# CHAPTER 6
# PROJECT MANAGEMENT IN INDUSTRIAL ENGINEERING

## BASIC COMPETENCIES

Students are able to understand the concept of project management through procedural text, plan and manage engineering projects, and communicate project status and results in English with appropriate terminology using imperative sentences and temporal conjunctions.

## LEARNING OBJECTIVES

After studying this chapter, students are expected to:

1. Understand the structure and characteristics of procedure text in the context of project management
2. Use imperative sentences and temporal conjunctions appropriately
3. Create project plans, schedules, and budgets using procedural language
4. Write procedure text for project management activities
5. Apply project management tools and techniques in a procedural format

## PHASE 1: PRE-ACTIVITY

### Discussion Starter

*Think about a group project you've worked on:*

- What steps did you follow to complete it?
- How did you organize the work sequence?
- What instructions did you give to team members?
- How did you track progress step by step?

## PHASE 2: INPUT & EXPLORATION

### PROCEDURE TEXT: HOW TO DEVELOP A PROJECT PLAN

*Source: Adapted from Project Management Institute. (2021). A guide to the project management body of knowledge (PMBOK guide) (7th ed.). Project Management Institute.*

**Goal:**

To create a comprehensive project plan that guides project execution from initiation to closure.

**Materials/Tools Needed:**

- Project charter document
- Stakeholder register
- Work Breakdown Structure (WBS) template
- Gantt chart software (e.g., Microsoft Project)
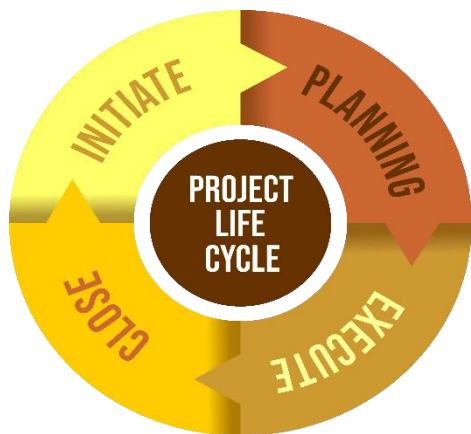- Risk register template
- Budget spreadsheet



*Figure 1: PMBOK Process Groups*

## Steps/Procedure:

### Step 1: Define the Project Scope

First, identify and document all project deliverables. Review the project charter carefully. Then, create a scope statement that clearly describes what is included and excluded from the project. According to Kerzner (2022), clear scope definition prevents scope creep and ensures all stakeholders have aligned expectations.

### Step 2: Develop the Work Breakdown Structure (WBS)

Next, decompose the project scope into smaller, manageable work packages. Start with major deliverables at the top level. After that, break down each deliverable into sub-deliverables. Continue decomposing until each work package is small enough to be estimated and assigned. Number each element using a hierarchical coding system.

### Step 3: Sequence Project Activities

Then, identify dependencies between activities. Determine which tasks must be completed before others can begin (finish-to-start). Use the Critical Path Method (CPM) to identify the longest sequence of dependent activities. This determines the minimum project duration.

### Step 4: Estimate Resources and Duration

Subsequently, estimate the resources required for each activity, including personnel, equipment, and materials. Calculate the duration based on resource availability. Use three-point estimation for uncertain activities: (Optimistic + 4×Most Likely + Pessimistic) ÷ 6.

### Step 5: Develop the Project Schedule

After that, create a Gantt chart showing all activities, their durations, and dependencies. Assign start and finish dates to each activity. Identify milestones for key deliverables. Finally, establish the project baseline schedule for tracking progress.

### Step 6: Plan Risk Management

Identify potential risks using brainstorming and historical data. Analyze each risk for probability and impact. Develop response strategies: avoid, transfer, mitigate, or accept for threats. Document all risks in the risk register with assigned owners and response plans.

**Step 7: Finalize and Approve the Plan**

Lastly, compile all planning documents into the Project Management Plan. Review the plan with key stakeholders. Obtain formal approval from the project sponsor. Distribute the approved plan to all team members and stakeholders.

