PROJECT PLANNING

Planning Success Before Execution Begins.

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1. INTRODUCTION

A project does not become successful simply because execution has started. By the time engineering is progressing, purchase orders are being issued, equipment is being manufactured, and construction teams are mobilized, many decisions that influence project performance have already been made. Those decisions are shaped during **project planning**.

Project planning is the disciplined process of converting an approved project into an integrated, realistic, and executable delivery plan.

It establishes:

What → Why → How → When → Who → With What → Under What Constraints → Against Which Baselines

In an EPC environment, this is particularly important because the project contains many interconnected workstreams, deliverables, dependencies, decisions, and commitments.

A weakness in planning can therefore create consequences later in execution.

An unclear scope can lead to uncertainty.

An incomplete work breakdown can create gaps.

Unrealistic assumptions can produce an unachievable plan.

Poorly understood dependencies can create delays.

Inadequate resource planning can constrain execution.

Therefore: **Planning is not merely paperwork performed before the real project begins. Planning is part of the real project.**

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2. WHAT IS EPC PROJECT PLANNING?

📌 **Project planning** is the structured process of defining how an approved project will be delivered and establishing the framework against which execution can be organized and managed.

A Project Manager needs to establish an appropriate understanding of:

- Project objectives
- Scope and deliverables
- Work breakdown
- Execution approach
- Major dependencies
- Planning assumptions
- Constraints
- Milestones
- Time requirements
- Resource requirements
- Cost requirements
- Risk considerations

- Quality and HSE requirements
- Communication requirements
- Procurement requirements
- Approval requirements
- Baseline requirements
- Execution-readiness criteria

The purpose is not to create the maximum number of documents. The purpose is to create **clarity before execution complexity increases**.

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3. FROM PROJECT APPROVAL TO PROJECT EXECUTION

EPC-05 examined **Project Initiation & Feasibility**—understanding the need, assessing feasibility, and reaching a decision to proceed. EPC-06 addresses the next question: **Now that the project has been approved, how will we prepare it for successful execution?** The transition can be viewed as:

Business Need → Objectives → Approved Project → Scope Definition → WBS & Work Packages → Planning Strategy → Integrated Project Plan → Review & Validation → Approval & Baseline → Execution Readiness

Project planning therefore converts an approved project into a structured delivery framework.

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4. THE PROJECT PLANNING MINDSET

A weak planning approach asks:

"What activities should we put into the schedule?"

A stronger Project Manager asks:

"What must be defined, understood, aligned, and ready before execution can be reliably planned?"

This distinction is important.

Planning should consider:

- What the project must deliver
- How the work will be structured
- What assumptions are being made
- What constraints exist
- What dependencies must be respected
- What resources will be required
- What major decisions are still outstanding

- What approvals are required
- What conditions must exist before execution
- How the plan will be reviewed and baselined

Figure EPC-06-G02 — Project Planning Architecture

The objective is not to predict every future event.

It is to create a sufficiently mature framework for making informed execution decisions.

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5. PLANNING INPUTS

A project plan does not start from a blank page. Important planning inputs may include:

📋 Project Definition

- Approved business case
- Project objectives

- Project charter
- Preliminary scope
- Feasibility findings

📑 **Contractual & Technical Information**

- Contract requirements
- Employer/client requirements
- Technical specifications
- Applicable standards
- Regulatory requirements

🤝 **Stakeholder Requirements**

- Client expectations
- Approval requirements
- Operational requirements
- Key coordination requirements

📐 **Project Conditions**

- Site conditions
- Existing facilities
- Access limitations
- Available resources
- Logistics constraints

📚 **Organizational Knowledge**

- Previous project experience
- Lessons learned
- Existing procedures
- Historical performance information

The quality of the project plan depends significantly on the quality and maturity of its inputs.

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6. PLANNING PRINCIPLES

Effective EPC project planning should follow several fundamental principles.

1 Plan from approved objectives

The plan must support the project's intended outcomes.

