[Name], Shaahin Qajar

PLANNING PROCESS GROUP (PMBOK 6)

In the Oil and Gas Industry

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PLANNI NG PROCESS

In the Oil and Gas Industry

"If you fail to plan, you are planning to fail

by Benjamin Franklin"

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Preface by the sponsor

Project Management in the Oil and Gas Industry by veteran project manager focuses on using practical tools and methods that are widely used in petroleum projects. This book is helpful to any engineering discipline or staff in sharing or applying the work of a petroleum project.

This Book suggests that the current oil and gas project management approach should focus on capital-project performance rather than just the critical path and increasingly detailed planning. This would help improve capital-project performance, reduce costs, increase safety, improve quality, reduce cycle times, increase predictability, reduce risk, improve collaboration between stakeholders, increase transparency, improve communication between teams, and enable better decision making.

The Project Management Body of Knowledge (PMBOK) framework from the Project Management Institute (PMI) is used as a platform for project management in the oil and gas industry. This framework includes five Process Groups: Initiating, Planning, Executing, Monitoring and Controlling, and Closing. Oil and gas projects come with unique challenges that require professional project managers to manage science, technology, and engineering aspects. To ensure the competence of professionals working in this area, OMC (Oil and Gas Management Center) offers several programs such as Certified Project Planning Professional Development Programme, Certified Project Control Professional Development Programme, Certified Project Manager Development Programme, Certified Project Master Development Programme, and Project Management Professional Exam Preparation Programme. Project management in the oil and gas industry also involves better advanced planning by integrating contractors on a long-term basis to share knowledge and expertise. Managers in this industry need to be diligent in handling their projects due to global issues such as recession which can lead to layoffs. With the current slump in oil prices, project managers need to run projects with smaller budgets while still achieving a return on investment (ROI).

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Preface by the author

Project management in the oil and gas industry is a complex and competitive field, requiring the management of science, technology, and engineering aspects. The Project Management Institute (PMI) defines project management as "the applications of the relevant knowledge, tools, skills and techniques to project activities to meet the project requirements".

Projects in the oil and gas industry require specific processes and procedures to ensure sustainability. Training and roll-outs are necessary for successful implementation of these processes. Project managers must have a strong understanding of project management principles in order to successfully manage projects in this field. With the current global recession in oil and gas business, all project managers need to enhance their skills and knowledge in order to handle projects with smaller budgets and less personnel.

This book tries to be practical and, at the same time, match with the Project Management Professional (PMP) guide. What makes this book different from other similar books is providing practical tips in planning group processes. In addition, good scheduling experiences in oil and gas projects along with formats and application patterns are given in the appendix of the book. Considering that this book was compiled for the first time and based on the experiences and learnings of the authors in the oil and gas infrastructure industries, it is certainly not without problems, and all experts and experts are requested to send their points of view to the authors' email. It is hoped that with the publication of this book, we have taken a small step for the infrastructure project planners to achieve the final goal, which is to reduce delays in projects.

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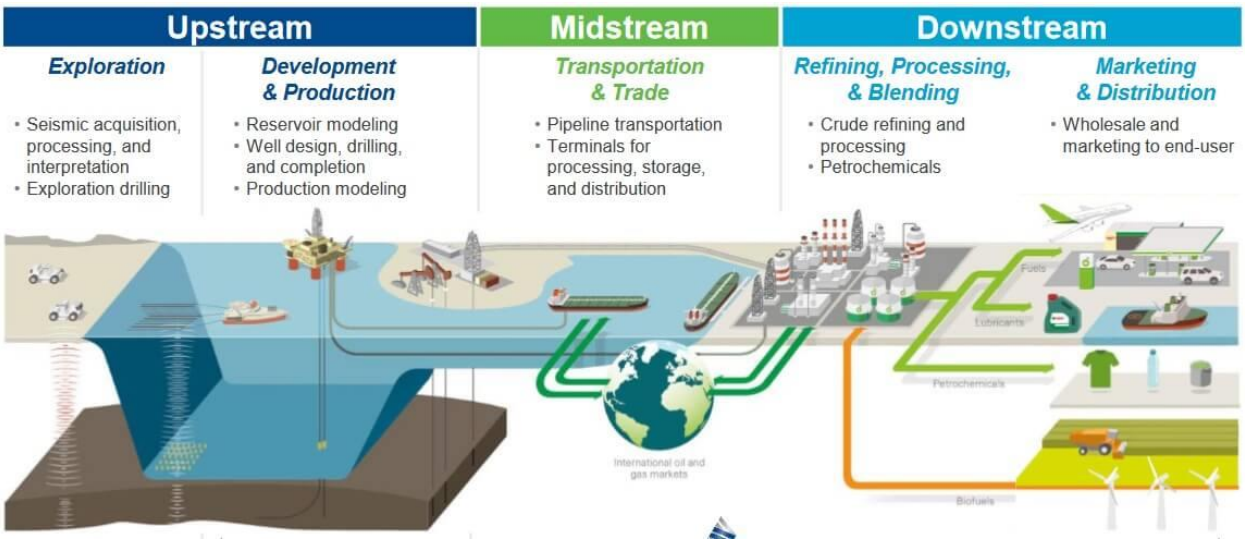
1

The Principle of Planning Process

The Planning Process Group consists of those processes that establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives.

"A Guide to the Project Management Body of Knowledge (PMBOK Guide) Sixth Edition"



The Planning Process Group is one of the five PMBOK (Project Management Book of Knowledge) process groups defined by the Project Management Institute (PMI). It consists of 24 processes, including developing a project management plan and subsidiary plans, obtaining project plan approval, and creating a work breakdown structure. The Planning Process Group is important for establishing the total scope

of a project, defining and refining objectives, and developing the course of action required to attain those objectives. It is also used to think ahead about the project and keep the planning process streamlined. The Planning Process Group can be tailored to specific market segments or focus areas such as oil & gas or software development. This allows for more detailed planning that takes into account industry-specific requirements.

Once authorized, the project management team needs to plan the project at an appropriate level of details using progressive elaboration techniques. This is thinking ahead of time about the project. The Planning Process group contain the biggest chunk of the Project Management processes from the 49 processes. The process group brings together all of the different types of planning needed to run the project. This is not only to identify the Scope, Cost, Schedule but also identify the resources needed and plan proper mitigation strategies against any unforeseen future event. The project management plan provides all the necessary planning to complete the project and deliver the objectives with the identified constraints.

Project planning emphasizes on developing a roadmap that needs to be followed. A project roadmap is a strategic plan that outlines the goals and objectives of a project, as well as the steps needed to achieve them. It provides an overview of the complexity and effort involved in the project, and helps identify which stages require the most attention. A project roadmap should be simple and concise, providing high-level detail without relying on excessive planning notes and briefs. It should also contain two key parts: a clear list of defined aims and deliverables, and an accompanying timeline detailing when each step needs to be completed. Whether or not you include dates in your roadmap depends on who your audience is. If it's focused on tactical details such as development teams, then you'll want to emphasize timeframes and dates. However, if it's more strategic in nature, then you'll want to focus more on the overall plan rather than the timeframe for executing it. It's

important to remember that while developing a roadmap can help streamline your work process, it should always be done in the context of a well-thought-out timeframe so that you can track progress effectively.

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

2

Develop Project Management Plan

The most important task in the Monitoring and Controlling Process Group is to develop the baselines for scope, cost, and schedule. These baselines are used to measure and compare the project's progress against a fixed reference point, allowing project managers to understand at what stage a project is currently at, any changes that the project is going through, any issues that need to be dealt with immediately, and whether the project will be finished on time. The activities in this process group measure the project performance and ensure it is on track. To do this, a Work Breakdown Structure (WBS) can be used to break down a large project into tasks and subtasks, making it easier to manage and evaluate a project. A WBS also integrates scope, cost, and schedule baselines ensuring that project plans are in alignment. Additionally, it allows for cost and schedule data collection, analysis, and reporting which are connected to the WBS.

To be successful in execution, careful and diligent planning is essential. Poor planning can lead to the failure of a project, as it increases the risk that designated activities won't be carried out properly. Without proper planning, organizations inevitably fall back into the same trap over and over again. A lack of execution is one of the most significant problems facing businesses today, and without it, projects are likely to fail. Therefore, it is important to plan carefully and diligently in order to ensure successful execution of a project.

The processes that are typically used in project management include creating activities, estimating duration, assigning resources, sequencing tasks, and scheduling. These processes are often done as part of one process. For example, when creating activities, the duration and resources needed for each activity must be estimated and the tasks must be sequenced in the right order before they can be scheduled. Additionally, when scheduling a project, it is important to consider any dependencies between tasks and identify any potential bottlenecks that could delay the project.

The process attempts to answers questions like:

1) What detailed is expected in the plan? What sections requires details and which will survive without detailed planning?

- A project plan should include sections on scope management, quality management, risk assessment, resource allocation, and timeline. These sections should contain detailed information about the project such as objectives, requirements, scope statement, deadlines, estimations and resources needed. A

business plan should include elements such as a description of the business, market analysis, competitive analysis, sales strategies and financial projections.

2) The levels of WBS and eventually identify what is needed to plan as neat future.

- The Work Breakdown Structure (WBS) is a hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables. It is used for many different things, including planning, defining, and organizing scope. A good WBS is one that makes the project more manageable. The WBS levels are what determine the hierarchy of a WBS element. Most work breakdown structures have 3 levels that represent the project's main deliverable, control accounts, and project activities. The final WBS level is the activities level which includes all the tasks that need to be completed before a team can work on the tasks. The Planning Process Group brings together all of the different types of planning needed to run a project. This includes identifying scope, cost, schedule, resources needed, and mitigation strategies against any unforeseen future events. Detailed planning should include outlining strategy and tactics to successfully complete the project tasks in Planning Process Group as well as determining what level of engagement is expected from stakeholders in planning and how to keep the planning process streamlined.

3) What level of engagement is expected from stakeholders in planning?

