



چگونه در برنامه‌ریزی و کنترل پروژه متمایز شوید و فرصت‌های شغلی بهتری کسب کنید؟

(بر اساس سندی از AACE برای اخذ مدرک PSP)

ارائه دهنده:

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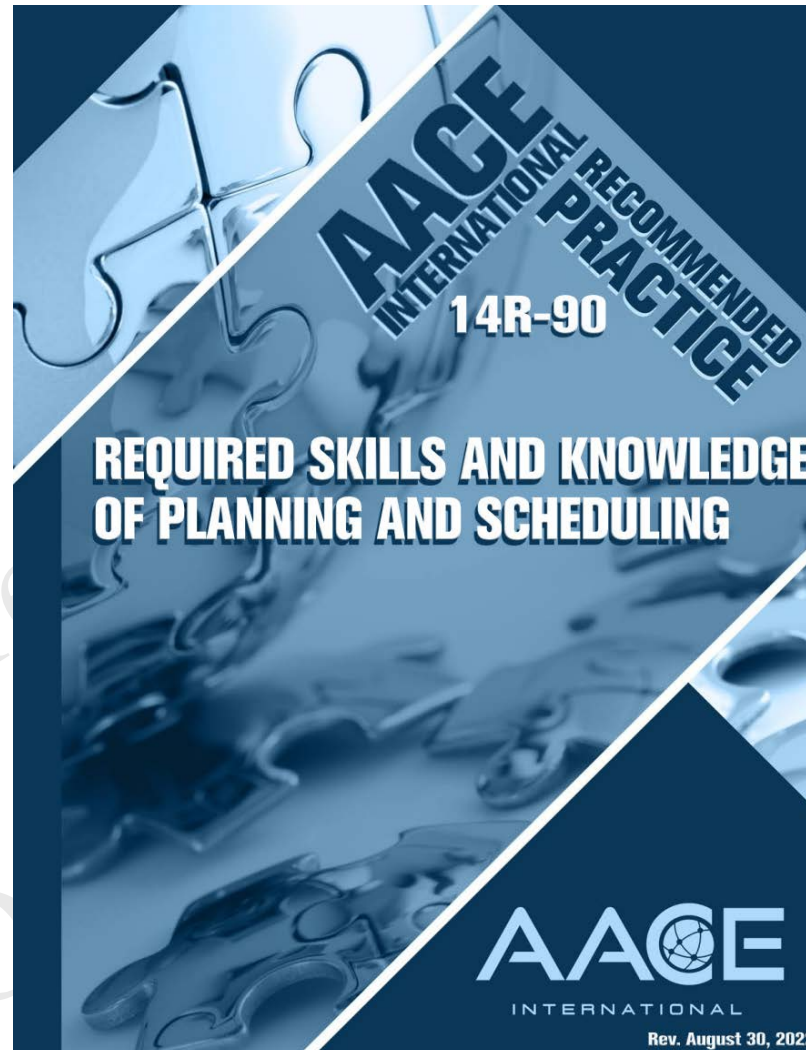
What we will learn?

- ☐ Introduction
- ☐ Background
- ☐ Purpose
- ☐ Planning and scheduling process map
- ☐ Planning and scheduling phases
 - ❖ Project planning phase
 - ❖ Scheduling phases
- ☐ Competency model

Reference



Primary reference



Introduction

❑ This recommended practice is intended to serve the **following purposes**:

1. Define the **core** skills and knowledge

a **planning** and **scheduling** practitioner is required to have, and in doing
so

2. Establish the core competencies for the

AACE international **PSP** education and certification programs.



Introduction

□ Knowledge is **understanding** gained through experience or study,

while skills are **abilities** that

transform knowledge into **use**.

Core competencies are those whose usage is and which AACE International considers as being **required** for planning and scheduling **practitioners** to

1. know and
2. use.



Introduction

❑ This recommended practice (RP)

1. **Lists** the core competencies and

2. **Provides** general **performance statements** (e.g., “Describe”, “perform”, etc.)

to represent the level of proficiency expected in **each subject area**.

