicholas & Herman Steyn
4. Roger Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill, ISBN 0-07-337597

Unit I -Introduction to Project Management (07 Hours)

- Project Definition
- Project Life Cycle
- processes and Knowledge areas in Project management
- WBS and its types
- introduction to PMBOK
- portfolio Management
- Traditional Vs Modern Project using PMBOK Concept

Case Study: Online Shopping

A **project** is a temporary endeavor undertaken to create a unique product, service, or result.

- It is a carefully **planned and controlled effort** that must be completed within a **defined timeline, budget, and scope**.

Key Characteristics of a Project

- **Temporary**

Has a definite **start and end**.

- **Unique outcome**

Produces something new. A product, service, or result.

- **Progressive elaboration**

Details are refined as the project moves forward.

- **Purpose-driven**

Exists to achieve a **specific objective**.

- **Constrained**

Operates within **scope, time, cost, and quality** constraints.



Examples

- Building a bridge
- Developing a mobile app
- Organizing a school cultural fest
- Launching a new product

Characteristics of a Project

- **Objectives** – A project is started to achieve clearly **defined goals** related to time, cost, quality, and quantity.
- **Single Entity** – A project is treated as **one complete unit** even though many people work on it.
- **Life Span** – Every project has a **fixed time duration** and cannot continue indefinitely.
- **Require Funds** – **Adequate financial resources** are essential for successful project completion.
- **Life Cycle** – A project **passes through various stages from initiation to completion**.
- **Team Spirit** – **Cooperation and unity** among team members are necessary to achieve project goals.
- **Risk and Uncertainty** – Projects involve **uncertainty and risk due to forecasting and changing** conditions.
- **Directions** – Projects are executed according to **customer requirements regarding time, quality, and quantity**.
- **Uniqueness** – Every project is **distinct and differs from others in objectives and execution**.
- **Flexibility** – Projects must **adapt to changes** throughout their life span.
- **Sub-Contracting** – External experts or agencies are often required to complete complex projects.
- **Cost** – **Any change in project quality or speed directly** affects the overall project cost.

Characteristics of a Project



Project Management

Project Management is the **process of planning, organizing, directing, and controlling** project activities to achieve specific objectives **within given time, cost, and quality limits.**

Importance of Project Management :

- **Timely completion** – Ensures the project is finished within the planned schedule.
- **Cost control** – Helps keep the project within the approved budget.
- **Quality assurance** – Maintains the required standards and specifications.
- **Efficient resource use** – Optimizes use of manpower, materials, and money.
- **Risk management** – Identifies and reduces risks and uncertainties.
- **Clear coordination** – Improves communication and teamwork among members.
- **Customer satisfaction** – Ensures project outcomes meet customer expectations.
- **Better decision-making** – Provides timely information for corrective actions.



Project Life Cycle

The systematic **stages through which a project passes** from its beginning to its end is called project Life cycle.

- The life cycle gives a **practical approach to problem solving** applied to all aspects of a project.
- The project life cycle provides a **structured framework** that **ensures a project is completed efficiently, on time, within budget, and with desired quality**
- Phases in a project life cycle encompasses **sequential and overlapping phases.**
- **The project manager** is usually responsible for managing the life cycle of a project.



5 Phases of Project Management Life Cycle



1. Initiation Phase

- This is the **starting stage** where the project idea is identified and its **feasibility** is examined.
- **Objectives, scope, requirements, expected benefits, risks and stakeholders** are defined.
- Approval is taken from management or the client to proceed.

Example:

A school decides to develop a **new mobile app for online classes**. Management studies whether it is needed, affordable, and technically possible before approving it.

2. Planning Phase

In this stage, a **detailed project plan** is prepared.

- **Executive Summary:** High-level project overview for stakeholders.
- **Goals & Objectives:** SMART (Specific, Measurable, Achievable, Relevant, Time-bound) definitions of success.
- **Scope Statement:** Project boundaries and key deliverables (defines what's included and excluded).
- **Work Breakdown Structure (WBS):** Breaking total work into manageable tasks.
- **Project Schedule & Timeline:** Key dates, milestones, and task dependencies (often a Gantt chart).
- **Budget & Resource Plan:** Cost estimates and required personnel/equipment.
- **Roles & Responsibilities:** Clarifies ownership
- **Risk Management Plan:** Identifies potential pitfalls and mitigation strategies.
- **Communication Strategy:** Guidelines for sharing updates and meeting frequency.
- **Quality & Change Plans:** Procedures for standards maintenance and handling adjustments.

Example:

The school plans the app features, decides the budget, assigns developers, sets a 4-month deadline, and prepares a risk plan for technical issues.

3. Execution Phase

- This is the **action stage** where the actual work is carried out according to the plan.
- Teams **perform assigned tasks and resources are used to create project deliverables.**

Example:

Developers design the app interface, write code, add video features, and integrate login systems for students and teachers.

4. Monitoring and Controlling Phase

- In this stage, progress is **continuously monitored**
- It ensure the project **stays on schedule, within budget, and meets quality standards.**
- **Deliverables are measured** against the set metrics to ensure quality is acceptable
- **Corrections** are made if deviations occur.

Example:

The school checks whether development is on time, tests the app for errors, controls costs, and fixes bugs found during trial runs.

5. Closing/closure Phase

- The project is **formally completed and handed over** to the client.
- Final documentation is prepared
- Resources are released
- Performance is reviewed.

Example:

The app is launched for students, final approval is taken from the school, and the project team is dissolved after submission.

Processes and Knowledge Areas In Project Management

- Processes are the tasks and methodologies that occur within a phase.
- They **describe how work is carried** out within each phase.