2 Define before you detail

The work must be sufficiently understood before unnecessary planning detail is developed.

3 Decompose the work logically

Large deliverables must be converted into manageable components.

4 Make assumptions visible

Unstated assumptions can become future surprises.

5 Identify constraints early

A plan must recognize conditions that limit how or when work can be performed.

6 Build around dependencies

The plan must reflect meaningful relationships between project elements.

7 Align the planning elements

Scope, time, cost, resources, and other requirements must remain coherent.

8 Validate before baselining

A plan should survive professional challenge before becoming the control reference.

9 Refine as information matures

Planning should become progressively more detailed as reliable information becomes available.

10 Plan for execution readiness

A project should not be considered ready merely because a document called a “project plan” exists.

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7. SCOPE PLANNING — DEFINE WHAT WILL BE DELIVERED

Scope provides the foundation for planning.

Before determining how the work will be scheduled or resourced, the project team must establish:

- What is included
- What is excluded
- What must be delivered
- What boundaries exist
- What assumptions apply

- What acceptance requirements exist

A simple statement such as:

"Construct a 132 kV substation."

is not sufficient for detailed planning.

The planning team may need to understand whether the project includes:

- Civil works
- Foundations
- GIS/AIS equipment
- Transformers
- Protection and control
- SCADA
- Telecom
- Auxiliary systems
- Fire protection
- Earthing
- Cabling
- Testing
- Energization
- Existing-network integration
- Documentation
- Training
- Handover requirements

The more clearly the project scope is understood, the more credible the subsequent planning becomes.

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8. WORK BREAKDOWN STRUCTURE — TURNING SCOPE INTO MANAGEABLE COMPONENTS

The **Work Breakdown Structure (WBS)** is one of the most important planning structures.

A WBS provides a **deliverable-oriented hierarchical decomposition of the project scope into progressively smaller and more manageable components**.

Its purpose is to answer:

“What does the project have to deliver, and how can that total scope be structured into manageable components?”

A typical EPC structure might begin with:

PROJECT

├— Project Management
├— Engineering
├— Procurement
├— Construction
├— Testing & Commissioning
└— Closeout

These major elements can then be decomposed into progressively more detailed deliverables and work packages.