- When planning a project, stakeholders should be engaged at various levels depending on the type of project, potential impacts, and types and needs of stakeholders. Generally, there are three levels of engagement: informing/updating stakeholders, consulting stakeholders, and collaborating with stakeholders. Informing/updating stakeholders involves providing them with

information about the project. This is especially important for high-influence/low-interest stakeholders. Consulting stakeholders involves having more intimate conversations with them to ensure their expectations are met. Collaborating with stakeholders involves treating them as part of the team and engaging in activities such as voting ballots or referenda to place final decision-making power in their hands. Key stakeholders to be involved in strategic planning include employees, unions, customers, suppliers, shareholders, government agencies and other organizations that have a vested interest in the success of the organization. It is important to ensure that all these groups are properly informed and encouraged to participate in the stakeholder engagement process.

4) How to keep the planning process streamlined?

- To keep the planning process streamlined, it is important to focus on the most important success factors, match the strategy to the organization's goals and objectives, identify the right planning approach for the organization, adapt strategic planning to streamline it, work from one platform, shorten the budget cycle, consider a driver-based approach, collaborate with team members, align business processes, automate processes and workflows and ask staff members for their input on how to streamline processes and workflows. Additionally, it is important to plan within shorter, more targeted engagements that free up participants from time spent in unproductive meetings and play the long game by giving yourself a generous timeline for planning which reduces inefficiencies of cramming for a closer date.

5) How often to re-plan?

- It is recommended to re-plan when things go wrong, such as when progress on a project cannot be measured against the established plan. Re-adjusting the plan should take place during the middle of a project, such as months four-, five-, and six of a nine-month project. Planning should be done habitually daily, weekly, quarterly, and yearly, while re-planning should be done less often, such as when tasks need to be organized to achieve goals or when priorities need to be recalibrated weekly.

6) How to administer changes to the plan?

- A change management plan is a process that implements a change or changes in a project or across an organization. It helps to control the budget, schedule, scope and resources of the project. A change management plan should include elements such as a Change Control Board, an Action Plan Template and a Free Change Management Plan Template. The five steps of the change management process are preparing the organization for change, planning, implementation, embedding the change and review. To create a successful change management plan, one must understand how the changes will impact their team, business, clients and customers. The plan should also include goals for the transition and establish a team to execute it. During implementation, it is important to empower employees to take necessary steps to achieve goals and celebrate any short-term wins. Finally, it is important to review and adapt the plan once changes are live in order to assess its impact.

3

Purpose of Planning Process Group

The purpose of the Planning Process Group is to create a roadmap for the project, helping to define and refine objectives, develop the course of action required to attain those objectives, and create plans for scope, cost, schedule, resources, quality, communications, risk management and procurement. This group consists of 24 processes in total, including developing a project management plan and subsidiary plans, collecting requirements, defining scope, creating a work breakdown structure, determining how planning will be done, finalizing "how to execute & control" parts of all management plans and gaining formal approval of the plan. The Planning Process Group activities help to create the planning documents of the project and ensure that all necessary steps are taken before execution begins.

The PMBOK (Project Management Body of Knowledge) Guide outlines five major process groups for project management: Initiation, Planning, Execution, Monitoring and Controlling, and Closing. The Planning Process Group is the largest of the five process groups, consisting of 24 processes in total. These processes are designed to help define and plan the extent of the project, as well as plan how it will be executed. The Planning Process Group includes processes such as Collect Requirements, Define Scope, Create Work Breakdown Structure, Define Activities, Sequence

Activities, Estimate Activity Resources and Durations, Develop Schedule, Estimate Costs and Determine Budget. These processes are designed to help create a Project Management Plan that will guide the project team through the entire project from start to finish. The benefits of using these process groups include increased efficiency and accuracy in planning projects.

Project managers in the oil and gas industry face a number of risks and challenges, including budgeting risks due to uncertainties in the extraction process, regulation risks, technology risks, and construction risks. Keeping projects on time and under budget is one of the most significant challenges facing EPC contractors and operators. Companies must also have robust project reference frameworks to avoid cost and schedule overruns. Additionally, project managers need to understand all the challenges they face and put mitigation measures in place to address them.

Project management is an important tool for the oil and gas industry, as it helps to bring efficiency to technical challenges and achieve a competitive edge. There are several techniques that can be used in project management for oil and gas projects, such as network planning, task estimation, managing problems, change management, and resource allocation. Project managers need to have both technical skills and standard expertise in project management such as planning, budgeting, human resources, risk management, scheduling, and quality control. They must also consider parameters such as time schedule and budget when creating a realistic plan. Additionally, they must be able to manage large teams of people who may be expatriated. Finally, project managers should have a process in place to analyze changes requested by the client during the project lifecycle in order to control costs. By mastering these techniques of project management for oil and gas projects, organizations can achieve a high incidence of success.

4

Tasks in Planning Process Group

The Planning Process Group is one of the five major process groups in project management, as outlined by the PMBOK's Guide. This process group involves establishing the total scope of the project, creating a roadmap for success, and developing plans to ensure that the project is completed on time and within budget. The tasks involved in this process group include determining how to approach planning, finalizing requirements, creating a work breakdown structure (WBS), defining activities and sequencing them, developing baselines for scope, cost and schedule, and tracking progress. Additionally, it is important to consider all potential risks and milestones when planning a project. ProjectManager.com provides tools to help with the Planning Process Group such as organizing tasks, linking dependencies and setting milestones. Other factors that are important to consider when planning a project include collecting requirements, defining scope and creating a WBS.

The Planning Process Group is an important part of project management. It sets forth the processes needed to define the scope of the project, set strategic plans in place to maximize workflow, and begin to assemble priority lists and plan team needs. The most important factors of process planning groups include developing a project management plan, collecting requirements, defining scope, creating a work

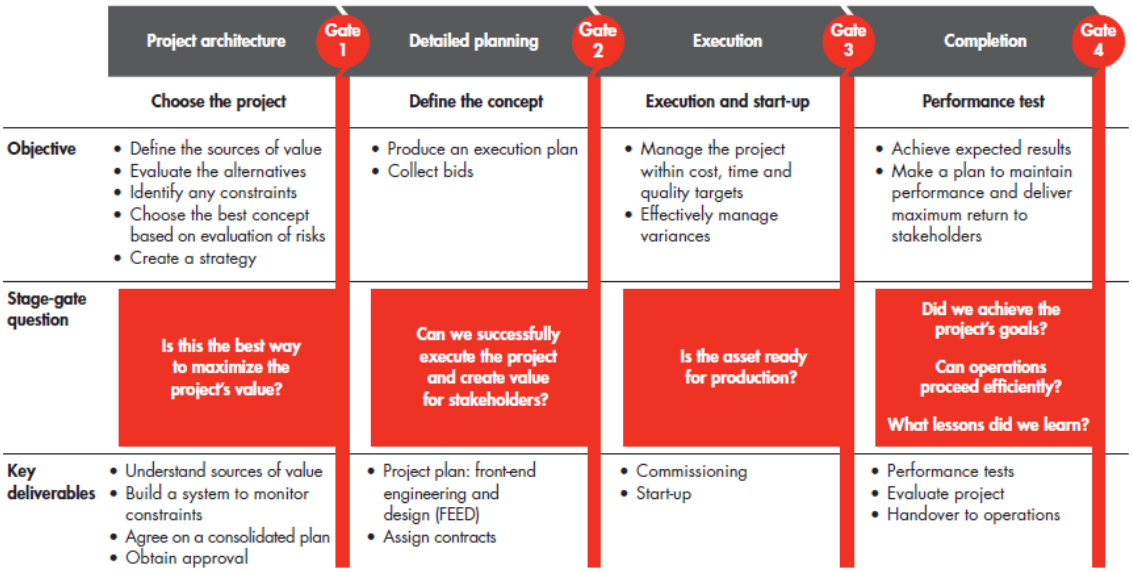
breakdown structure, defining activities, sequencing activities, and developing baselines for scope, cost and schedule. The Planning Process Group activities help to create the planning documents of the project. These activities include finalizing “how to execute & control” parts of all management plans and gaining formal approval of the plan. The project manager is responsible for leading the project planning phase and making accurate estimates on time, budget and resources. Project management software can help with PMBOK process groups by providing tools for planning, controlling costs and managing risks. Overall, the Planning Process Group is essential for successful project management as it helps to define the scope of the project and develop plans that will ensure its success.

The Planning Process Group in an oil & gas project involves tasks such as developing a Project Management Plan, planning Scope Management, collecting Requirements, defining Scope, creating a Work Breakdown Structure (WBS), and planning the Schedule. The Project Manager is responsible for leading the project planning phase and making accurate estimates on time, budget and resources. The role of the Project Owner's Representative (POC) is to oversee the project and ensure it will be done within budget, on schedule and meet the functional and quality requirements. Procurement involves a series of activities and processes by the purchase or procurement team.

The oil and gas project planning process involves 12 major stages. These stages include creating and analyzing a business case, identifying and meeting stakeholders for approval, setting project goals and objectives, determining project deliverables, creating a project schedule and milestones, conducting feasibility assessments such as scheduling feasibility and PFD (Process Flow Diagram), developing the project design basis with Pre-FEED (Front End Engineering Design), engineering deliverables such as preliminary plot plan, P&ID (Piping and Instrumentation

Diagram) General Arrangements Drawings for main equipment and main pipework, Project Execution Plan, HSE Plan Review of P&ID, procurement of resources, managing human and labor relations to ensure adherence to quality.

Figure: Typical phases and stage gates of a major oil and gas infrastructure project



Source: Bain & Company

5

Planning Process Group

The Planning Process Group in oil and gas projects consists of 24 processes, including Develop Project Management Plan, Plan Scope Management, Collect Requirements, Plan Procurement Management, and Sequence Activities. These processes are part of the five process groups (Initiating, Planning, Executing, Monitoring and Control, and Closing) that are used to manage oil and gas projects. The Planning Process Group is responsible for establishing the total scope of the project, defining and refining objectives, developing a course of action to attain those objectives, and creating a Project Management Plan. This plan includes a cost management plan, process improvement plan, and other documents that may need to be updated if changes occur. The Planning Process Group also involves activities such as scheduling feasibility studies, preparing PFDs (Process Flow Diagrams), Pre-FEED development, Project Execution Plans, HSE Plans (Health Safety Environment), reviews of P&IDs (Piping & Instrumentation Diagrams), workflow management plans, procurement processes and budget allocation evaluations. After these activities have been completed, the Sunoco IT Project Process requires a final review and approval by IT management before the project can proceed to the next phase. Pre-commissioning & commissioning is then executed by the contractor and operator of the plant.