Example: *Planning, organizing, directing, controlling.*

Project Management Processes (Process Groups)

Initiating Process – Defines a new project or phase and authorizes its commencement.

Planning Process – Establishes the scope, objectives, schedule, cost, and plans required to achieve project goals.

Executing Process – Performs the work defined in the project management plan.

Monitoring and Controlling Process – Tracks, reviews, and regulates project performance and progress.

Closing Process – Finalizes all project activities and formally closes the project.

Knowledge Areas In Project Management

Knowledge areas are the **core subject areas of project management** that define what must be managed effectively to ensure project success.

- Each area represents a **specialized field of expertise** — a body of **knowledge, skills, tools, and techniques** that a project manager must understand to manage a project successfully.

Project Management Knowledge Areas (10 areas)

1. Project Integration Management – Coordinates and integrates all project management activities.

Example: Creating the Project Charter and managing overall changes.

2. Project Scope Management – Ensures that the project includes all required work and only the required work.

Example: Creating Work Breakdown Structure (WBS).

3. Project Schedule (Time) Management – Plans and controls the project schedule to ensure timely completion.

Example: Activity sequencing and Gantt charts.

4. Project Cost Management – Estimates, budgets, and controls project costs.

Example: Cost estimation and budget monitoring.

5. Project Quality Management – Ensures that the project satisfies the quality requirements.

Example: Quality planning, assurance, and control.

6. Project Resource (Human Resource) Management – Organizes, manages, and leads the project team.

Example: Team formation and workload assignment.

7. Project Communications Management – Ensures timely and appropriate generation and dissemination of project information.

Example: Status reports and stakeholder updates.

8. Project Risk Management – Identifies, analyzes, and responds to project risks.

Example: Risk registers and mitigation plans.

9. Project Procurement Management – Manages the acquisition of goods and services from external sources.

Example: Vendor selection and contract management.

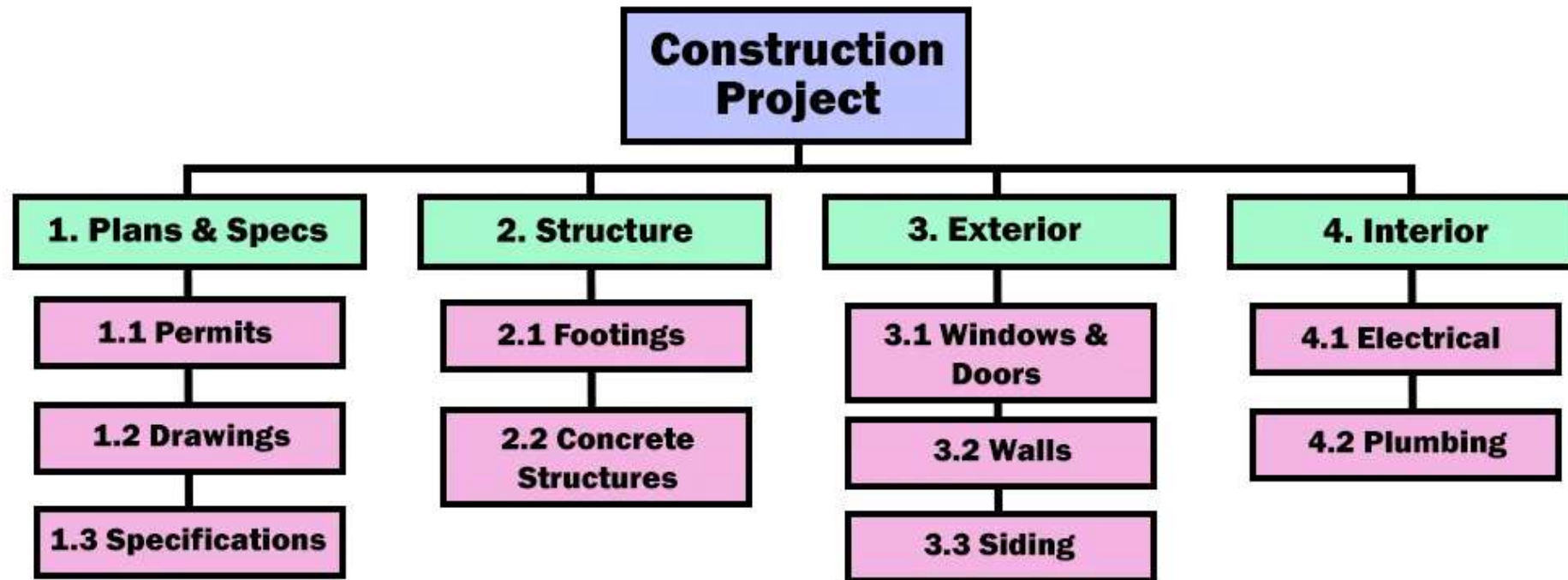
10. project Stakeholder Management – Identifies stakeholders and manages their expectations and engagement.

Example: Stakeholder analysis and engagement strategies.

WBS and its types

A **Work Breakdown Structure** (WBS) is a hierarchical decomposition of the total project scope into smaller, manageable components called **work packages**, which help in **planning, scheduling, costing, and controlling a project**.

Deliverable-based WBS



- It is a helpful diagram for project managers because it allows them to **break down their project scope and visualize all the tasks** required to complete their projects.
- The main purpose of creating a WBS is **to provide a framework for organizing and controlling project work.**

Key Characteristics of WBS

1. Hierarchical structure

1. Starts from the total project
2. Breaks down into sub-deliverables and tasks

2. Deliverable-focused

1. Defines *what* will be delivered, not *how fast*

3. 100% Rule

1. WBS includes **100% of the project scope**
2. No extra work, no missing work

4. Mutually exclusive elements

1. No overlap between work packages

5. Lowest level = Work Package

1. Smallest unit of work
2. Can be costed, scheduled, and assigned

WBS Levels

Level 1: Project/Overall Deliverable: The highest level, representing the entire project goal or final product.