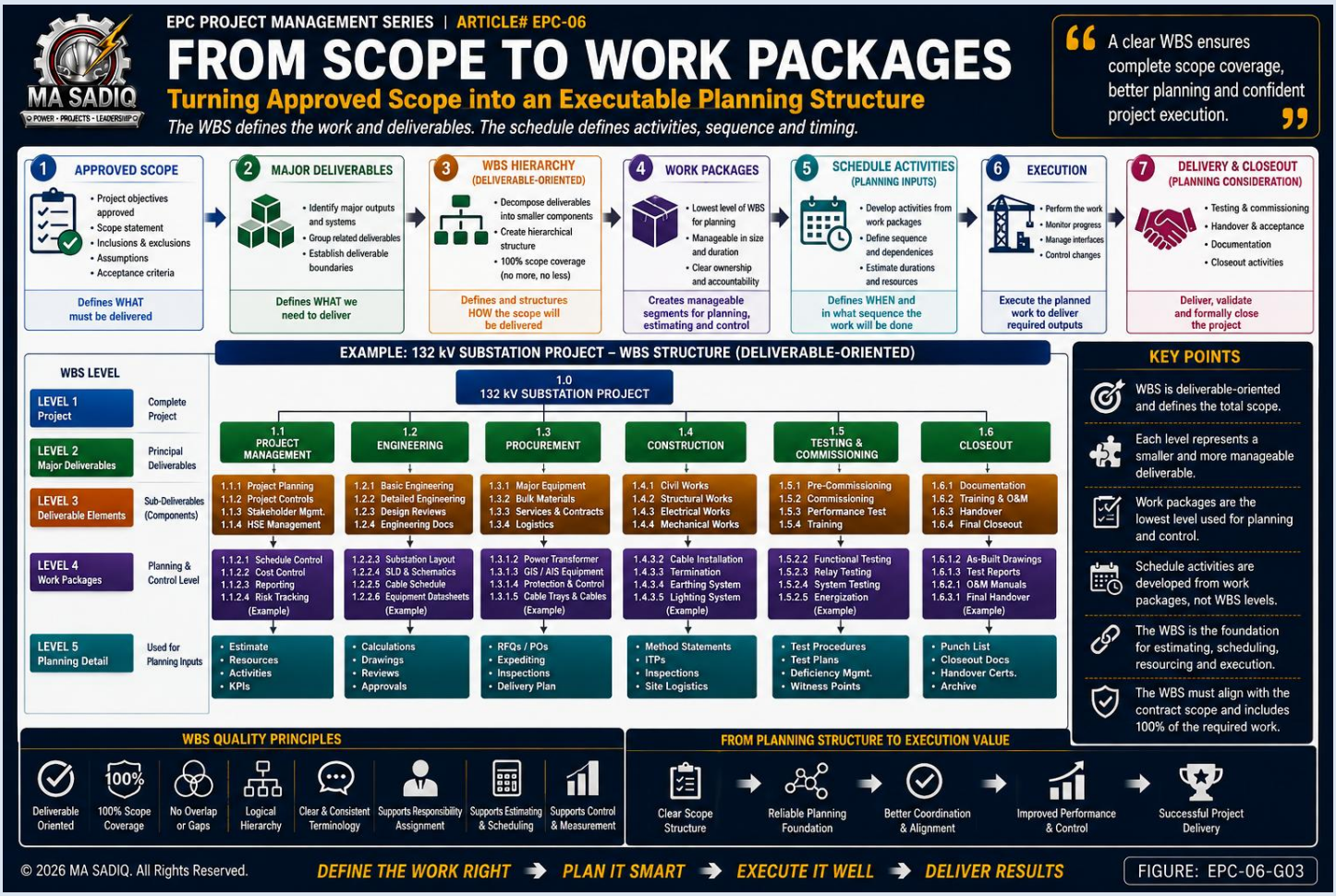

Figure EPC-06-G03 — From Scope to Work Packages

⚠️ **An Important Distinction**

The WBS is **not the project schedule**.

The WBS defines the **work and deliverables**.

The schedule subsequently defines the **activities, relationships, sequence, durations, and timing** associated with that work.

This distinction is fundamental.

A Project Manager who confuses the WBS with the schedule may create a planning structure that is difficult to manage and difficult to maintain.

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9. WBS QUALITY PRINCIPLES

A useful WBS should:

- Be deliverable-oriented
- Cover the approved project scope
- Avoid unnecessary overlap
- Use clear and consistent terminology
- Establish a logical hierarchy
- Identify manageable work packages
- Support responsibility assignment
- Support estimating and scheduling
- Provide a common structure for project planning

The **100% principle** is particularly important: the WBS should represent the complete approved project scope without deliberately omitting required work or introducing unrelated work.

A WBS should also remain distinct from:

- Organizational charts
- Procurement lists
- Schedules
- Activity lists
- Resource structures

Each serves a different planning purpose.

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10. WORK PACKAGES — WHERE PLANNING BECOMES ACTIONABLE

The lowest-level WBS components are generally work packages.

A well-defined work package should be sufficiently understood to support:

- Responsibility assignment
- Estimation
- Scheduling
- Resource planning
- Progress measurement
- Performance tracking

The objective is not to create excessive detail.

If decomposition continues indefinitely, the planning structure can become more difficult to manage than the work itself.

The Project Manager must determine an appropriate level of detail based on the project's:

- Size
- Complexity
- Risk
- Management needs
- Delivery strategy

Good planning achieves the **right level of detail**, not the maximum level of detail.

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11. PLANNING THE TIME FRAMEWORK

Once the work has been sufficiently defined, the Project Manager can establish the project's time framework.