These statements are **guiding examples only** and are presented in a
“**verb-object**” format.

- ❑ This outline is intended to be a structural foundation for **additional** planning and scheduling products to be developed by AACE International and **will continue** to be **modified** as current practices change.

Background

- ❑ This revision **retains most** of the content of the **previous version** and includes information from

RP 11R-88, Required Skills and Knowledge of **Cost Engineering**.

- ❖ It also incorporates those **elements** of the Total Cost Management (TCM) Framework

that are deemed **applicable** for a planning and scheduling professional.

It provides **organization** of the subjects **aligned** with the TCM Framework.

- ❑ TCM provides an integrated structure and organizes the development of RPs.
- ❑ This includes
 - ❖ planning the project and planning for schedule development,
 - ❖ establishing scheduling requirements,
 - ❖ identifying activities,
 - ❖ developing activity logic,
 - ❖ estimating durations,
 - ❖ allocating resources,
 - ❖ submitting schedule deliverables,
 - ❖ reviewing and validating the schedule,
 - ❖ documenting and communicating the schedule,
 - ❖ developing and maintaining schedule methods and tools,
 - ❖ optimizing the schedule and establishing a control basis.

❑ **In addition** to the TCM Framework and the scope of knowledge provided in this document, the following **AACE recommended practices** are related to the **required skills of planning and scheduling**:

- ❖ RP 20R-03, Implementing Project Constructability
- ❖ RP 23R-02, Identification of Activities
- ❖ RP 24R-03, Developing Activity Logic
- ❖ RP 27R-03, Schedule Classification System
- ❖ RP 32R-04, Determining Activity Durations
- ❖ RP 33R-15, Developing the Project Work Breakdown Structure
- ❖ RP 37R-06, Schedule Levels of Detail – As Applied in Engineering, Procurement, and Construction
- ❖ RP 38R-06, Documenting the Schedule Basis
- ❖ RP 39R-06, Project Planning
- ❖ RP 48R-06, Schedule Constructability Review

❑ **In addition** to the TCM Framework and the scope of knowledge provided in this document, the following **AACE recommended practices** are related to the **required skills of planning and scheduling**:

- ❖ RP 49R-06, Identifying the Critical Path
- ❖ RP 50R-16, Trending and Forecasting of CPM Schedules
- ❖ RP 54R-07, Recovery Scheduling – As Applied in Engineering, Procurement and Construction
- ❖ RP 55R-09, Analyzing S-Curves
- ❖ RP 64R-11, CPM Schedule Risk Modeling and Analysis: Special Considerations
- ❖ RP 70R-12, Principles of Schedule Contingency Management
- ❖ RP 90R-17, Statusing the CPM Schedule – As Applied in Construction
- ❖ RP 91R-16, Schedule Development
- ❖ RP 109R-19, Schedule Change Management – As Applied in Construction
- ❖ Any other recommended practice published under TCM Section 7.2.

Purpose



Purpose of this RP

❑ The **purpose** of this recommended practice is to:

1. Identify

- i. the **applicable** skills and knowledge for planning and scheduling **practitioners** from RP 11R-88 and
- ii. the **core competencies** required for the AACE PSP Certification.

2. **Establish** a planning and scheduling guideline for **training** and **professional development**.

3. **Provide** ethics subscribed to by planning and scheduling **practitioners**.



Purpose of this RP

- This recommended practice is organized in three major sections **consistent** with the breakdown of **traditional** planning and scheduling “phases” as shown in Figure 1.