Ex: Online Shopping System

Level 2: Major Deliverables/Phases: The primary components, outputs, or phases needed to achieve the project goal (e.g., Requirement Analysis, Design, Development, Testing, Deployment).

Level 3: Sub-Deliverables/Tasks: Further breakdown of Level 2 items into smaller, manageable parts. (Front-end Development, Back-end Development, Database Implementation)

Level 4: Work Packages: The lowest, most detailed level, representing specific, assignable work units that can be estimated, scheduled, and tracked (e.g., code, "Write User Manual," "Test Login Feature").

Level 5 (Optional): Activities: Specific actions or tasks performed by team members, often used for detailed scheduling and resource allocation.

Level 1

Build Garage Project

Level 2

1. Design

2. City

3. Construction

Level 3

1.1 Drawings

2.1 Permits

3.1 Electrical

1.1.1 Interior
1.1.2 Exterior
1.1.3. Landscape

2.1.1 Schedule
2.1.2 Pay Fees
2.1.3 Meetings

3.1.1 Wiring
3.1.2 HVAC
3.1.3 Layout

Types of WBS

There are three types of WBS:

1. Deliverable-based WBS
2. Phase-based WBS
3. Process –based WBS

Some authors and teaching notes include **two additional types** for practical understanding:

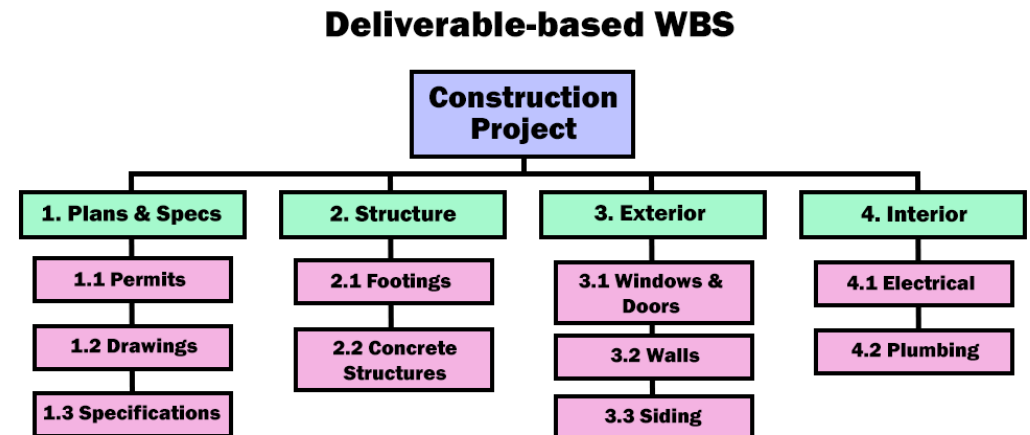
4. Responsibility-Based WBS
5. Resource-Based WBS

1. Deliverable-Based WBS:

- The most common approach, it focuses **on the project's physical or functional outcomes.**
- The project is decomposed into major deliverables (e.g which are further broken down into sub-deliverables.
- Focus is on **what is to be produced, not on activities.**

Structure

Project → Deliverables → Sub-deliverables → Work packages



Example (Software Project: Online Shopping App)

- Online Shopping App
 - User Interface
 - Login Screen
 - Product Listing Page
 - Backend System
 - Order Processing
 - Payment Gateway
 - Database
 - Product Table
 - User Table

Example: Website Project

Website

Homepage

About Page

Contact Page

Login System

Each part represents a **tangible result**.

Advantages

- Very clear project scope
- Prevents scope creep : It keeps the project work limited to what was originally planned.
- Preferred by PMBOK (**Project Management Body of Knowledge**)

Best used when

Client deliverables are clearly defined.

2. Phase-Based WBS

- This type focuses on **the project lifecycle** and organizes work chronologically.
- The second level of the hierarchy typically consists of standard project phases such as Initiation, Planning, Execution, and Closeout.

Structure

Project → Phases → Activities → Work packages

Example (Software Project)

Software Development Project

- ✓ Initiation
- ✓ Planning
- ✓ Design
- ✓ Development
- ✓ Testing
- ✓ Deployment

Each phase can further contain tasks.

Advantages

- Easy to track progress
- Aligns with SDLC

Limitations

Deliverables spread across phases, i.e (each phase of project produces documents, products, components etc)

Best used when

Project follows a strict life cycle.

Work Breakdown Structure

Commercial Project

Initiation

Evaluation

Charter

Approval Documents

Planning

Scope Statement

Project Team

Plan Schedule

Budget

Planning Documents

Execution

Lay Foundation

Excavate

Pour Concrete

Interior Work

Electrical

Plumbing

Exterior Work

Finishing Touches

Physical Work

Control

Resource Management

Cost Management

Risk Management

Monitoring and Controlling

Closeout

Audit

Site Cleanup

Document Handover

Handover Project

3. Process-Based WBS

- Decomposes work into specific **workflows or business processes** (e.g., design, fabrication, testing) rather than final deliverables.
- It **shows how work flows, with major stages** broken into sub-tasks and work packages,
- Work is **broken down based on processes or functions performed during the project.**

Structure

Project → Processes → Sub-processes → Work packages.