Planning for time considers:

- Major activities
- Logical relationships
- Sequence
- Durations
- Milestones
- Constraints
- Dependencies

- Required approvals
- Major procurement lead times
- Site readiness
- Execution requirements

For example:

Engineering Requirement → Procurement Requirement → Equipment Availability → Installation Requirement → Testing Requirement → Commissioning Requirement

The detailed techniques of schedule development and schedule management will be addressed separately in:

EPC-13 — Schedule Management.

For EPC-06, the focus is on ensuring that the project's time requirements are properly incorporated into the **integrated project plan**.

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12. PROJECT PLANNING TOOLS

Modern EPC projects use specialized software to develop, analyze, communicate, and maintain project plans and schedules.

Commonly used tools include:

💻 Oracle Primavera P6

Primavera P6 is widely used for complex EPC and large-scale construction projects where detailed scheduling, logical relationships, resources, baselines, and project information need to be managed within a structured planning environment.

💻 Microsoft Project

Microsoft Project is commonly used for project planning and scheduling, particularly for small to medium-sized projects and less complex planning environments.

Other organizationally approved planning and scheduling tools may also be used depending on the project's requirements, size, complexity, and established practices.

However, the Project Manager should remember:

A planning tool does not create a good project plan. It only provides a platform for representing and managing the plan.

The quality of the output depends on the quality of:

- Scope definition
- WBS
- Work packages

- Activity definition
- Logic and dependencies
- Duration estimates
- Resources
- Constraints
- Milestones
- Planning assumptions
- Project information

A sophisticated software schedule built on poor planning inputs is still a poor project plan.

The detailed use of planning and scheduling tools is beyond the scope of this article. The focus here is on the **planning principles that must exist before, and alongside, the use of any software tool**.

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13. MILESTONE PLANNING

Milestones provide important reference points within the project plan.

Examples may include:

- Project Kick-off
- Design Basis Approval
- Major Engineering Completion
- Major Purchase Orders
- Major Equipment Delivery
- Construction Readiness
- Mechanical Completion
- Testing Readiness
- Energization
- Substantial Completion
- Handover
- Final Completion

A meaningful milestone represents an important project condition or achievement.

Milestones should therefore be linked to the actual delivery strategy rather than inserted simply to populate a schedule.

The key planning question is:

What major conditions must be achieved, and when must they be achieved to support successful project delivery?

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14. PLANNING COST AND RESOURCES

The project plan must also establish the resources and financial requirements necessary to execute the defined work.

👥 **Resource planning considers:**

- People
- Equipment
- Materials
- Facilities
- Specialist capabilities
- Availability
- Timing
- Location

💰 **Cost planning considers:**

- Major project expenditures
- Engineering requirements
- Procurement requirements
- Construction requirements
- Labor
- Equipment
- Subcontracting
- Logistics
- Testing and commissioning
- Appropriate contingency considerations

The purpose at EPC-06 level is to ensure that **scope, work, resources, and cost are aligned within the project plan**. Detailed cost management, forecasting, and EVM will be addressed separately in: **EPC-14 — Cost Management & EVM.**

15. PLANNING FOR UNCERTAINTY

Every project plan contains assumptions and uncertainty. Planning should therefore identify:

- Major assumptions
- Constraints
- Dependencies
- Known uncertainties
- Planning sensitivities
- Conditions that could affect execution readiness

Uncertainty should influence planning decisions. For example, a significant uncertainty may require:

- Additional planning contingency
- Alternative sequencing
- Additional resources
- Earlier decision-making
- Additional approval time
- Alternative procurement timing

Detailed risk-management methodology shall be discussed in: **EPC-16 — Risk Management.**

The EPC-06 planning principle is simply: **Make uncertainty visible and incorporate its implications into the project plan.**

16. PLANNING QUALITY, HSE AND COMPLIANCE REQUIREMENTS

The project plan must recognize applicable:

- Quality requirements
- HSE requirements
- Regulatory requirements
- Inspection requirements
- Testing requirements
- Approval requirements
- Documentation requirements

These requirements may influence:

- Work sequence
- Resources
- Milestones
- Procurement
- Site readiness
- Acceptance requirements

EPC-06 does not attempt to teach Quality or HSE Management. Those subjects will be addressed separately in:

EPC-19 — Quality Management and **EPC-20 — HSE Management.**

The planning principle is straightforward:

Requirements that can affect execution must be identified during planning—not discovered accidentally during execution.