*Task 1. Read the procedure text above and answer the following questions:*

1. What is the goal of the procedure text above?
2. List the materials/tools needed for developing a project plan.
3. How many steps are there in the procedure? Name each step briefly.
4. What is the purpose of including materials/tools in a procedure text?
5. Why is defining project scope considered the first step in project planning?
6. Explain the purpose of a Work Breakdown Structure (WBS) in your own words.
7. What is the Critical Path Method (CPM) and why is it important?
8. How is three-point estimation calculated? What is its purpose?
9. What are the four risk response strategies for threats mentioned in the text?
10. Why is formal approval from the project sponsor necessary before project execution?
11. Find five imperative sentences from the procedure text. What verb forms are used?
12. Identify the temporal conjunctions (sequence words) used in the text. List at least six.
13. Why does procedure text use simple present tense? Give examples from the text.

14. How do the temporal conjunctions help readers follow the procedure?
15. What might happen if a project manager skips Step 6 (Risk Management)?
16. How would you adapt this procedure for a small academic project versus a large industrial project?
17. Based on the procedure, what skills should a project manager possess? Explain your reasoning.

## BUILDING VOCABULARY

Master these essential project management terms before studying the grammar focus.

### A. Core Project Management Terms

| No | Term | Definition | Example in Context |
|----|------|------------|--------------------|
| 1 | **Project** | A temporary endeavor to create a unique product or service | *Develop a new manufacturing line (6-month project)* |
| 2 | **Project Charter** | Document that formally authorizes a project | *First, create the project charter to define objectives* |
| 3 | **Stakeholder** | Person or organization affected by the project | *Identify all stakeholders before planning begins* |
| 4 | **Deliverable** | A tangible output produced by the project | *The main deliverables include design documents and prototypes* |
| 5 | **Milestone** | A significant point or event in the project | *Then, set milestones for each phase completion* |
| 6 | **Work Breakdown Structure (WBS)** | Hierarchical decomposition of project work | *Next, decompose the scope into a WBS* |
| 7 | **Critical Path** | Longest sequence of dependent activities | *Calculate the critical path to determine project duration* |
| 8 | **Scope Creep** | Uncontrolled expansion of project scope | *Prevent scope creep by documenting change requests* |
| 9 | **Gantt Chart** | Visual representation of project schedule | *After that, create a Gantt chart showing all activities* |
| 10 | **Baseline** | Approved plan used for comparison | *Finally, establish the baseline for tracking progress* |

## B. Vocabulary Exercise

Exercise 1. Fill in the blanks with the appropriate terms from the vocabulary list above:

1. The _____ is a hierarchical decomposition of project work into smaller components.
2. A _____ is a significant point or event in the project timeline.
3. _____ occurs when project requirements expand without proper change control.
4. The _____ determines the minimum project duration by identifying dependent activities.
5. A _____ is any person or organization affected by the project outcomes.
6. The _____ formally authorizes the project and identifies the project manager.
7. A _____ chart provides a visual representation of the project schedule.
8. The approved project plan becomes the _____ for measuring project performance.

## GRAMMAR FOCUS

Procedure texts use specific grammatical features to give clear instructions. According to Knapp and Watkins (2005), the key language features include imperative sentences and temporal conjunctions.

### A. Imperative Sentences

Imperative sentences are commands or instructions. They begin with a base verb (infinitive without 'to') and usually have no explicit subject.

**Formula:** Base Verb + Object/Complement

**Examples from the text:**

- **Identify** and document all project deliverables.
- **Review** the project charter carefully.

- **Create** a scope statement.
- **Decompose** the project scope into smaller work packages.
- **Obtain** formal approval from the project sponsor.

## B. Temporal Conjunctions (Sequence Words)

Temporal conjunctions indicate the order of steps in a procedure. They help readers follow the sequence of actions (Anderson & Anderson, 2003).

| Beginning | Middle | End |
|-----------|--------|-----|
| First | Next / Then | Finally |
| Firstly | After that | Lastly |
| To begin | Subsequently | In the end |
| Initially | Following this | At last |

## C. Grammar Exercise

### Exercise 2: Convert these sentences into imperative form:

1. You should define the project objectives clearly.
   Answer: _____
2. The team needs to estimate the project duration accurately.
   Answer: _____
3. It is important to communicate with stakeholders regularly.
   Answer: _____
4. You must document all project changes in the log.
   Answer: _____

### Exercise 3: Add appropriate temporal conjunctions to connect these steps:

_____, *gather all project requirements from stakeholders.* _____, *analyze the requirements for feasibility.* _____, *prioritize the requirements based on business value.* _____, *document the approved requirements in the scope statement.*