Example

Software Project

Designing

Coding

Testing

Documentation

Advantages

- Good for repetitive and technical work
- Improves process efficiency

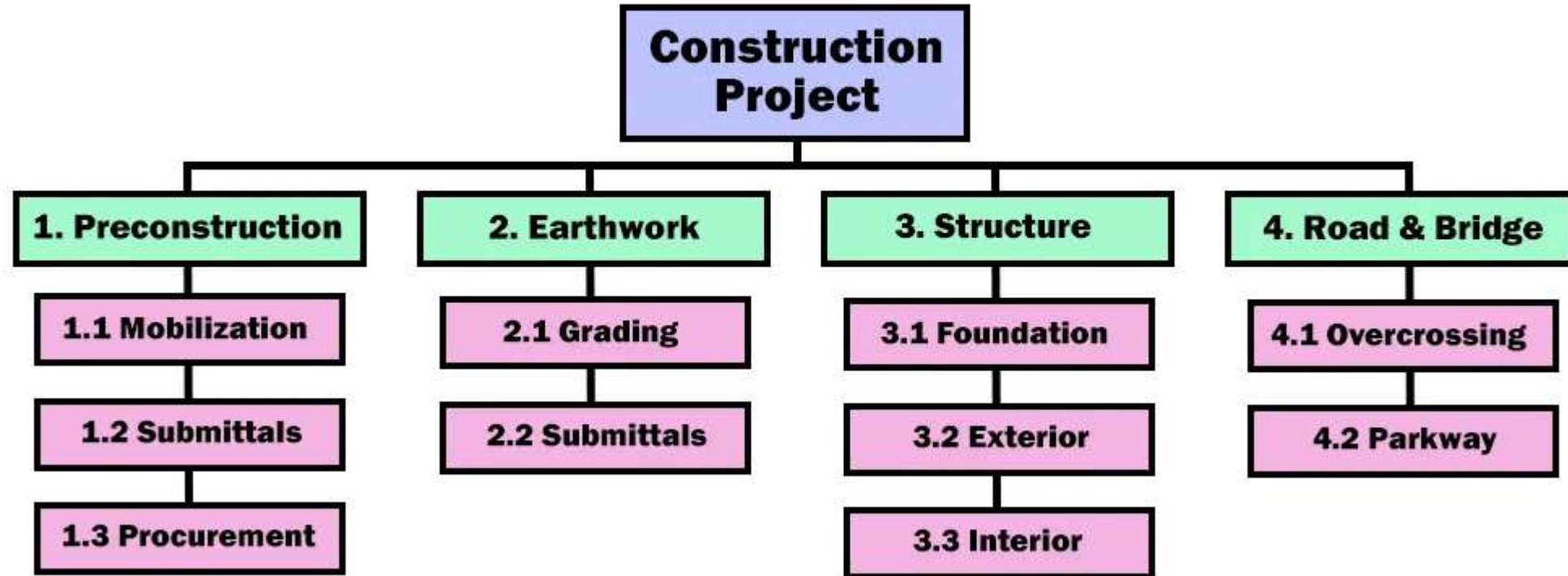
Limitations

Less focus on final deliverables

Best used when

Process improvement is important.

Process-based WBS



4. Responsibility-Based WBS (Extended Type)/ Organizational WBS

Meaning

Work is divided according to **teams or departments** responsible.

Example

- Software Project
 - Design Team
 - Development Team
 - Testing Team
 - Marketing Team

Advantages

- Clear accountability
- Easy performance monitoring

Limitations

- May ignore deliverable integration

5. Resource-Based WBS (Extended Type)

Meaning

Project is broken down based on **resources required**.

Example

- Software Project
 - Human Resources
 - Software Tools
 - Hardware Infrastructure

Advantages

- Helps in budgeting and resource planning

Limitations

- Weak scope definition

PMBOK

PMBOK = Project Management Body of Knowledge

It is a **standard guide book** published by **PMI (Project Management Institute)** that explains:

- **Best practices** in project management
- **Tools and techniques** used in PM
- **Processes** used to manage projects successfully

It is **not a method**, **but a framework** that can be **applied to any project**: software, construction, events, startups, school projects, or exhibitions

PMBOK

- **PMBOK** stands for **Project Management Body of Knowledge**.
- It is a **comprehensive framework of standards, best practices, guidelines, and terminology** for project management that are accepted as global standards within the project management Industry.
- It is developed and published by the **Project Management Institute (PMI), USA. in 1969.**
- **In 1984, PMI issued its first certification: the Project Management Professional (PMP).**
- The certification is recognized as **a critical tool for project managers to prove their ability to carry out their duties.**
- In 1987, PMI released the “Project Management Body of Knowledge” whitepaper, followed by the PMBOK guide in 1994.

- The Project Management Institute (PMI) publishes the extensive **Project Management Body of Knowledge (PMBOK)**, **a manual that describes standard terminology and best practices in project management.**
- PMBOK is also an **industry framework rather than a methodology** because it incorporates best practices, a set of guidelines, processes, and tools in project management.
- It offers a structure and set of rules that can assist project managers in **efficiently organizing, carrying out, overseeing, and managing projects** in a variety of fields and sectors.

PMBOK

Why PMBOK is Important?

PMBOK helps project managers:

- Plan projects correctly
- Control cost, time, and quality
- Manage risks
- Handle teams and communication
- Deliver projects successfully

It is used worldwide as a **common standard**.