PMBOK Knowledge Areas
Project Integration Management
Project Scope Management
Project Time Management
Project Cost Management
Project Quality Management
Project H R Management
Project Communications Management
Project Risk Management
Project Procurement Management
Project Stakeholders Management

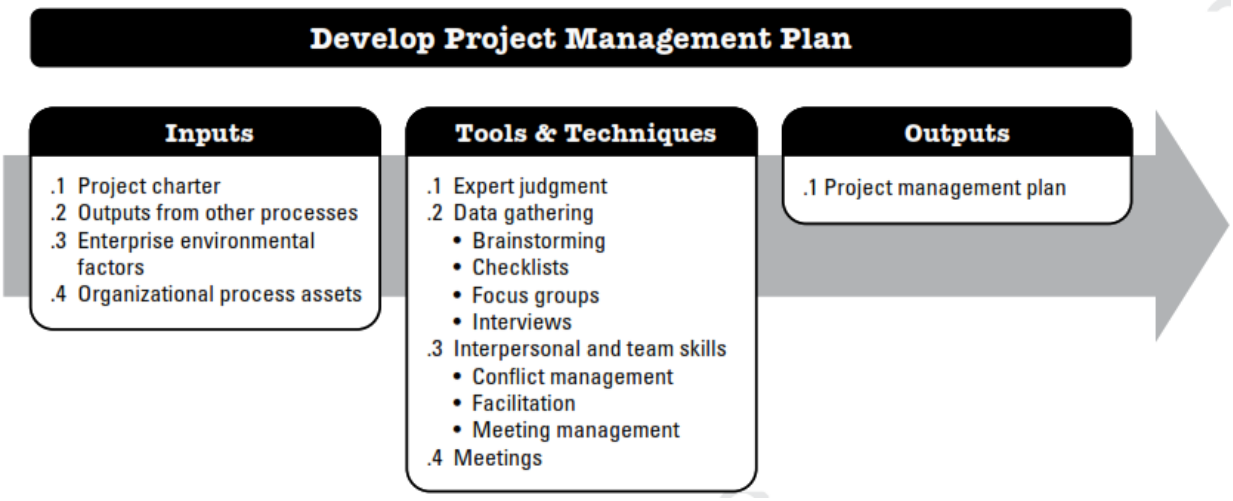
The Planning Process Group has processes from each knowledge area.

1. Develop Project Management Plan ⇒ Project Integration Management
2. Plan Scope Management ⇒ Project Scope Management
3. Collect Requirements ⇒ Project Scope Management
4. Define Scope ⇒ Project Scope Management
5. Create WBS ⇒ Project Scope Management
6. Plan Schedule Management ⇒ Project Schedule Management
7. Define Activities ⇒ Project Schedule Management
8. Sequence Activities ⇒ Project Schedule Management
9. Estimate Activity Durations ⇒ Project Schedule Management
10. Develop Schedule ⇒ Project Schedule Management
11. Plan Cost Management ⇒ Project Cost Management
12. Estimate Costs ⇒ Project Cost Management
13. Determine Budget ⇒ Project Cost Management
14. Plan Quality Management ⇒ Project Quality Management
15. Plan Resource Management ⇒ Project Resource Management
16. Estimate Activity Resources⇒ Project Resource Management
17. Plan Communications Management ⇒ Project Communication Management
18. Plan Risk Management ⇒ Project Risk Management
19. Identify Risks ⇒ Project Risk Management
20. Perform Qualitative Risk Analysis ⇒ Project Risk Management
21. Perform Quantitative Risk Analysis ⇒ Project Risk Management
22. Plan Risk Responses ⇒ Project Risk Management
23. Plan Procurement Management ⇒ Project Procurement Management
24. Plan Stakeholder Engagement ⇒ Project Stakeholder Management

1) Develop Project Management Plan ⇒ Project Integration Management

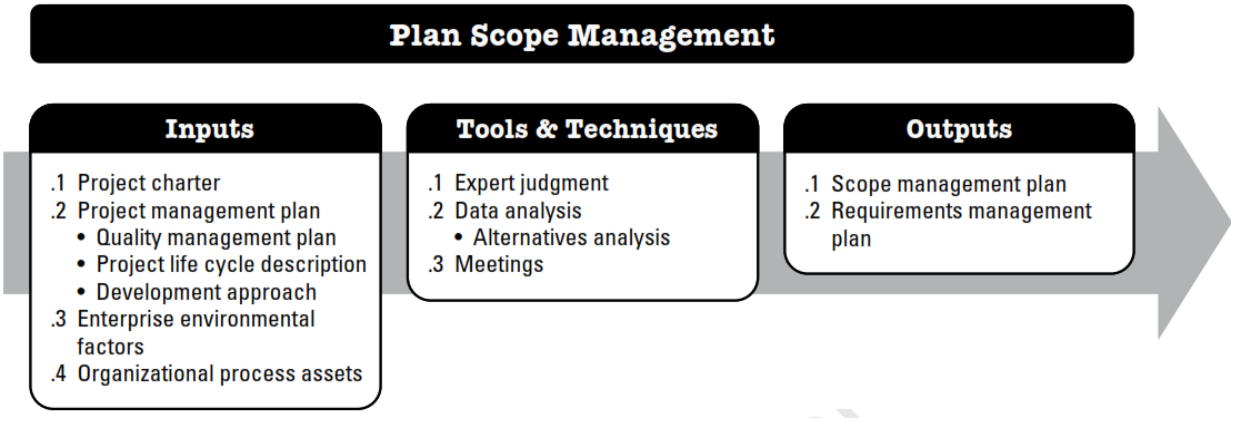
A project management plan is a comprehensive document that defines the basis of all project work and how the work will be performed. It should include key stakeholders, roles, and a kick-off meeting. The steps to develop a project management plan include collecting requirements from key stakeholders, defining the scope of the project, creating a work breakdown structure, and sharing an initial idea with the team. The plan should also document the actions required to define, prepare, integrate and coordinate various planning activities.

Oil and gas construction projects include production facilities, liquefaction plants, refineries, pipelines, and storage tanks. The oil and gas industry are facing increasing demands to clarify the implications of energy transitions for their operations and business models. The current oil and gas project management approach focuses on the critical path and increasingly detailed planning.



2) Plan Scope Management ⇒ Project Scope Management

Project scope management is the process of identifying and defining what actions are required to deliver a project's requirements. It involves taking a variety of inputs and using various tools and techniques to generate outputs that will guide the process. The scope management plan outlines the processes involved in executing a project and serves as a guideline to keep the project within specific limits. It is primarily concerned with defining, validating, and controlling the scope of a project. The purpose of a scope management plan is to create project structure by documenting the resources required to achieve the project objectives. It also helps prevent scope creep by planning against it. The steps for creating a scope management plan include developing your skills, defining the project's objectives, analyzing variance, and monitoring progress. Project scope management is important because it helps avoid challenges that project might face such as cost overruns or missed deadlines.

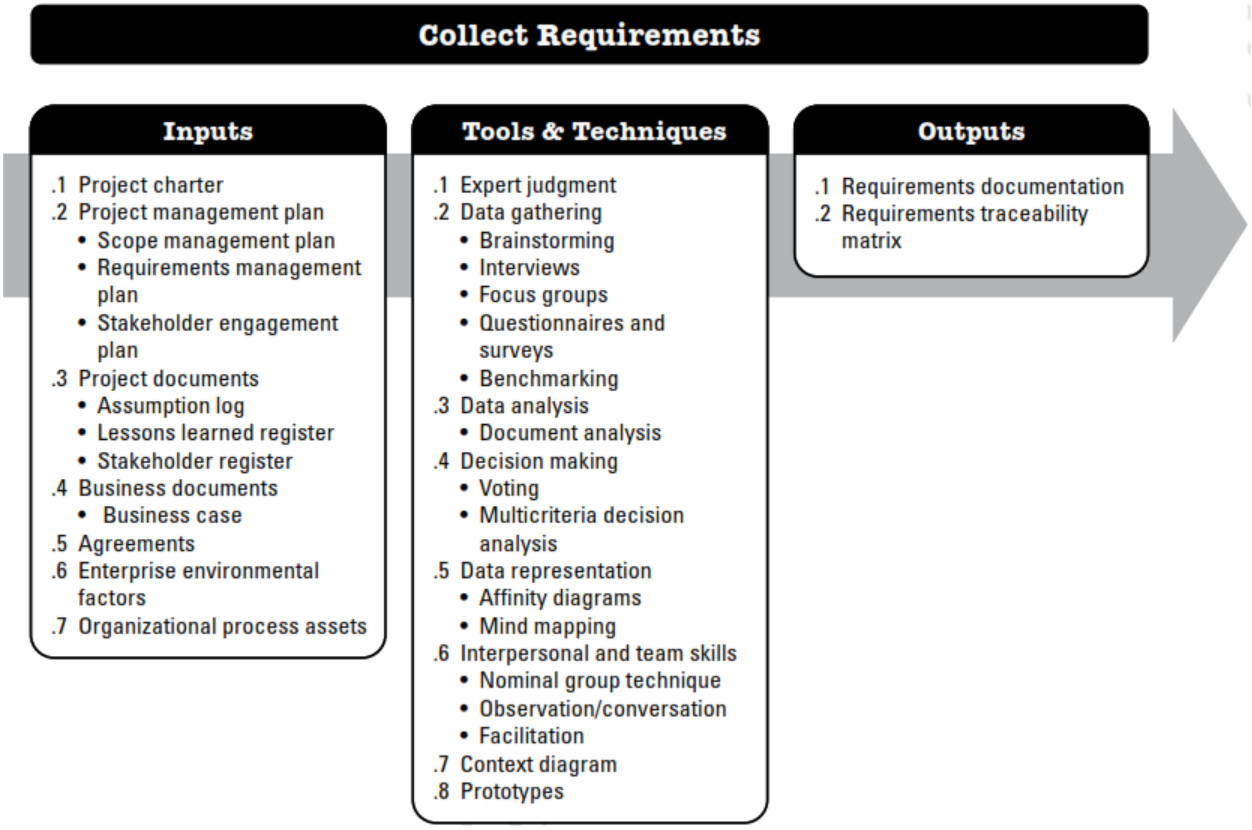


Plan scope management in oil and gas projects involves creating an engineering execution plan that is in line with the overall project execution plan. This includes drafting a work breakdown that is specific, measurable, attainable, realistic and

constructible. Project management in the oil and gas industry also involves coordinating many people and resources to finish a specific task within a set time frame and budget without sacrificing quality. Successful project management in the oil and gas industry requires an integrated project team with clear roles and responsibilities, as well as a shared interest in the project's objectives to ensure accountability. Companies must also continuously improve their general project management skills, as well as skills specific to oil and gas. Additionally, leading oil and gas companies revise their stage-gate frameworks to align them with evolving market conditions.