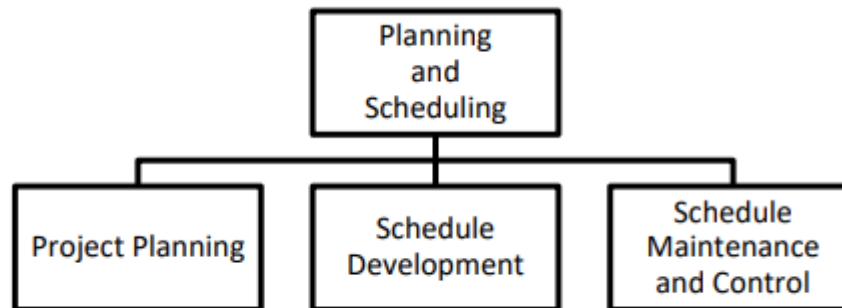


Figure 1: Planning and Scheduling Scope of Knowledge



Purpose of this RP

- ❑ A planning and scheduling **practitioner** should understand the **core purposes** of the **scope of knowledge**, which are as follows:
1. The purpose of project planning is to establish an acceptable course of action (“**plan**”) to **execute** a project in an **effective manner** through the **review** of project scope and objectives.
 2. The purpose of schedule development is to **define** activities, durations, and relationship logic to implement the project plan.
 3. The purpose of schedule maintenance and control is to **monitor**, **update**, and **communicate** the schedule to reflect status and the impact of project changes.
 4. The planning and scheduling **practitioner provides** the project management team with the expertise to plan, schedule, and control the project delivery in the most effective manner.



Purpose of this RP

- ❑ Planning and scheduling are distinct but **related disciplines**.
- ❑ Both terms are defined by AACE in Recommended Practice No. 10S-90, Cost Engineering Terminology. It is imperative to understand the **difference** and **purposes** of these two skills, as described in the Planning and Scheduling Phases section below.



Purpose of this RP

PLANNING –

(1) The determination of a project's objectives with identification of the activities to be performed, methods and resources (cost, hours, time, materials, etc.) to be used for accomplishing the tasks, assessment of both value and risks, assignment of responsibility and accountability, and establishment of an integrated plan to achieve completion as required.

(2) In planning and scheduling, the identification of the project objectives and the ordered activity necessary to complete the project (the thinking part) and not to be confused with scheduling; the process by which the duration of the project task is applied to the plan. It involves answering the questions: 1) What must be done in the future to reach the project objective?; 2) How it will be done?; 3) Who will do it?; and 4) When it will be done? (October 2006)

SCHEDULING –

(1) Assignment of desired start and finish times to each activity in the project within overall time cycle required for completion according to plan.

(2) Process of converting a general or outline plan for a project into a time-based schedule based on available resources and time constraints.

Syn.: DIAGRAMMING (SCHEDULE). See also: PLANNING. (June 2007)

Planning and Scheduling Process Map



Planning and scheduling process map

- ❑ **Figure 2 (TCM Framework Fig 7.2.1)** illustrates the **process map** for schedule planning and development and shows the **basic workflow** based on the plan, do, check, act (**PDCA**) control cycle.