Example (Simple)

If you are building a **college website**, PMBOK helps you:

- Decide what features to include
- Estimate how long it will take
- Calculate budget
- Assign tasks to people
- Control changes

What PMBOK Contains (Main Areas)

PMBOK describes Knowledge Areas, such as:

- Scope Management
- Time (Schedule) Management
- Cost Management
- Quality Management
- Risk Management
- Human Resource (Team) Management
- Communication Management
- Procurement Management
- Stakeholder Management
- Integration Management

Each area explains what to do and how to do it.

Core Purpose and Use

- **Standardization:** Establishes a "universal language" for project managers across different industries and organizations.
- **Certification:** It is the primary study resource for major certifications like the Project Management Professional (PMP) and Certified Associate in Project Management (CAPM).
- **Best Practices:** Consolidates proven methods to increase project success rates, optimize resource use, and effectively manage risks.

How PMBOK can help with project management:

Standardized Framework:

PMBOK provides a standardized framework that ensures consistency and effective communication in project management.

Best Practices:

It incorporates proven best practices and guidelines for initiating, planning, executing, monitoring, controlling, and closing projects.

Common Terminology:

PMBOK establishes common project management terminology, reducing misunderstandings among stakeholders.

Knowledge Areas:

It defines ten knowledge areas covering all major aspects of project management such as scope, time, cost, quality, risk, procurement, stakeholder, and integration management.

Tools and Techniques:

PMBOK offers various tools and techniques to support planning, decision-making, execution, and control of projects.

PMBOK structure

The PMBOK (Project Management Body of Knowledge) structure organizes project management into

1. **10 Knowledge Areas** (like Scope, Risk, Cost) grouped by content,
2. **5 Process Groups** (Initiating, Planning, Executing, Monitoring & Controlling, Closing) that define the project lifecycle : They let you take your knowledge and step you and your team through exactly what you have to do at each point.
3. **Process groups** containing **49 core project management processes**

Key Components

- **Process Groups (5):** Define the project's phases.

1. **Initiating:** Defining and authorizing the project.

2. **Planning:** Establishing scope, refining objectives, and defining the course of action.

3. **Executing:** Performing the work defined in the plan.

4. **Monitoring & Controlling:** Tracking, reviewing, and regulating progress and performance.

5. **Closing:** Finalizing all activities across all groups.

- **Knowledge Areas (10):** Group processes by subject matter.

1. Project Integration Management

2. Project Scope Management

3. Project Schedule Management

4. Project Cost Management

5. Project Quality Management

6. Project Resource Management

7. Project Communications Management

8. Project Risk Management

9. Project Procurement Management

10. Project Stakeholder Management

- **Processes (49):** Each knowledge area contains specific processes. Processes are mapped across the five process groups. **Every process has Inputs, Tools & Techniques, and Outputs (ITTOs)**

Explain the 5 Process Groups of PMBOK with examples

1. initiating Process Group

Meaning

The Initiating Process Group formally **starts the project** or a phase **by defining objectives and obtaining authorization.**

Objectives

- Establish the project's purpose
- Identify stakeholders
- Appoint the project manager

Major Processes

- Develop Project Charter
- Identify Stakeholders

Example

In a **software development project**, top management approves the development of a web application. A **project charter** is created defining scope, budget, timeline, and the project manager.

Key Inputs

- Business case
- Agreements
- Enterprise environmental factors

Key Outputs

- Project Charter
- Stakeholder Register

2. Planning Process Group

Meaning

The Planning Process Group involves **defining the course of action** required to achieve project objectives.

Objectives

- Define project scope in detail
- Develop schedule and cost estimates
- Identify risks and plan responses

Major Processes

- Define Scope & Create WBS
- Develop Schedule
- Estimate Costs & Determine Budget
- Plan Quality, Risk, Communication, Procurement

Example

For the web application, a **WBS** is prepared, milestones are fixed, costs are estimated, and risks such as “technology change” are identified with mitigation plans.

Key Inputs

- Project Charter
- Stakeholder Register

Key Outputs

- **Project Management Plan**
- Scope Baseline (WBS)
- Schedule & Cost Baseline
- Risk Management Plan

3. Executing Process Group

Meaning

The Executing Process Group involves **performing the work** defined in the project management plan.

Objectives

- Produce project deliverables
- Manage resources and team
- Ensure quality assurance

Major Processes

- Direct and Manage Project Work
- Manage Quality
- Acquire, Develop, and Manage Team
- Manage Communications

Key Inputs

- Project Management Plan
- Approved change requests

Key Outputs

- **Deliverables**
- Work performance data
- Issue log

Example

Developers code the application, designers design the UI, testers conduct testing, and regular progress meetings are conducted.

4. Monitoring and Controlling Process Group

Meaning

This process group focuses on **tracking, reviewing, and regulating** project progress to meet performance objectives.

Objectives

- Measure performance
- Control scope, time, cost, and quality
- Manage changes and risks

Major Processes

- Monitor and Control Project Work
- Perform Integrated Change Control
- Validate Scope
- Control Schedule and Cost

Key Inputs

- Project Management Plan
- Work performance data

Key Outputs

- **Change Requests**
- Work performance reports
- Updates to project documents

Example

If the project is behind schedule, the manager analyzes variance, controls scope changes, and updates the project plan accordingly.

5. Closing Process Group

Meaning

The Closing Process Group formally **completes the project** and ensures all work is finalized.

Objectives

- Obtain formal acceptance
- Close contracts
- Document lessons learned

Major Processes

- Close Project or Phase

Key Inputs

- Accepted deliverables
- Contract documentation

Key Outputs

- Final Product or Service**
- Project closure report
- Lessons learned repository

Example

The completed web application is delivered to the client, final documentation is submitted, and the project is officially closed.