3) Collect Requirements ⇒ Project Scope Management

Collecting requirements is an important process in project management that involves identifying, documenting, and controlling changes to the project requirements. This process helps to define the scope of the project during scope management. There are various tools and techniques used for collecting requirements, such as brainstorming, nominal group technique, Delphi technique, questionnaires and surveys, observation, prototypes, group decision making, benchmarking, context diagrams, interviews and focus groups. Collecting requirements is important because it helps to ensure that all stakeholders' needs are met and that the project meets its objectives. The biggest challenges with collecting requirements include identifying all stakeholders involved in the project and ensuring that their needs are accurately documented. Requirements can be divided into three categories: business requirements; stakeholder requirements; and product/transition/quality requirements. It is also important to update requirements regularly as they may change over time due to external factors or new information being discovered.

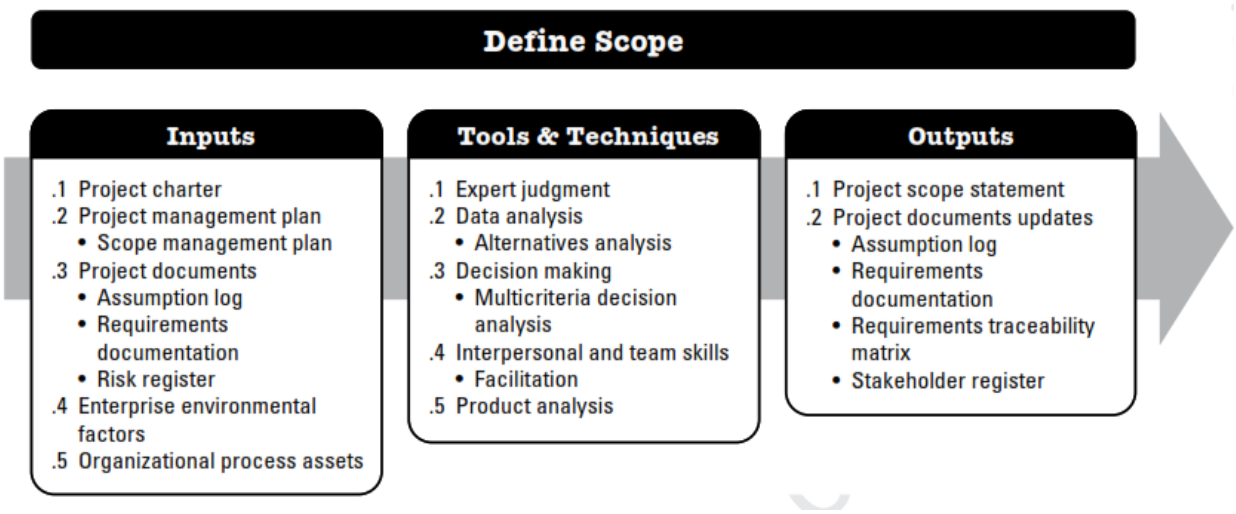


To collect requirements for oil and gas projects, project managers must understand the relevant rules and regulations, local content requirements, and technological demands. They should also have knowledge of chemicals to understand the process of extraction, as well as skills in project management such as mobilizing teams, executing projects, managing changes, and accommodating personnel. Additionally, they should use a standardized framework for capturing and storing data to get the most out of project data. Finally, they should be familiar with the process of requirements gathering in project management.

4) Define Scope ⇒ Project Scope Management

Scope is a term used in project management, consulting, and other business contexts to refer to the combined objectives and requirements needed to complete a project.

It can also refer to the range of activities or interests that can be anticipated, or the opportunity for doing something. Scope is often used to define the boundaries of a project, task, or action, and it can also be used to describe the extent of an individual's responsibilities. Additionally, scope can refer to an instrument used for viewing distant objects such as a telescope mounted on a firearm for use as a sight.

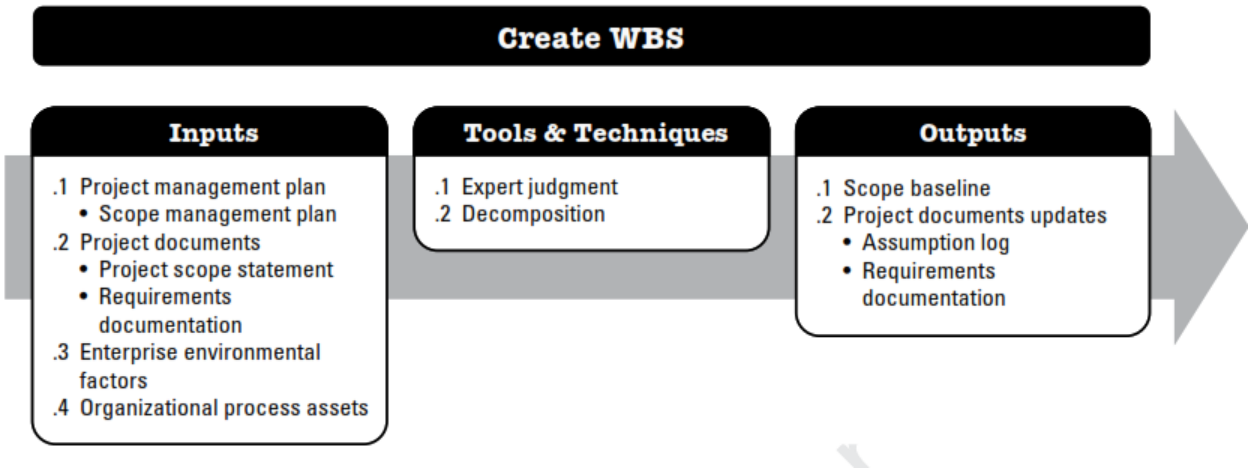


In the oil and gas industry, project scope is an aspect of project planning that delineates all of a project's tasks and deliverables, deadlines, and costs. It is important to define the scope of a project early on in order to ensure success. A project scope statement, also called a scope of work (SOW), documents key details of a project's constraints. The steps involved in Scope management as per Project management Institute (PMI) are as follows: Plan Scope Management, Define Scope, Verify Scope with Client, Monitor and Control the Project Scope. The sequence for project scope definition and management typically follows the structure detailed below: Define the project scope, Verify the Project Scope with the Client, Monitor and Control the Project Scope. The primary objective of an oil and gas project is to complete the job as planned and within the allocated budget. The phases of project

management in the oil and gas industry are as follows: Systematic Execution Phase, Efficient Management of Oil and Gas Projects.

5) Create WBS ⇒ Project Scope Management

A Work Breakdown Structure (WBS) is a visual tool used in project management to break down a project or objective into smaller, more manageable components. It is used to plan, manage, and evaluate large projects by breaking them down into smaller tasks and subtasks. A WBS can capture all the moving pieces of a large commercial project, including those of vendors and subcontractors. Creating a WBS involves defining level one, the main deliverable of the project, and then adding as much detail as possible to level two before moving to smaller chunks of work in level three and beyond. Tools such as Microsoft Office or templates can be used to create a WBS chart. Benefits of creating a WBS include having a clear understanding of what the project is expected to deliver, create or change. A good WBS must be complete and specific in order for it to enable you to move directly into project planning.

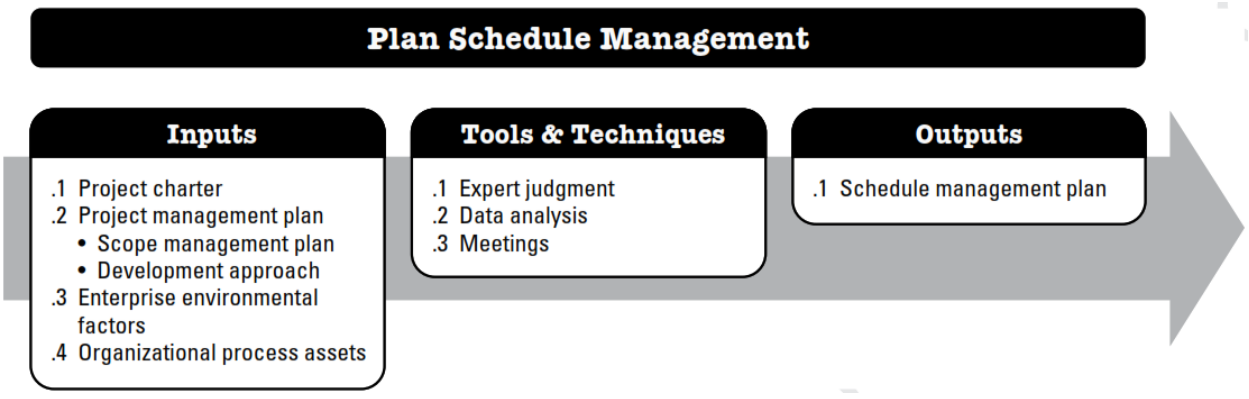


To create a Work Breakdown Structure (WBS) for oil and gas projects, it is important to consider the project scope and the potential regions in which the

development will be executed. A typical WBS for an onshore project includes cost estimates, unit rates, and cost analysis. It is also important to consider the inputs from the project team when creating a WBS. For example, a petrochemical plant revamp project scope could include design and engineering, bulk materials, pre-construction work, fabrication work, equipment work, instrumentation work, insulation work, and more. The WBS can be broken down into reasonable and controllable levels that meet project requirements. Project data such as planned costs, earned costs, and forecasted costs should be monitored and controlled by assigning each task to a specific individual or team. This will help ensure that all tasks are completed on time and within budget.