Planning and scheduling process map

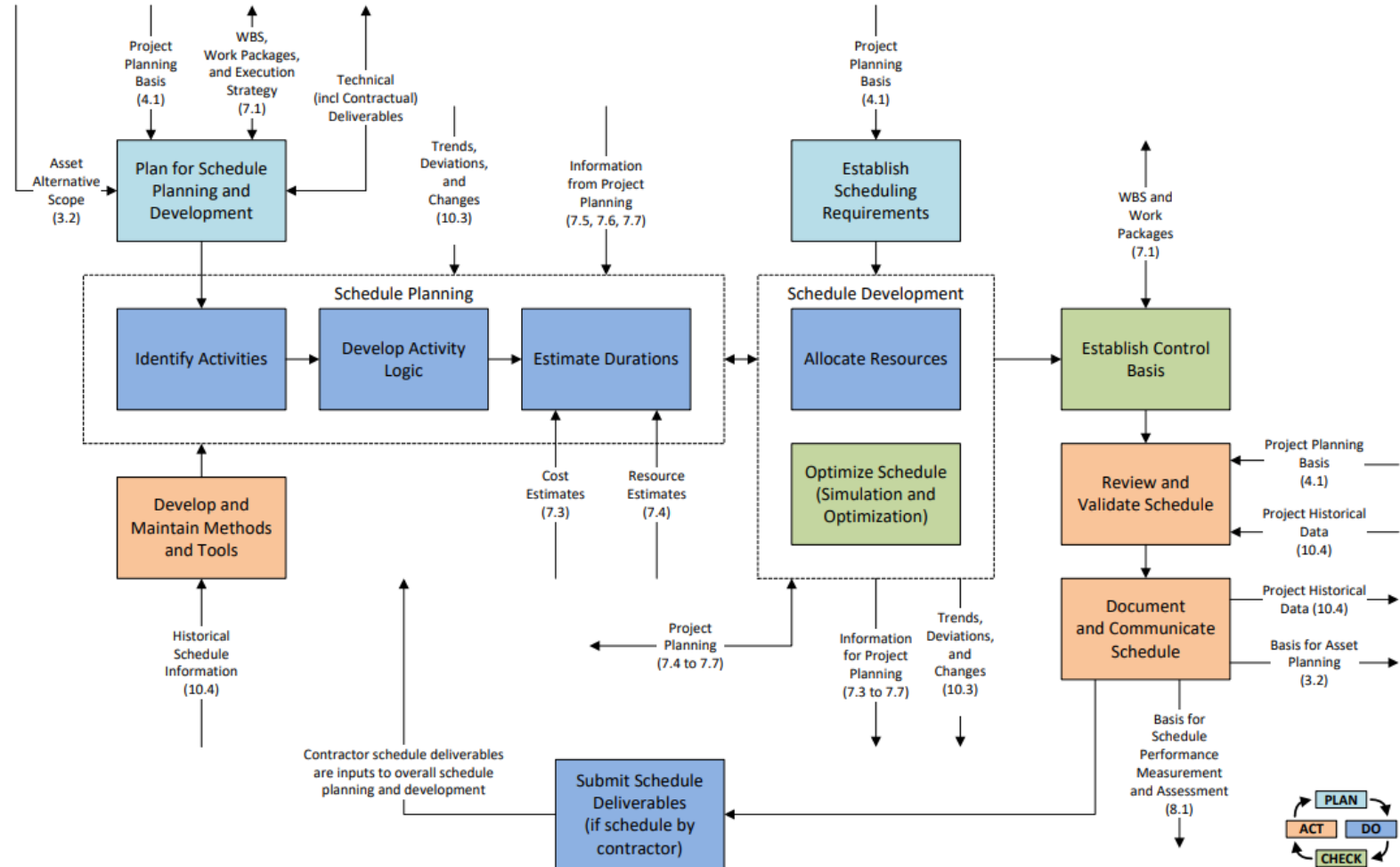


Figure 2. Process Map for Schedule Planning and Development [2]



Planning and scheduling process map

❑ The schedule planning and development process includes:

- ❖ Plan for schedule planning and development (Plan)
- ❖ Establishing scheduling requirements (Plan)
- ❖ Identifying activities (Do)
- ❖ Developing activity logic (Do)
- ❖ Estimating durations (Do)
- ❖ Allocating resources (Do)
- ❖ Submitting schedule deliverables (Do)
- ❖ Optimizing the schedule (Check)
- ❖ Establishing control basis (Check)
- ❖ Reviewing and validating the schedule (Act)
- ❖ Documenting and communicating the schedule (Act)
- ❖ Developing and maintaining schedule methods and tools (Act)