Project Management Knowledge Areas

- According to the Guide to the Project Management Body of Knowledge (PMBOK), the project management is divided into ten knowledge areas.
- These Project Management knowledge areas coincide with the with the process groups of project management.
- In PMBOK (6th Edition), there are 49 project management processes. These processes are arranged across 10 Knowledge Areas and 5 Process Groups
- A project manager must know all these knowledge areas and apply them in a project to effectively manage the project.

1. Project Integration Management

- Project integration management is the most important knowledge area as it acts as a **binding force for the project and includes the processes to identify, define, combine, unify and coordinate** the various processes and activities of the project.
- This knowledge area interacts at every phase (process group) of the project lifecycle.

Project Phase/ Process Group	Processes Involved
Initiating	Develop Project Charter
Planning	Develop Project Management Plan
Executing	Direct and Manage Project Work, Manage Project Knowledge
Monitoring & Controlling	Monitoring and Control Project Work, Perform Integrated Change Control
Closing	Close Project or Phase

These are core
management
processes

2. Project Scope Management

- Scope is one of the constraints of within which the project is performed.
- Project scope means **the works performed to deliver a product or service with the specified features and functions.**
- It the prime responsibility of the Project Manager to **deliver the project outcome strictly as per the scope defied initially.**
- Project scope management includes the processes which are required to insure that the project consists of all the works required to complete the project successfully.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Scope, Collect Requirements, Define Scope, Create WBS
Executing	
Monitoring & Controlling	Validate Scope, Control Scope
Closing	

3. Project Schedule Management

- Project schedule management includes the processes which are required to complete the project timely.
- This knowledge area is very important because completing the project on time is what the client and other stakeholders want.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Schedule Management, Define Activities, Sequence Activities, Estimate Activity Durations, Develop Schedule
Executing	
Monitoring & Controlling	Control Schedule
Closing	

4. Project Cost Management

- The budget is one of the constraints within which the project is to be performed.
- A project is called successful when it is done within the cost initially decided.
- Cost management is basically **about how to plan, manage and control the project cost** in relation to the cost baseline.
- The processes like plan cost management, estimate costs and determine budget are performed in the planning phase. During the control & monitoring phase, the control cost process is done.
- The **Earned Value Management** technique is used to determine the potential deviation from the cost and/or schedule baseline

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Cost Management, Estimate Costs, Determine Budget
Executing	
Monitoring & Controlling	Control Costs
Closing	

5. Project Quality Management

- Quality of deliverable is crucial for the project success.
- A project is said to meet quality expectations when all the project requirements agreed in the beginning of the project are met.
- The project should be able to deliver intended quality output as defined in the project.
- Every stakeholder need good quality.
- Meeting the quality expectation of stakeholders is not only the prime responsibility of only project manager but everybody involved in the project.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Quality Management
Executing	Manage Quality
Monitoring & Controlling	Control Quality
Closing	

6. Project Resource Management

- Project resource management **includes identification, acquiring and management of resources needed for the successful completion of the project.**
- Resources may be **human resources** like project team, employees, contractors, suppliers, etc. or physical resources like tools, machinery, equipment, property, etc. necessary for the project.
- Resource management runs across planning, execution and monitoring and control process groups.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Resource Management, Estimate Activity Resources
Executing	Acquire Resources, Develop Team, Manage Team
Monitoring & Controlling	Control Resources
Closing	

7. Project Communications Management

- There should be effective communication, not only between the project team members but all the other stakeholders as well.
- The communication management is to determine who need what and when.
- How much communication each stakeholder requires? What will be the frequency of communication? What will be the mode of communication?
- Communication involves transfer of information to project stakeholders, reporting project progress, etc.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Communications Management
Executing	Manage Communications
Monitoring & Controlling	Monitor Communications
Closing	

8. Project Risk Management

- Risk management involves **identification, categorization and management of risk.**
- The first step in risk management is making a risk register. All the **risks which are identified are penned down in the risk register.**
- In the planning stage, the processes like **risk management** plan preparation, identification & categorization of risks, risk analysis (quantitative as well as qualitative) and planning risk response are done.
- At the execution stage, the action is taken as per risk management plan to mitigate the risk.
- The risk response depends upon the type of risk and the strategies may be risk avoidance, risk mitigation, risk transfer and risk acceptance.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Response
Executing	Implement Risk Response
Monitoring & Controlling	Monitor Risks
Closing	

9. Project Procurement Management

- Procurement means **acquiring the goods and services to accomplish the objectives of the project.**
- It is not only limited to getting supply of goods or getting services but it also involves vendor management i.e., their selection, evaluation, relationship management, etc.
- In the planning phase, the procurement plan is prepared and all the activities for the procurement are included in the procurement plan.
- Organizational requirements, the quantities of the supplies, services required, the time of procurement, method of procurement, specifications, etc. are part of the procurement plan.

Project Phase/ Process Group	Processes Involved
Initiating	
Planning	Plan Procurement Management
Executing	Conduct Procurements
Monitoring & Controlling	Control Procurements
Closing	

In the execution phase, actual procurement is done. The goods and services are procured, checked for quality and stored. There may be many activities involved in the execution of procurement plan, such as, drafting of specifications and request for proposal (RFP) documents, invitation of bids or proposals, selection of supplier, contract preparation and signing, taking supply of goods and services, quality checking of materials procured, supplier management, supplier relationship management, etc.

10, Project Stakeholder Management

- Making stakeholders happy is very important for the project manager. The projects are done to fulfil the needs of the stakeholders. Therefore, the stakeholders need to be managed actively.
- There are three steps in [stakeholder management](#). (1) Stakeholder identification, (2) Stakeholder Prioritization, (3) Stakeholder Management.
- There are different strategies to manage stakeholders, which depends from which category they belong. One powerful tool to manage stakeholders is using power-interest matrix.