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17. PLANNING ENGINEERING, PROCUREMENT AND CONSTRUCTION DEPENDENCIES

EPC projects contain major workstreams whose requirements must be reflected in the project plan.

For example:

Engineering maturity → Procurement readiness → Equipment availability → Construction readiness → Testing & Commissioning readiness

The purpose of EPC-06 is not the detailed explanation about Engineering Management, Procurement Management, or Construction Management. Those are separate subjects:

- **EPC-08 — Engineering Management**
- **EPC-09 — Procurement Management**
- **EPC-10 — Construction Management**

Here, EPC-06 simply establishes that their requirements and dependencies must be **recognized and considered during planning**.

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18. PLANNING STAKEHOLDER AND COMMUNICATION REQUIREMENTS

Planning must also consider who needs to:

- Provide information
- Review documents
- Approve deliverables
- Make decisions

- Receive critical information
- Coordinate requirements
- Accept completed work

Communication and approval requirements should therefore be reflected in the project plan.

Examples include:

- Approval cycles
- Coordination requirements
- Decision points
- Reporting requirements
- Escalation requirements

Detailed Stakeholder Management and Communications Management will be covered separately in:

EPC-24 — Stakeholder Management and **EPC-25 — Communications Management.**

For EPC-06, the focus remains on ensuring that these requirements are **recognized as planning inputs and incorporated where they affect delivery**.

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19. INTEGRATED PROJECT PLANNING

The central purpose of EPC project planning is to bring the planning elements together into **one coherent delivery framework**.

Scope cannot be planned independently of time.

Time cannot be planned independently of resources.

Resources cannot be planned independently of cost.

Procurement requirements cannot be planned independently of engineering maturity.

Execution readiness cannot be assessed independently of approvals and constraints.

The project plan therefore needs to bring these elements together. The emphasis here is **planning integration**—not the detailed subject of Integration Management, which will be covered in EPC-07.

Figure EPC-06-G04 — Integrated Project Planning Framework

20. PLANNING ASSUMPTIONS, CONSTRAINTS AND DEPENDENCIES

Three areas deserve particular attention.

Assumptions

An assumption is something accepted as true for planning purposes.

Examples include:

- Availability of a required facility
- Timely client approval
- Availability of a specialist resource
- Expected delivery period
- Availability of site access

Assumptions should be visible and reviewable.

Constraints

Constraints limit what the project can do.

Examples include:

- Fixed completion date
- Restricted site access
- Limited working hours
- Regulatory restrictions
- Available budget
- Resource limitations

Dependencies

Dependencies describe relationships between elements of the plan.

For example:

Design Approval → Procurement Release

or: **Equipment Delivery → Installation**

or: **Installation Completion → Testing**

Good planning makes these relationships visible **before they become execution problems**.

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21. Execution Readiness

A project should not be considered ready for execution simply because planning documents exist.

Execution readiness should consider whether the necessary conditions are sufficiently established.

📋 **Scope:** Is the required scope sufficiently defined?

🧩 **WBS:** Has the work been appropriately decomposed?

🗓️ **Time Framework:** Is there a credible execution sequence and milestone framework?

👥 **Resources:** Are key resources identified and planned?

🛒 **Procurement:** Are critical procurement requirements understood?

⚙️ **Engineering:** Is the required engineering maturity available?

✅ **Approvals:** Are essential approvals identified?