Planning and scheduling process map

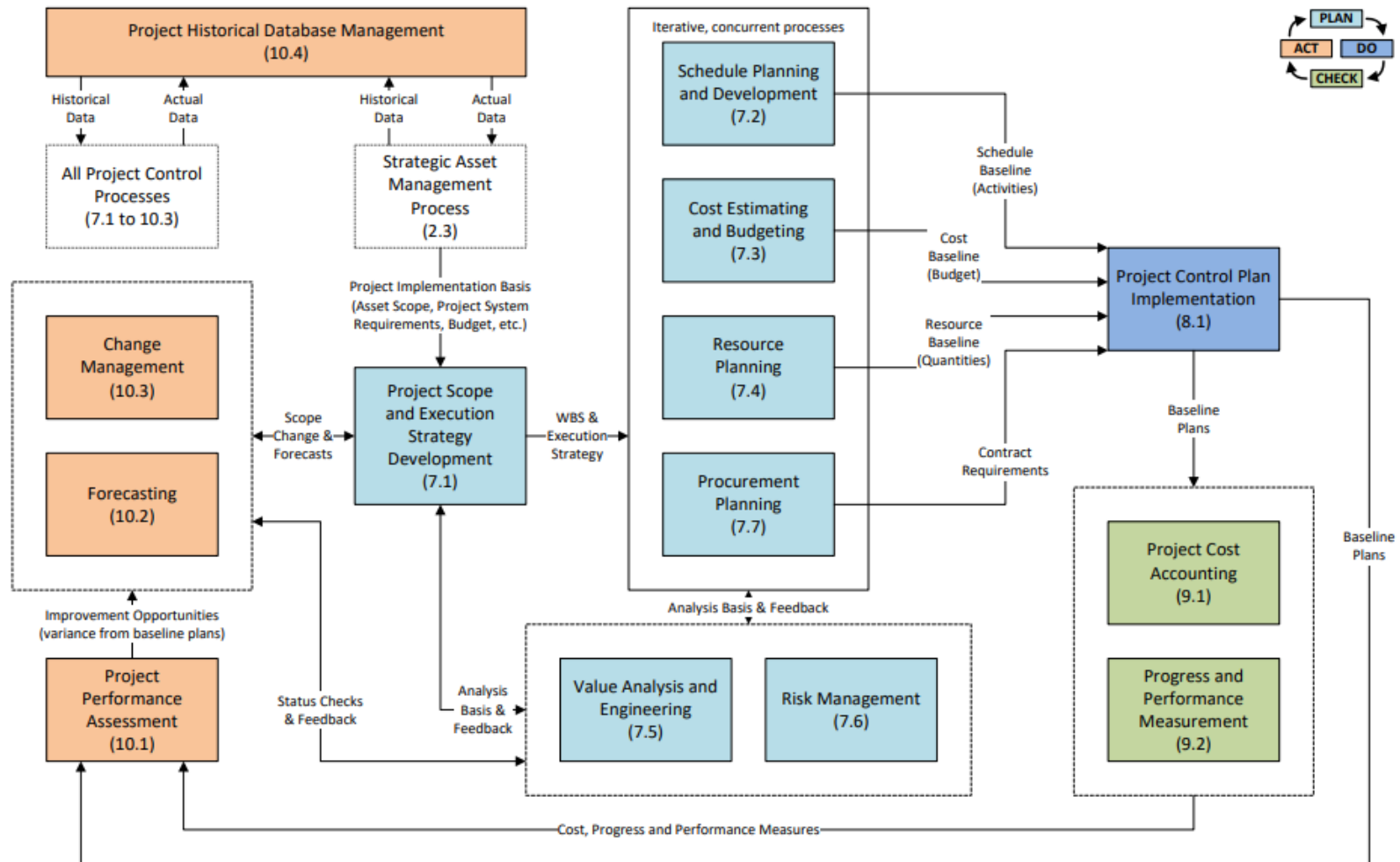


Figure 1 – Project Controls Process - Total Cost Management Framework

Planning and Scheduling phases

(Project Planning Phase)



Project planning phase

❑ **Planning**, is defined in AACE RP 10S-90 and consists of:

1. **Reviewing** the scope of work, client requirements, division of responsibility, project objectives and constraints to **develop** the **strategy** for effective project delivery.

❖ A planning and scheduling **practitioner** should be able to

1. **Read** the applicable scoping documents (e.g., **Construction drawings**) and
2. **Understand** the applicable sections of **contract specifications**.



Project planning phase

❑ **Planning**, is defined in AACE RP 10S-90 and consists of:

2. **Identifying** major activities to be performed and the preferred sequence in which they are to be accomplished.
3. **Developing** an integrated plan to effectively execute the scope of work and meet project objectives.
4. **Identifying** the cost/schedule/resource aspects of the scope of work.
5. **Coordinating** the scope of work and planning assumptions with the project management.



Project planning phase

- ❑ Project planning **begins early** and **continues** as the project moves through the **various phases** of the project life cycle from project conception through to project completion, and closeout.