## PHASE 3: PRACTICE & APPLICATION

## TASK 2: PROJECT SCHEDULING EXERCISE

**Scenario:** You are managing a facility improvement project. Using the procedure text as a guide, complete the following tasks.

| Task | Description | Duration | Predecessors |
|------|-------------|----------|--------------|
| A | Design layout | 5 days | - |
| B | Order equipment | 3 days | A |
| C | Prepare site | 4 days | A |
| D | Receive equipment | 7 days | B |
| E | Install equipment | 6 days | C, D |
| F | Test systems | 3 days | E |

**Complete the following:**

1. Draw a network diagram showing task relationships.
2. Identify the critical path: _____
3. Calculate the total project duration: _____ days
4. What happens if Task D is delayed by 3 days? Impact: _____

## TASK 3: WRITING A PROCEDURE TEXT

**Write a procedure text on ONE of the following topics. Use imperative sentences and temporal conjunctions.**

- How to Conduct a Project Risk Assessment
- How to Create a Work Breakdown Structure
- How to Hold an Effective Project Status Meeting

**Your procedure text must include:**

- Goal/Aim (1 sentence)
- Materials/Tools (minimum 4 items)
- Steps (minimum 5 steps with imperative sentences)
- Temporal conjunctions to connect steps

## PHASE 4: PRODUCTION

### TASK 4: PROJECT CHARTER DEVELOPMENT

Using the procedure for developing a project plan, create a project charter for a real or hypothetical industrial engineering project.

## PROJECT CHARTER TEMPLATE

**Project Title:**

**Project Code:**

**Date:**


## 1. PROJECT PURPOSE AND JUSTIFICATION

*Business Need: [Explain why this project is being undertaken]*

_____
_____

**Expected Benefits:**

1. _____

2. _____

## 2. PROJECT SCOPE AND DELIVERABLES

*High-Level Scope: [What will be delivered]*

_____

**Major Deliverables:**

1. _____   2. _____   3. _____

## 3. PROJECT OBJECTIVES AND SUCCESS CRITERIA

| Objective | Success Criteria |
|---|---|
|  |  |
|  |  |


## 4. MAJOR MILESTONES

| Milestone | Target Date | Description |
|---|---|---|
|  |  |  |
|  |  |  |

| 5. RISKS AND MITIGATION | | |
|---|---|---|
| **Risk** | **Impact** | **Mitigation Strategy** |
| | | |
| | | |

## 6. PROJECT APPROVALS

Project Sponsor: _____

Signature: _____

Date: _____

Project Manager: _____

Signature: _____

Date: _____

### PHASE 5: ENRICHMENT & CASE STUDY

### TASK 5: PROJECT FAILURE ANALYSIS

#### Case Study: Denver Airport Baggage System Project

*Source: Adapted from Calleam Consulting. (2008). Case study: Denver International Airport baggage handling system. Calleam Consulting Ltd.*

Denver International Airport's automated baggage handling system is one of the most famous project failures in history. The initial budget was $186 million, but the actual cost exceeded $560 million. The system delayed the airport opening by 16 months.

**What Went Wrong:**

- **Scope Issues:** Overly complex design and changed requirements
- **Schedule Problems:** Unrealistic deadlines and insufficient testing time
- **Stakeholder Issues:** Poor coordination between airlines, contractors, and airport
- **Risk Management:** New untested technology with no backup plan
- **Outcome:** System finally abandoned in 2005. Estimated total losses: Over $1 billion

**Analysis Tasks:**

5. Root Cause Analysis (300 words): What were the fundamental causes of failure? Which project management procedures were inadequate?
6. Lessons Learned (200 words): Write a procedure text titled "How to Prevent Project Failure" based on this case study.
7. Application (150 words): How can these lessons be applied to your academic or industrial projects?

## PHASE 6: REFLECTION & TRANSFER

### Self-Assessment Checklist

*After completing this chapter, can you:*

- ☐ Identify the structure of procedure text (goal, materials, steps)
- ☐ Use imperative sentences correctly in giving instructions
- ☐ Apply temporal conjunctions to sequence steps logically
- ☐ Create a project charter using procedural language
- ☐ Develop a project schedule with Critical Path Method
- ☐ Write original procedure texts for project management activities
- ☐ Apply project management vocabulary in professional contexts