⚠️ **Uncertainty:** Are major planning uncertainties visible?

🛡️ **Quality & HSE:** Are applicable requirements incorporated?

🔗 **Dependencies:** Are important relationships identified?

The question is not: **"Do we have a project plan?"**

The better question is: **"Does the plan provide sufficient confidence that the project is ready to execute?"**

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22. Planning Review and Validation

Before approval, the project plan should be challenged. The review should ask:

- Is the scope complete?
- Does the WBS represent the scope?
- Are the major deliverables identified?
- Are dependencies realistic?
- Are assumptions visible?
- Are constraints understood?
- Are milestones achievable?
- Are required resources identified?
- Are planning requirements aligned?
- Are major uncertainties recognized?
- Are responsibilities clear?
- Is the execution approach realistic?
- Does the plan provide sufficient execution confidence?

This is where planning moves from **document preparation to professional judgment**. A plan should not be baselined simply because the planned completion date is desirable. It should be baselined when the planning team has sufficient confidence that the plan is **credible, understood, aligned, and achievable within the approved project framework**.

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23. APPROVAL AND BASELINING

A disciplined planning sequence is:

Develop → Review → Challenge → Validate → Approve → Baseline

The approved baseline becomes the project's reference point.

It establishes the agreed planning framework against which future performance, forecasts, and approved changes can be considered. Baselining should therefore be a **management decision**, not merely an administrative action.

A baseline should represent a plan that has been sufficiently reviewed and accepted by the appropriate project stakeholders.

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24. PLANNING DURING EXECUTION

Planning does not disappear when execution starts. Actual project information will inevitably reveal:

- New constraints
- Better information
- Emerging dependencies
- Changed assumptions
- New uncertainties
- Resource challenges
- Design developments
- Procurement realities

Therefore, planning must remain responsive. The project team may need to:

- Refine assumptions
- Reassess execution readiness
- Re-sequence planned work
- Update forecasts
- Develop recovery options
- Reassess resource requirements

However, changes to approved baselines should follow the project's established change-control process.

Detailed monitoring and control will be addressed later in: **EPC-18 — Project Monitoring & Control.**

The important EPC-06 principle is: **A good plan is stable enough to provide direction, but mature enough to evolve through controlled planning and approved change.**

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25. COMMON PROJECT PLANNING MISTAKES

❌ **1. Planning before understanding the scope** ✅ A detailed plan built on an unclear scope is still an unreliable plan.

❌ **2. Confusing the WBS with the schedule** ✅ The WBS structures the project's deliverables and scope; the schedule subsequently addresses activities, relationships, and timing.

❌ **3. Making assumptions invisible** Unstated assumptions become difficult-to-manage surprises.

❌ **4. Ignoring constraints** ✅ A theoretically perfect plan may be practically impossible.

❌ **5. Developing planning elements independently** ✅ The project plan must bring the required planning elements together.

❌ **6. Creating unrealistic milestones** ✅ A milestone should represent an achievable project condition.

❌ **7. Ignoring dependencies** ✅ Dependencies that are not recognized during planning often emerge later as delays.

❌ **8. Treating baselining as paperwork** ✅ A baseline should represent a credible and reviewed plan.

❌ **9. Over-planning** ✅ Excessive detail can consume management effort without improving decision quality.

❌ **10. Stopping planning after approval** ✅ Planning must remain responsive as reliable project information develops.

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26. THE PROJECT MANAGER'S PLANNING PERSPECTIVE

A functional specialist may ask: *"When can I complete my deliverable?"*

The Project Manager must ask: **"What does this deliverable enable, what depends on it, and what happens if it is late?"** For example:

Engineering Deliverable → Approval → Procurement Release → Manufacturing → Delivery → Installation → Testing

The Project Manager therefore looks beyond individual activities and considers the **network of dependencies created by the plan**. This systems-level perspective is one of the most important planning capabilities in EPC project management.