6) Plan Schedule Management ⇒ Project Schedule Management

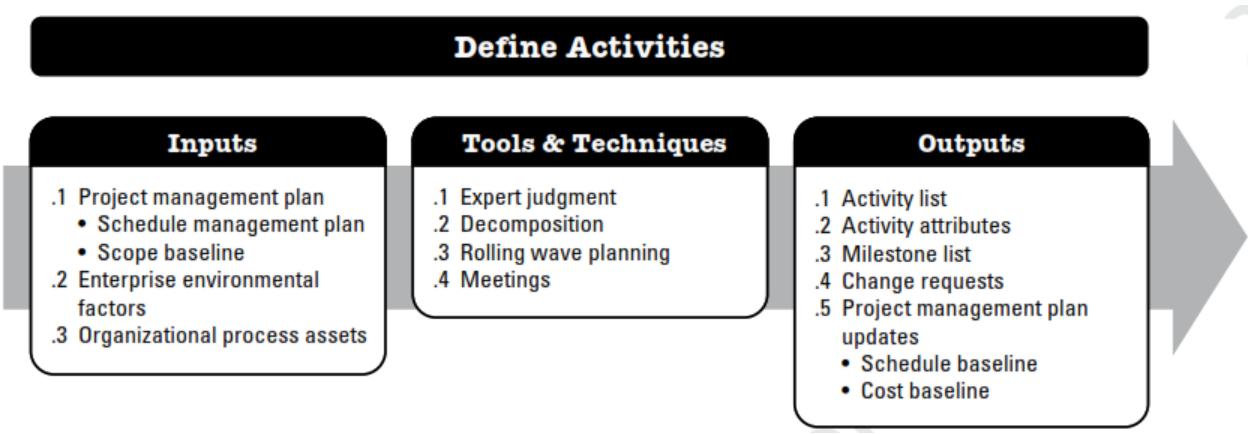
A schedule management plan is a document that details how a project's schedule will be created, managed, and monitored. It typically includes items such as the start and end dates of activities and tasks by time factors, policies, procedures, and documentation for planning, developing, managing, and monitoring the schedule, and how to make and maintain one.



Project management in the oil and gas industry involves coordinating many people and resources to finish a specific task within a set time frame and budget without sacrificing quality. The primary objective of an oil and gas project is to complete the job as planned and within the allocated budget. To achieve this, project managers need a solid consumer base and open lines of contact, as well as knowledge of the lifecycle of projects such as planning, execution, monitoring, closure, and evaluation. Additionally, they must be aware of common problems that can arise during the course of a project such as scope creep or cost overruns. Finally, effective risk management strategies are essential for successful completion of oil and gas projects. These include using Bayesian belief networks to quantify schedule risk, creating a design schedule milestone management plan, managing drawing status through simulation analyses, improving productivity by using tools such as Gantt charts, and understanding how to manage risks effectively.

7) Define Activities ⇒ Project Schedule Management

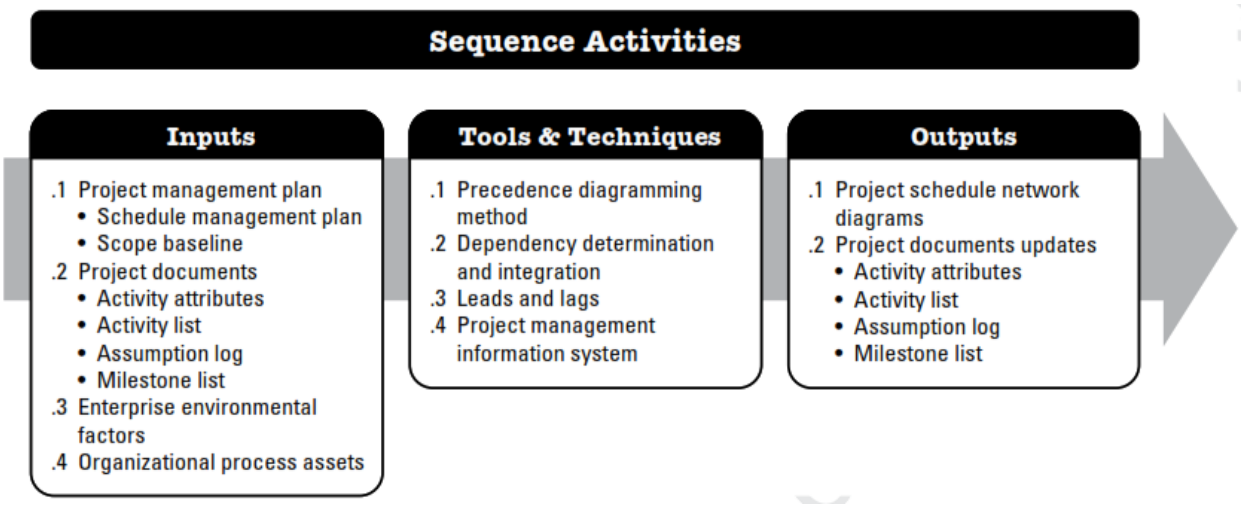
Define Activities is the process of identifying and documenting the specific actions to be performed to produce project deliverables. It involves creating an activity list, which sets out tasks that need to be carried out in order to reach the project goals and objectives. The key benefit of this process is that it decomposes work packages or milestones into small scheduled activities that offer a good basis for estimating, scheduling, and resource allocation. When defining activities, it is crucial not to break down the work package into very small and specific activities as it can lead to increased management overhead that will result to more costs.



Activities in the oil and gas projects include surface reconnaissance and exploration, as well as exploration, appraisal, extraction and abandonment activities. These activities involve locating potential sites for drilling and extraction, creating geological surveys and obtaining land rights, producing hydrocarbons from underground sources such as natural gas or crude oil, transporting them to market through pipelines or other means of transportation, and disposing of any remaining hydrocarbons safely. The life cycle of an oil and gas project involves several steps including pre-exploration, production, development, midstream operations, downstream operations, marketing and sales, disposal, and revenue generation.

8) Sequence Activities ⇒ Project Schedule Management

Sequence activities is the process of identifying and documenting relationships among project activities. It involves creating a network diagram to visualize the interrelationships between activities, such as start-to-start (SS), finish-to-finish (FF) and start-to-finish (SF) relationships. The sequence activities process can be performed by using Project Management software or manual procedures, with best practices including considering all stakeholders involved in the project when sequencing activities.

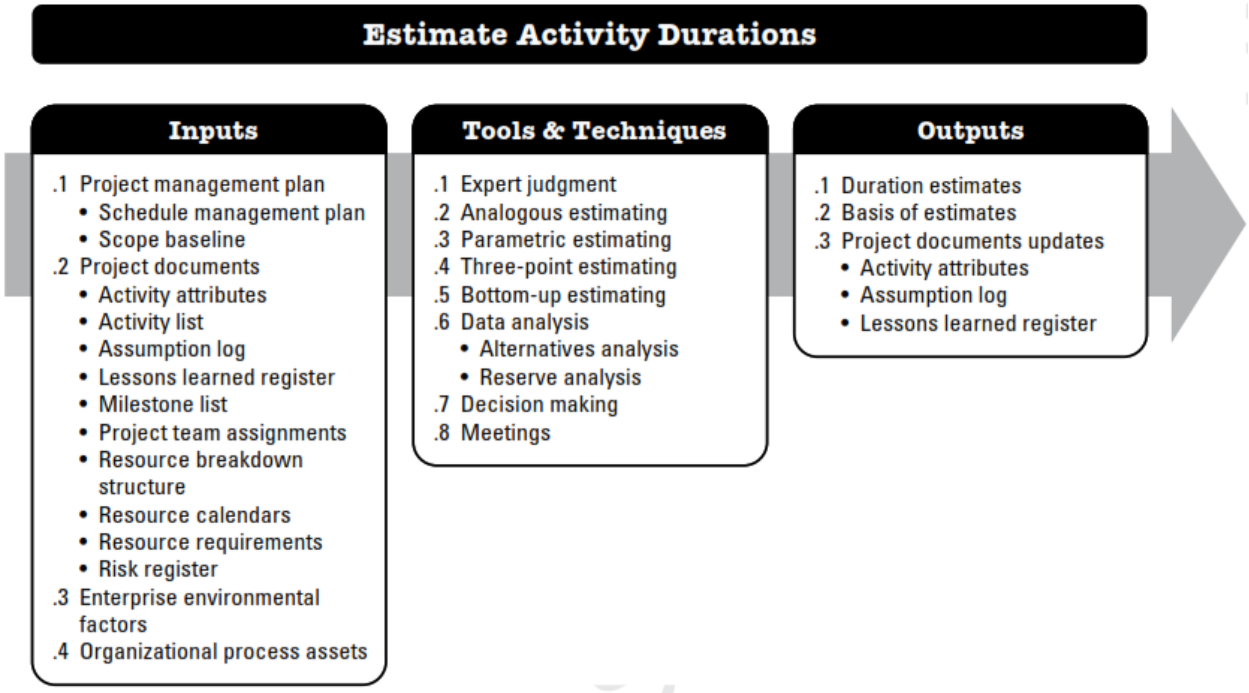


Sequencing activities in oil and gas projects involves several steps, such as scheduling feasibility, engineering deliverables of pre-FEED stage general arrangements drawings for main equipment and main pipework, project execution plan, HSE plan, procurement, mechanical completion, hydrotesting/leakage testing of pipelines, flushing & cleaning of pipelines, system dry-out, inverting and systematic testing of the pipeline's integrity. It is important to keep all relevant information top of mind when sequencing activities in order to ensure that they are completed efficiently. Additionally, it is beneficial to use tools such as Activity Sequence Diagrams (ASD) or Gantt charts to help visualize the sequence of tasks involved in a project.

9) Estimate Activity Durations ⇒ Project Schedule Management

Estimate Activity Durations is a process of the Project Schedule Management knowledge area according to PMI's Guide to the Project Management Body of Knowledge. This process involves estimating the number of work periods needed to complete individual activities with available resources. The main output of this process is a set of duration estimates for each task, which are statements about

how long a task will take. These estimates are used to create a project schedule and determine the total duration of a project. Activity duration estimates can be in the form of different time periods, such as hours, days, weeks or months, and usually refer to work or business periods. Estimating activity durations is an important part of project management as it helps project managers plan and manage their projects more effectively.