Rather than a straight-through process, it is best thought of as a planning cycle.



Project planning phase

- ❑ **Most** project management **professionals** agree that there is a basic, **five-step process** involved in developing a project plan.
- ❑ **Essential questions** that are answered during the **project planning** phase include:
 1. What? The project's physical features and technical objectives.
 2. How? Work breakdown structure (WBS).
 3. Who? Resource commitments and organization breakdown structure (OBS).
 4. When? Timeline initially and then the schedule later in the planning process.
 5. How Much? Budget estimate.



Project planning phase

❑ Based on these questions, the **recommended sequence** of actions to develop the **project plan** are as follows:

1. Define the project scope.
2. Establish the work breakdown structure (WBS).
3. Identify resources and availability (people and capital assets).
4. Establish the timeline and sequence of deliverables.
5. Identify and evaluate constraints related to work hours or contiguous operations.
6. Determine the budget for each component activity, work package, or group of tasks.
7. Identify and evaluate risks.



Project planning phase

- ❑ The **final output** of the planning process is an optimized project execution plan for the selected alternative that **best meets** project objectives and goals.

Planning and Scheduling phases

(Scheduling Phases)



Scheduling phases

- ❑ Scheduling is defined in AACE RP 10S-90 and consists of **two distinct phases**, development followed by maintenance and control.



Schedule development

- ❑ The **purpose** of schedule development is to **implement** the project schedule by **converting** the project plan into a **logical arrangement** and sequence of activities.
- ❑ **During** the schedule development phase, the planning and scheduling **practitioner** will **interface** with, and **obtain input** from, project personnel for the development of a project schedule that reflects the **defined scope of work**.
 - ❖ The **major output/deliverable** from the schedule development phase is the project baseline schedule as documented in the **schedule basis document**.
- ❑ After schedule development is complete, including quality review and stakeholder acceptance of the baseline schedule, then scheduling transitions to the **next phase** of schedule **management** and control.



Schedule development

- ❑ The **schedule development phase** is outlined as follows:

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Schedule development

1. Initiate a schedule development process that establishes:

- a. Schedule development process and procedures.
- b. Modeling methodologies.
- c. Approval and distribution requirements.
- d. Process for obtaining project team schedule review and approval.
- e. Process for obtaining client approval.



Schedule development

2. Obtain input/data for schedule development from:

- a. Stakeholders.
- b. Contract schedule specifications.
- c. Client requirements.
- d. Other requirements.
- e. Cost estimate.
- f. Output from project planning including:
 - i. Project scope of work.
 - ii. Project execution approach/methodology.
 - iii. Work breakdown structure (WBS).
 - iv. Project milestones and key events.
 - v. Activity definitions.
 - vi. Activity durations.
 - vii. Logical relationships and sequences.



Schedule development

3. Develop detailed project schedule that meets the client requirements and includes:

- a. Entire project scope of work.
- b. Schedule hierarchy.
- c. Division of responsibility.
- d. Optionally, resources and/or costs may be included in the schedule activities.
 - ❖ Assigning costs, labor, and equipment to each activity contributes to the determination of progress and resource requirements to meet the project completion date.



Schedule development

4. Review developed schedule including:

- a. Quality analysis.
- b. Constructability analysis.
- c. Compliance with client requirements.
- d. Contingency determination and allocation.



Schedule development

5. Schedule development output/deliverables:

- a. Baseline schedule.
- b. Cash flow.
- c. Resource histograms.
- d. Documented basis of schedule.



Schedule maintenance and control

❑ The **purpose** of the scheduling maintenance and control phase is to

monitor the execution of the project **baseline schedule**.

❖ During schedule maintenance and control,

a planning and scheduling **practitioner** must be able to

1. Not only accurately document **past progress** and
2. Model the **projected schedule**,
3. But also to **analyze** the **current schedule status** and
4. Provide **accurate reporting** to the project management team and client.