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27. PRACTICAL EPC PLANNING LESSONS

💡 **Lesson 1 — Define before you detail** Do not build unnecessary planning detail around poorly defined scope.

💡 **Lesson 2 — Build the WBS around deliverables** The WBS should clarify what the project must deliver.

💡 **Lesson 3 — Make assumptions visible** Visible assumptions can be challenged and managed.

💡 **Lesson 4 — Identify constraints early** A constraint discovered late can invalidate an otherwise good plan.

💡 **Lesson 5 — Plan dependencies explicitly** A project is a network of relationships, not a collection of isolated activities.

💡 **Lesson 6 — Validate before baselining** An unchallenged plan may contain hidden weaknesses.

💡 **Lesson 7 — Do not confuse detail with quality** The best plan is not necessarily the longest plan.

💡 **Lesson 8 — Keep the plan useful** Planning should evolve as reliable information becomes more mature.

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28. WHAT MAKES A GOOD EPC PROJECT PLAN?

A good project plan should be:

Clear The team understands what is expected.

Complete The major required planning elements are addressed.

Logical The relationships between the work are realistic.

Integrated The planning elements work together.

Measurable The plan provides meaningful reference points.

Realistic The assumptions and constraints are credible.

Executable The plan can actually be implemented.

Adaptable The plan can respond to controlled changes and improved information.

Approved The appropriate stakeholders understand and accept the baseline.

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29. KEY TAKEAWAYS

Before execution begins, the Project Manager should be able to answer:

📋 **Scope** What exactly are we delivering?

🧩 **WBS** How is the total work structured into manageable deliverables and work packages?

🗓️ **Time** What major sequence and milestones are required?

👥 **Resources** What capabilities and resources will be needed?

💰 **Cost** What financial requirements must the plan accommodate?

⚠️ **Uncertainty** What assumptions, constraints, and dependencies could affect the plan?

🔗 **Planning Integration** How do the planning elements fit together?

💻 **Tools** Are appropriate planning and scheduling tools being used to represent and maintain the plan?

✅ **Readiness** Does the plan provide sufficient confidence for execution?

📌 **Baseline** What approved planning framework will become the project reference?

If these questions cannot be answered with reasonable confidence, the project may not yet be ready for full-scale execution.

30. CONCLUSION

A good project plan does not guarantee project success. But a poorly planned project starts execution with disadvantages that become increasingly expensive to correct.

In EPC projects, planning converts an approved project into an **integrated delivery framework**.

It establishes:

Scope → WBS → Work Packages → Planning Elements → Dependencies → Integrated Plan → Validation → Baseline → Execution Readiness

The most effective Project Managers understand that planning is not about creating the largest possible collection of documents. It is about creating **clarity before complexity increases**. A good plan:

- Establishes direction
- Defines the work
- Exposes assumptions
- Identifies constraints
- Makes dependencies visible
- Aligns planning requirements
- Establishes credible baselines
- Tests execution readiness

Most importantly, good planning creates an opportunity to influence project outcomes **before problems become expensive**.

The best time to influence project success is before the first dollar is spent.

Plan deliberately. Execute confidently. Deliver successfully.

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31. LOOKING AHEAD

Project planning establishes the foundation.

The next article will examine the discipline that ensures the various components of the project are coordinated as one coherent system: **EPC-07 — Integration Management**

The series will then progressively examine Engineering, Procurement, Construction, Interfaces, Testing & Commissioning, and the other specialist management disciplines in greater depth.

👨‍💼 ABOUT THE AUTHOR

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The **MASADIQ EPC Project Management Series** is a structured educational publication developed to provide engineers, project managers, students, and industry professionals with practical knowledge covering the principles and practices of EPC project management.

Each article explores a specific EPC topic, progressing systematically from foundational concepts to advanced project-management practices while emphasizing practical experience, professional excellence, leadership, and continuous learning.

The series aims to bridge the gap between project-management principles and the realities of engineering, procurement, construction, commissioning, and project delivery.

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