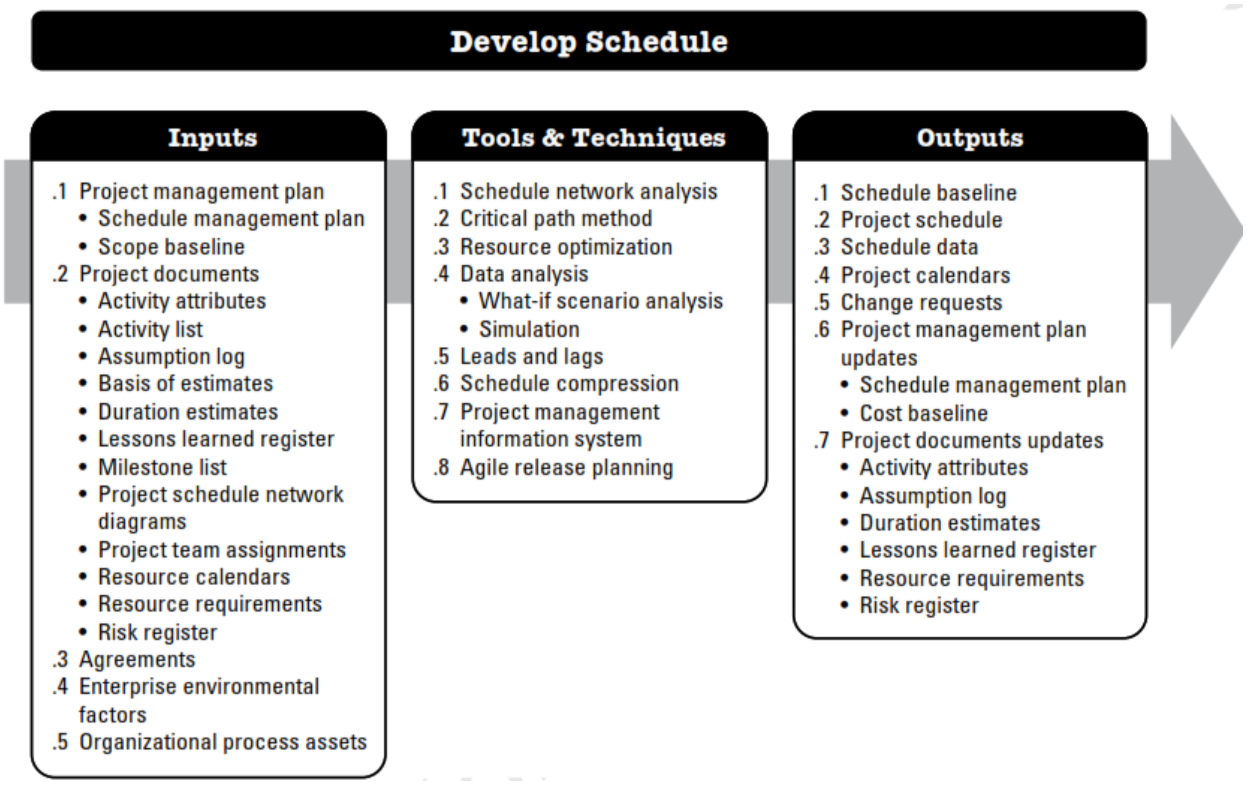


Estimating activity durations in oil and gas projects is a complex process that requires various inputs and tools. There are six main tools used to estimate activity duration, including Expert Judgment, Analogous Estimating, and Parametric Estimating. Additionally, a statistical method for estimating activity uncertainty parameters can be used to improve project forecasting. Short duration measurements can also be used to estimate methane emissions from oil and gas production sites. Project duration can also be estimated using most likely values

from historical data or the formula (O + 4M + P) / 6. Finally, actual productivity rates from completed projects can be recalled to estimate new project tasks duration.

10) Develop Schedule ⇒ Project Schedule Management

Developing a project schedule is an important part of project management and involves analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model. This process is iterative and can occur multiple times throughout the project life cycle. The inputs for the Develop Schedule process include activity sequences, durations, resource requirements, and schedule constraints. The outputs of this process are a schedule model with planned dates for completing activities, a schedule baseline, a project schedule, and other related documents. Tools used in the Develop Schedule process include the Schedule Network Analysis, Critical Path Method (CPM), Critical Chain Method (CCM), Resource Leveling Heuristics (RLH), Resource Optimization Techniques (ROT), Monte Carlo Analysis (MCA), Program Evaluation Review Technique (PERT) Charts, Gantt Charts, and Earned Value Management (EVM). Project managers can use various software tools to help them develop an efficient project schedule. These tools provide features such as calendaring and resource management to assign personnel with the right skills and schedules to current and future projects. They also allow managers to view all projects and tasks assigned to team members while creating project roadmaps with set due dates, milestones and deliverables. Popular PM software for Schedule Management include Asana, Microsoft Project Manager, Wrike, Trello and Smartsheet.

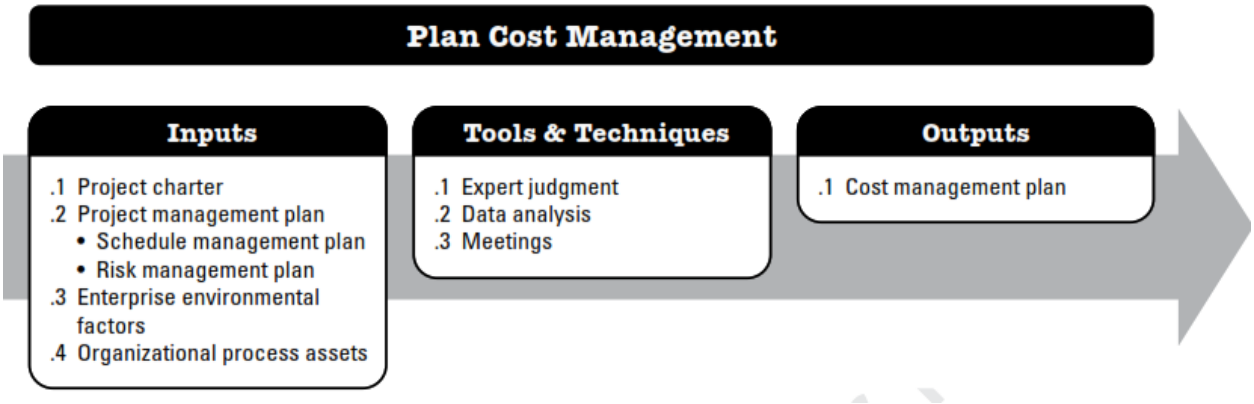


Developing a schedule for oil and gas projects requires careful planning and management. The process involves 12 major stages, including concept development/conceptual design, economic feasibility, scheduling feasibility, preliminary plot plan, P&ID (Piping and Instrumentation Diagram), general arrangements drawings for main equipment and main pipework, project execution plan, HSE plan, detailed engineering, procurement of materials and services, pre-commissioning & commissioning, construction phase, startup phase, operation phase and decommissioning phase. To ensure successful completion of the project it is important to develop an optimal schedule that takes into account factors such as drilling schedule, rig allocation, facilities acquisition, number and location of wells, rate of production decline, water and/or gas, cash flow function interaction with other parameters, limited resources and potential risk events typical in an Oil

& Gas industry. Additionally, software can be used to help manage these complex projects by providing real-time updates on progress and cost savings opportunities.

11) Plan Cost Management ⇒ Project Cost Management

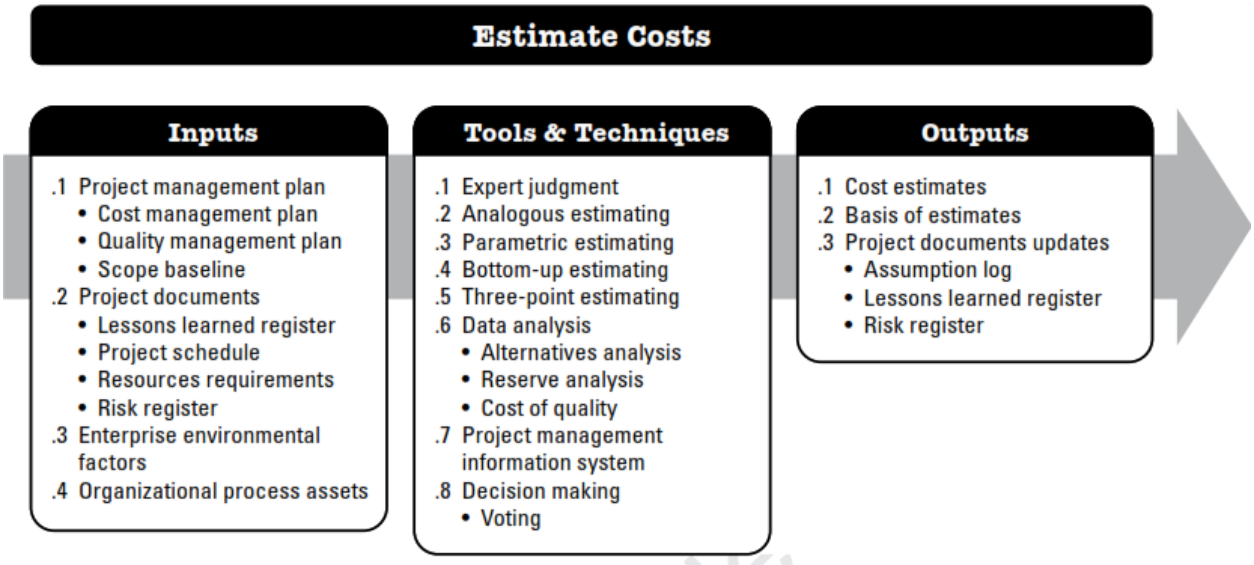
A cost management plan is a document that helps project managers map and control a budget. It includes all the costs associated with the project, including direct and indirect costs, as well as strategies for managing them throughout the life cycle of the project. The process involves four steps: planning, budgeting, and controlling costs, which can be done using templates or software. Benefits of creating a cost management plan include improved communication between stakeholders, better decision-making capabilities, increased efficiency in resource allocation, and reduced risk of overruns.



Project cost management is an important process for oil and gas projects, as it helps to keep expenditures within approved budget. It involves four steps: estimating costs, budgeting, controlling costs and monitoring performance.