Schedule maintenance and control

❑ **Reporting** may include of the following:

- ❖ **Recording** accurate actual progress.
- ❖ **Assessing** actual progress versus planned progress to **determine** trends and variances.
- ❖ **Analysis** of critical path and near critical activities.
- ❖ **Schedule change management** including recording and assessing the effects of project schedule changes.
- ❖ **Analysis** of schedule trends, risk assessment, and **development** of **options** for preventative and corrective actions.
- ❖ **Forecasts** and **recovery** plan.
- ❖ **Progress** reporting.
- ❖ **Revising** the project plan and project schedule as required.



Schedule maintenance and control

- ☐ The schedule maintenance and control phase is **outlined as follows**:

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Schedule maintenance and control

1. Implement schedule management and control procedures

a. **Ensure** project scheduling controls are appropriately **implemented** and **maintained**

as defined in **schedule development phase**.



Schedule maintenance and control

2. Maintaining the schedule by:

- a. **Tracking** progress by updating the project schedule on a **regular basis** to assess actual performance against the plan.
- b. **Assessing** impacts on the critical path and near-critical activities and **report** critical work activities to the project manager.



Schedule maintenance and control

2. Maintaining the schedule by:

- c. **Monitoring** schedule deviations and variances and **assist** in developing **alternative methods** for preventative and corrective action.
- d. **Performing** value analysis upon recommended alternatives to
 - ❖ **determine** cost/benefit tradeoff, and
 - ❖ **present** recommendations to project management.
- e. **Revising** the schedule as **directed** by project management and **ensure** that **schedule changes** are communicated to **all project team members**.



Schedule maintenance and control

3. Schedule coordination and communication

- a. **Present** and **answer** questions on project plans and schedules at project meetings.
- b. **Perform** analysis to
 - ❖ evaluate alternative plans, work-around courses of action, or
 - ❖ otherwise amend, plan, schedule and forecast as directed by project management.
- c. **Work** in with project cost engineers, quantity surveyors, estimators, and material control personnel,
to ensure cost and schedule **integration**.



Schedule maintenance and control

4. Schedule change management

- a. **Revise** the **schedule** when an approved change order mandates a change in scope or duration.
- b. **Keep time-phased copies** of the schedule for historical records as the project progresses.
- c. **Provide** schedule-related recommendations to the project management team on strategies to
 - ❖ recover from project **delays** or
 - ❖ leverage project **improvements** and **opportunities**.
- d. **Develop** and **update**
the **contingency drawdown**,
reflecting the **approved usage** of schedule **contingency**.



Schedule maintenance and control

5. Schedule reports and deliverables

- a. **Perform** schedule analysis and **provide** periodic reports of schedule content to the **project management team**.
- b. **Issue** status updates and approved revisions of the schedule that reflect work progress and time elapsed.



Schedule maintenance and control

6. Project and schedule closeout

- a. Upon completion of the project, **verify** that the **as-built schedule** reflects **accurate completion dates** for each schedule activity.
- b. **Disposition/status** all schedule **activities** to completion.
- c. **Provide** final schedule **report** and as-built schedule.

Competency Model



Competency model

- ❑ Figure 3 3 illustrates the **hierarchal structure** of the required skills and knowledge of planning and scheduling.
- ❑ The **first level** of the structure differentiates between
 - ❖ general supporting knowledge used in **more than one practice or process**, and
 - ❖ specific practice knowledge used in **specific** functions or process steps.
- ❑ **Succeeding levels** further break down the **content to whatever level** is appropriate for **each competency area**.
- ❑ The **location** of a skill or knowledge competency in the level of the outline does **not reflect** on its relative importance.



Competency model

- ❑ The **structure** is organized in accordance with the plan, do, check, and act (**PDCA**) process model that serves as the **basis for the TCM Framework** through which all the skills and knowledge of cost engineering are applied.
- ❑ TCM is **not structured** by a **practitioner's work function**.
 - ❖ For example, planners and schedulers will **not find** all required skills and knowledge under one heading.
 - ❖ The **required competencies** of a planning and scheduling practitioner will include **elements** of planning, measuring, and assessing that are appropriate to the planning and scheduling **functions**.

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