Project Phase/ Process Group	Processes Involved
Initiating	Identify Stakeholders
Planning	Plan Stakeholder Engagement
Executing	Manage Stakeholder Engagement
Monitoring & Controlling	Monitor Stakeholder Engagements
Closing	

PMBOK Matrix

*“The **PMBOK Matrix** is a structured representation that maps project management processes across knowledge areas and process groups, showing how processes interact throughout the project life cycle.”*

This Matrix maps the 49 project management processes (as defined in PMBOK 6th Edition) across two axes to show when and where they occur.

- ✓ **Vertical Axis** (10 Knowledge Areas): Integration, Scope, Schedule, Cost, Quality, Resource, Communications, Risk, Procurement, and Stakeholder Management.
- ✓ **Horizontal Axis** (5 Process Groups): Initiating, Planning, Executing, Monitoring & Controlling, and Closing.

This matrix shows

- ✓ ***Each cell of the matrix contains one or more processes***

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	Monitor and Control Project Work Perform Integrated Change Control	Close Project or Phase
Project Scope Management		Plan Scope Management Collect Requirements Define Scope Create WBS		Validate Scope Control Scope	
Project Time Management		Plan Schedule Management Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule		Control Schedule	
Project Cost Management		Plan Cost Management Estimate Costs Determine Budget		Control Costs	
Project Quality Management		Plan Quality Management	Perform Quality Assurance	Control Quality	
Project Human Resource Management		Plan Human Resource Management	Acquire Project Team Develop Project Team Manage Project Team		
Project Communication Management		Plan Communication Management	Manage Communications	Control Communications	
Project Risk Management		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Response		Control Risks	
Project Procurement Management		Plan Procurement Management	Conduct Procurement	Control Procurement	Close Procurement
Project Stakeholder Management	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholder Engagement	Control Stakeholder Engagement	

Need of PMBOK Matrix

1. Clear Process Structure

Projects require a logical flow of activities from planning through closure. The PMBOK Matrix organizes processes so it's easy to know *what to do and when*.

2. Improved Project Control

Matrix emphasizes controlling scope, time, cost, and quality. The matrix helps locate control activities in the right process group and knowledge area for effective monitoring.

3. Systematic Thinking

matrix describe project management as a systems approach with interconnected parts. The matrix shows these connections clearly, [helping managers coordinate activities across areas like risk, cost, and communication](#).

4. Enhanced Software Project Management

software projects are complex and require clear process mapping. The PMBOK Matrix helps software teams align development activities with project phases, improving predictability and reducing rework.

Portfolio Management

Portfolio Management in project management refers to the **centralized and strategic management** of a set of projects, programs, and other related work, grouped together to **achieve organizational strategic objectives and maximize value.**

- A project portfolio is a **collection of all the projects a company is doing.**
- It's about **"doing the right projects"** by balancing initiatives, managing risks, and ensuring investments in change initiatives support long-term objectives, unlike project management which focuses on "doing projects right".
- It's about **overseeing and controlling all the projects a company is working on.**
- PPM means deciding **which projects are most important and how to divide up resources like time and money among them.**
- It's about steering **everything in the right direction** to reach the company's goals and making sure things stay on track.

Objectives of Project Portfolio Management



1.Strategic Alignment: Ensure all projects align with the organization's vision, mission, and long-term business goals.

2.Resource Optimization: Efficiently allocate and utilize resources, such as finances, employees, and time, throughout the entire portfolio. PPM goals are to prevent useful resource bottlenecks, making sure the surest use of to-be-had property.

3.Risk Management: Identify, examine, and manipulate risks at the portfolio degree. PPM facilitates making knowledgeable selections approximately risk tolerance and implementing strategies to mitigate potential problems, making sure of a greater resilient assignment portfolio.

4.Decision-Making Support: Provide an established framework for comparing and selecting projects. PPM assists decision-makers in making informed choices by thinking about elements such as project viability, strategic alignment, and capacity returns.

5.Financial Management: Enable effective monetary planning and management by way of supplying a complete view of prices, benefits, and returns on investment throughout the whole mission portfolio. PPM helps knowledgeable financial choice-making.

6.Performance Measurement: Establish key overall performance signs (KPIs) and metrics to degree and compare project performance. PPM guarantees that projects are delivering the predicted price and that deviations from the plan are recognized and addressed.

Aspect	Project Portfolio Management	Project Management
Focus	Project Portfolio Management looks at all the projects together as a whole to manage them.	<u>Project Management</u> focuses on handling one project at a time.
Scope	Project Portfolio Management considers the overall picture of all projects in the portfolio.	Project Management deals with the specific details of each project.
Decision Making	In Project Portfolio Management, decisions are made about which projects to prioritize based on strategic goals.	In Project Management, decisions are made about how to carry out and finish a particular project.
Resource Allocation	Project Portfolio Management allocates resources like money and people across all projects to meet overall objectives.	Project Management allocates resources within a single project to meet its specific needs.
<u>Risk Management</u>	Project Portfolio Management handles risks across all projects, considering how they affect the whole portfolio.	Project Management manages risks within the context of one project.
Performance Monitoring	Project Portfolio Management keeps track of the overall performance and progress of all projects in the portfolio.	Project Management monitors the performance and progress of each project.