12) Estimate Costs ⇒ Project Cost Management

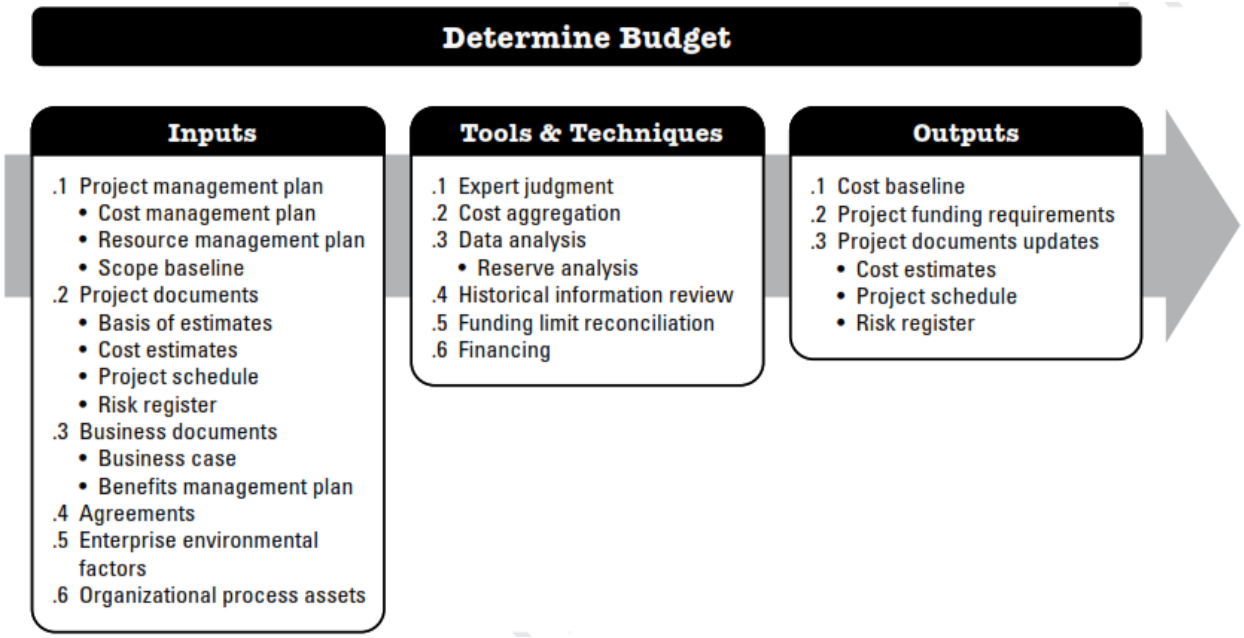
Estimating the cost of a project is an important process in project management as it is the basis for determining and controlling the project budget. Cost estimation involves forecasting the financial and other resources needed to complete a project within a defined scope. This includes taking into account direct costs, indirect costs, and other factors such as labor rates and materials. Project managers use various tools and techniques to estimate the cost of a project. These include meetings with stakeholders, work breakdown structures, parametric models, analogous estimating, bottom-up estimating, three-point estimates, reserve analysis, and expert judgment. The U.S. government has identified a 12-step process that results in reliable and valid cost estimates for project management. Estimating costs accurately is essential for successful project management as it helps ensure that projects are completed within their approved budgets.



Estimating the cost of oil and gas projects is a complex process that requires taking into account a variety of variables such as the tonnage of heavy machinery, production capacity, and other metrics.

13) Determine Budget ⇒ Project Cost Management

The process of determining the budget for a project is an activity of aggregating the cost estimates of individual activities or work packages to develop the total cost estimate and set a cost baseline. This involves using inputs such as the cost management plan, scope baseline, activity costs estimate, and risk register. The project budget is the sum of all task estimates plus the management reserve, while the cost baseline is the time-phased expenditure of project funds. Project Cost Management is a process that involves formally identifying, approving and paying for costs or expenses incurred on a project. It also includes creating a budget to make better decisions regarding different constraints like time, scope and cost so that they can complete the project while satisfying stakeholders' needs and expectations.



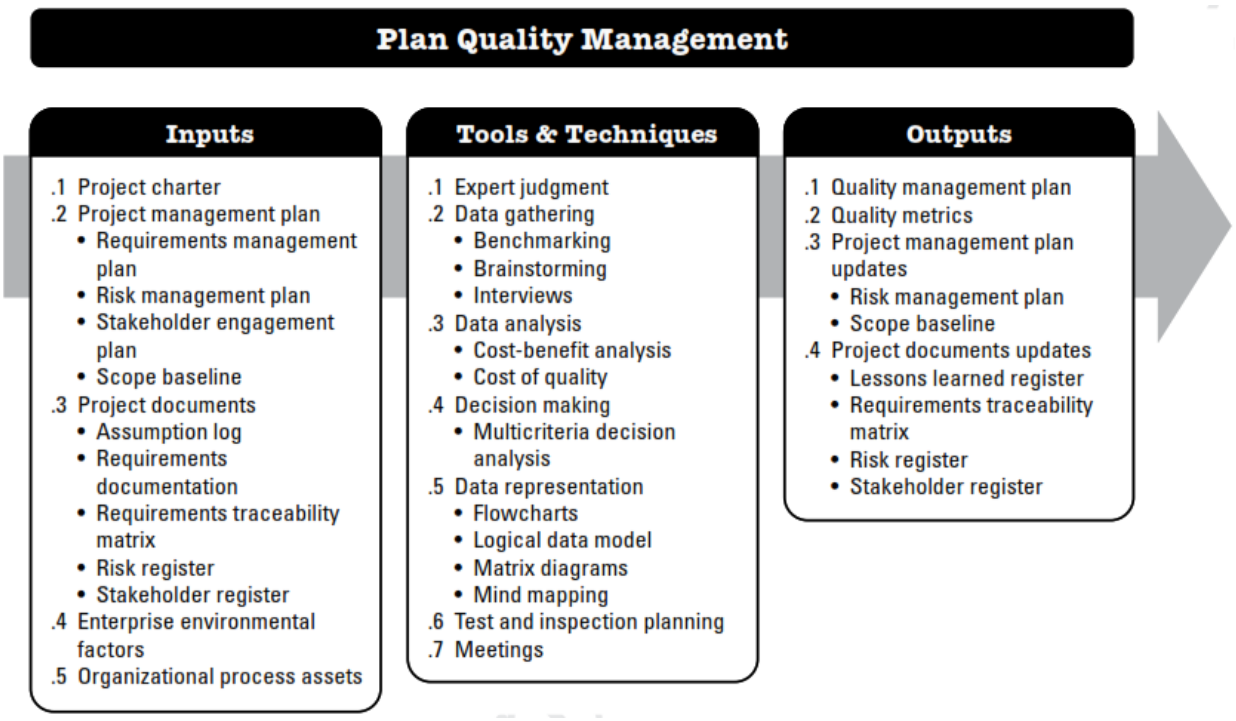
The capital cost of a project in the oil and gas industry is the total expenditure, or 'capex', incurred by a company to achieve the forecasted benefits of undertaking that project. This capex estimate can range from conception to completion and can change dramatically as the project progresses. The capex estimate is typically produced based on factors such as the tonnage of heavy machinery, operational costs, capital investments, labor costs, and market fluctuations.

A project's capital expenditures (CAPEX) is one of the major cashflows used to calculate net present value (along with e.g. operational expenditures (OPEX) and income). The CAPEX is developed through a cost estimate, very often by a company's internal cost estimation department.

14) Plan Quality Management ⇒ Project Quality Management

Project Quality Management is the process of identifying the quality of the requirements and standards of a project, as well as the deliverables, in order to ensure that quality is maintained throughout the project's lifecycle. It involves

three main processes: Quality Planning, Quality Assurance, and Quality Control. Quality Planning involves defining quality policies and procedures relevant to the project, such as setting up a Quality Management Plan (QMP) which documents how quality will be managed throughout the project's lifecycle. Quality Assurance involves monitoring and evaluating activities to ensure that they meet quality standards, while Quality Control involves verifying that deliverable meet specified requirements. Creating a Quality Management Plan (QMP) is an important step in Project Quality Management. It should include details such as what quality means for the project, how it will be managed and validated throughout all parts of the project, and who is responsible for ensuring quality. The QMP should also take into account other planning processes such as schedule and cost adjustments or risk management plans.

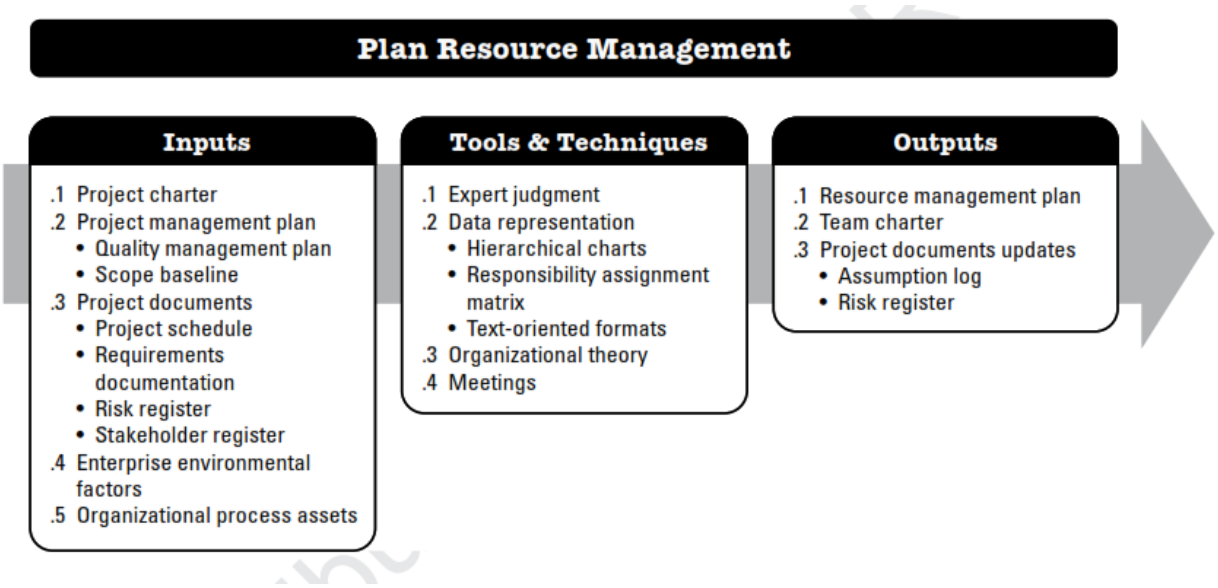


Quality management in oil and gas projects involves the use of quality tools such as charts, check sheets, diagrams, graphs, techniques, and methods to create ideas,

plan activities, analyze causes, and improve processes. It also requires the implementation of Total Quality Management systems to ensure successful completion of onshore/offshore construction projects. Additionally, books such as Quality Management in Oil and Gas Projects provide tools and techniques, management principles, procedures, concepts, and methods to ensure successful completion of oil and gas projects.