Basis	PPM (Project Portfolio Management)	PM (Project Management)
Meaning	Managing a collection of projects/programs together	Managing one individual project
Focus	Strategic alignment and value maximization	Execution and successful delivery
Objective	Select the right projects	Do the project right
Scope	Organization-wide	Project-specific
Decision Area	Project selection, prioritization, and termination	Scope, time, cost, quality of a project
Resource Management	Allocates resources across multiple projects	Uses resources within a single project
Risk View	Balances overall portfolio risk	Manages project-specific risks
Performance Measure	Business value, ROI, strategic fit	Schedule, cost, scope, quality
Example	Deciding which projects to fund this year	Managing a mobile app development project

Project Portfolio Management Process

1. Define Business Objectives

Organizational goals and strategies are identified to ensure all projects support business priorities. This helps in aligning investments with long-term strategic objectives.

2. Collect Project Ideas

Project ideas are gathered from stakeholders, employees, and market analysis. These ideas form the pool of potential projects for the portfolio.

3. Select Projects

Projects are evaluated based on strategic fit, ROI, risk, and resource availability. Only high-value and feasible projects are included in the portfolio.

4. Validate Portfolio Feasibility

Technical, financial, and organizational feasibility of selected projects is assessed. This ensures projects can be executed within constraints and capabilities.

5. Execute and Manage Portfolio

Approved projects are monitored and controlled at the portfolio level. Performance, risks, and resource utilization are continuously reviewed.

What Does a Project Portfolio Manager Do?

A **Project Portfolio Manager (PPM)** is responsible for managing multiple projects together as a portfolio so that they align with the organization's strategic objectives and deliver maximum value.

1. Aligning Projects with Organizational Strategy

The portfolio manager ensures that every project supports the company's long-term goals and business strategy. They work closely with senior management to select and prioritize projects that add the highest strategic value.

2. Monitoring Portfolio Performance and Risks

They continuously track the progress, cost, schedule, and risks of all projects in the portfolio. Early identification of problems helps in taking corrective actions before issues escalate.

3. Resource Allocation and Optimization

The portfolio manager allocates resources such as budget, manpower, and time across projects. This ensures optimal use of limited resources and avoids over-allocation or resource conflicts.

4. Stakeholder Communication and Coordination

They act as a communication bridge between top management, project managers, and teams. Regular reporting and feedback ensure transparency and alignment among all stakeholders.

5. Decision-Making and Prioritization

The portfolio manager decides which projects to start, continue, delay, or terminate. Decisions are based on factors such as ROI, risk, strategic fit, and resource availability.

6. Continuous Improvement

They improve portfolio management processes by adopting best practices, tools, and metrics. This helps enhance efficiency, governance, and overall project success rate.

Benefits of Project Portfolio Management



Traditional Vs Modern Project using PMBOK Concept

	Traditional Project Management	Modern Project Management (PMBOK-Oriented)
Management Approach	Uses a predictive and plan-driven approach where all activities are defined in advance and executed sequentially to maintain control.	Uses adaptive , iterative, and hybrid approaches where planning and execution evolve together to respond to change.
PMBOK Perspective	Emphasizes strict use of 5 Process Groups and 10 Knowledge Areas with detailed documentation.	Emphasizes PMBOK principles, performance domains, and value-based outcomes.
Planning Method	Detailed planning is completed at the start and followed strictly throughout the project.	Planning is progressive and refined using rolling-wave techniques.
Scope Management	Scope is clearly defined early and any change is considered a deviation.	Scope is flexible and evolves based on stakeholder feedback and business needs.
Change Management	Changes are discouraged and managed through formal change control boards.	Changes are expected and proactively managed to enhance value delivery.
Stakeholder Involvement	Stakeholders are involved mainly during initiation and approval stages.	Stakeholders are continuously engaged throughout the project lifecycle.

Risk Management	Risks are identified mainly during planning and reviewed periodically.	Risks are continuously identified, assessed, and mitigated.
Resource Management	Resources are allocated based on functional hierarchy and fixed roles.	Resources are flexibly allocated through cross-functional and collaborative teams.
Team Structure	Teams are hierarchical with centralized authority.	Teams are empowered, self-organizing, and collaborative.
Leadership Style	Project manager follows a command-and-control leadership style.	Project manager acts as a facilitator and servant leader.
Communication	Formal, documentation-heavy communication through reports.	Open, frequent, and transparent communication using modern tools.
Performance Measurement	Success measured mainly by cost, time, and scope adherence.	Success measured by value delivery, benefits realization, and customer satisfaction.
Quality Focus	Quality is ensured by conformance to predefined specifications.	Quality is improved continuously through feedback and learning.

Technology Usage	Limited use of automation and collaboration tools.	Extensive use of digital tools, dashboards, and agile platforms.
Suitability	Best suited for stable and predictable environments.	Best suited for dynamic, uncertain, and innovation-driven environments.
Examples	Construction, infrastructure, manufacturing projects.	Software development, IT systems, R&D, digital transformation projects.

CASE STUDY : ONLINE SHOPPING SYSTEM

- Introduction
- Problem Statement
- Objectives
- Stakeholders
- Functional Requirements
 - User Management
 - Product Management
 - Shopping Cart
 - Order Management
 - Payment Processing
 - Search and Filter
- Non-Functional Requirements
 - Performance
 - Security
 - Scalability
 - Reliability
 - Usability
- Architecture
- Database Design
- Workflow
- Advantages, Limitations & Conclusion

Assignment-1

1. Using the **Online Shopping System case**, identify:
 - Project objectives
 - Major project phases
 - At least four relevant knowledge areas involved
2. Develop a **Work Breakdown Structure (WBS)** for the **Online Shopping System** project
3. As a portfolio manager, decide whether to include new features like AI-based recommendations in the project portfolio.