15) Plan Resource Management ⇒ Project Resource Management

A resource management plan is a component of the project management plan that describes how project resources are acquired, allocated, monitored, and controlled. It is used to optimize the availability of resources to efficiently meet project goals. The 6 processes in this knowledge area are: Plan Resource Management, Estimate Activity Resources, Acquire Resources, Develop Team, Manage Team, and Control Resources. Creating a resource management plan is beneficial for the successful management of a project as it can help foresee potential roadblocks and ensure that resources are available when needed. It also helps to become familiar with key terms associated with resource management planning such as RACI Matrix and Project Organization Chart.

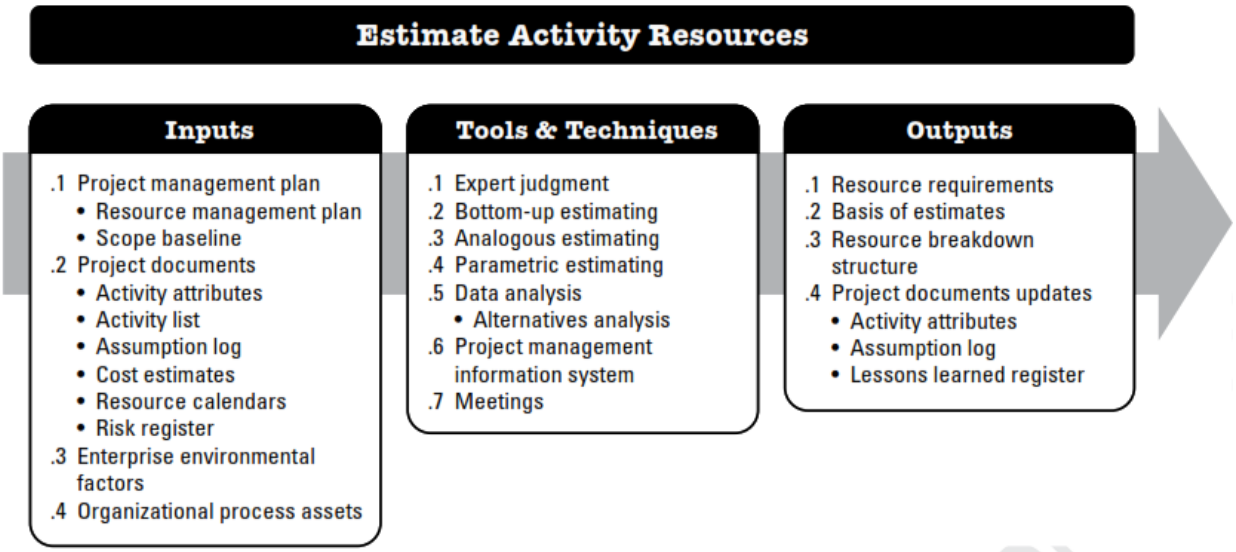


Effective resource management is essential for successful oil and gas projects. The lifecycle of an oil and gas project begins with careful planning, which includes coordinating many people and resources to finish a specific task within a set time frame and budget without sacrificing quality. To ensure success, the project management needs a solid consumer base and open lines of communication. Project management in the oil and gas sector requires the use of basic tools such as network planning, task estimation, problem management, etc. These tools help ensure that projects are completed on time under budget while meeting strict regulations and standards.

16) Estimate Activity Resources⇒ Project Resource Management

Estimate Activity Resources is a process in project management where the type and quantity of resources needed to complete an activity are determined. These resources can include labor, materials, facilities, equipment, and supplies. The Estimate Activity Resources process is part of the Time Management knowledge area and is undertaken in parallel with the Estimate Costs process. The inputs used

for this process include the project management plan, which contains the resource management plan and scope baseline, as well as the activity list. The outputs from this process are alternatives analysis and a resource breakdown structure. An example of Estimate Activity Resources is an event's organizer using a bottom-up estimating technique based on a detailed WBS for a large corporate event. This would involve determining the resource requirements for each activity in order to estimate activity durations and costs.

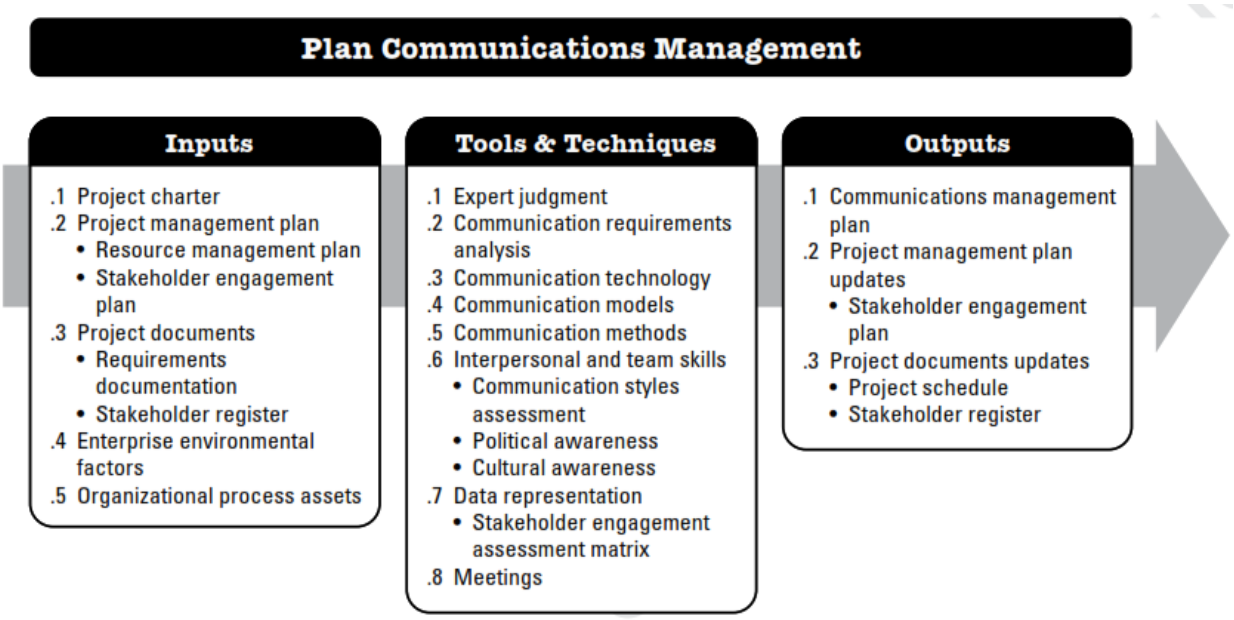


Estimate Activity Resources is a process in project management that helps the project team assess the nature and quantity of materials, human resources, tools, and supplies needed to complete a project. This process can be done using expert judgment, bottom-up estimation, parametric estimation, or other methods. In the oil and gas industry, estimating resources involves assessing potential volumes of undiscovered hydrocarbons. This requires an analysis of geologic risks to determine if any conventional oil or gas fields are present in the area. Other methods used to estimate oil and gas resources include geologic analogy, Delphi method, areal yield,

and volumetric yield variations. It is important to acknowledge the risks associated with these methods by employing ranges of values when estimating resources.

17) Plan Communications Management ⇒ Project Communication Management

The Plan Communications Management process is part of the Project Communications Management in project management. It involves developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets. To create the Plan Communications Management, necessary inputs are needed such as the project management plan, organizational process assets, and enterprise environmental factors. The steps to create a Project Management Communication Plan include choosing a format, setting a communication goal, identifying stakeholders, identifying methods of communication, determining frequency of communication. The communication activities involved in these processes may often have many potential dimensions that need to be considered such as key functions and benefits of the plan including: project communication management plan processes; plan communication management; manage communications; control communications.

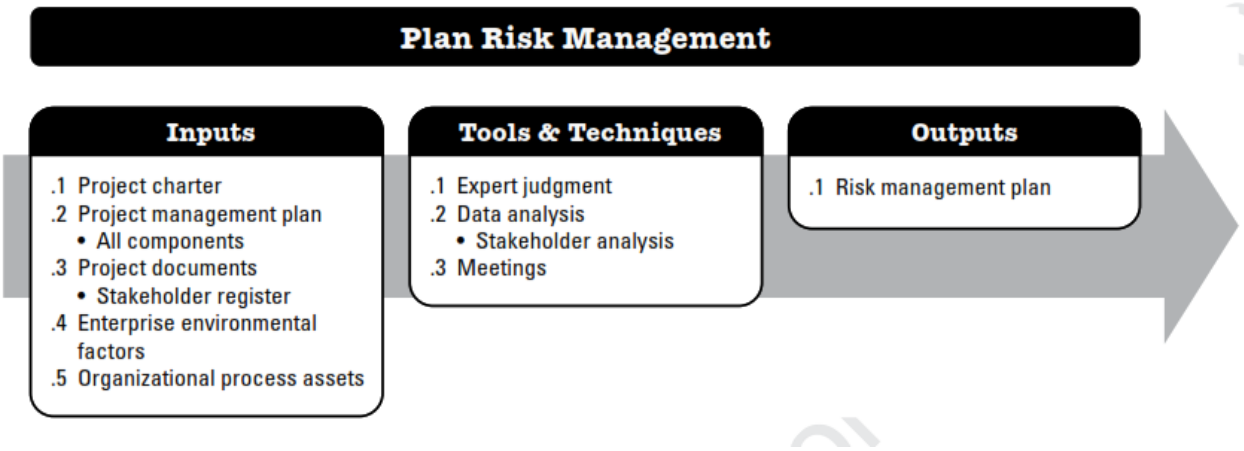


A communications management plan is essential for successful project management in the oil and gas industry. The plan should include processes for planning, managing, and monitoring communications, as well as strategies to ensure successful communication between stakeholders. Additionally, a risk communication plan should be developed to define specific actions for disseminating information regarding project objectives. The Project Management Institute (PMI) identifies three fundamental processes of project communication management: Plan Communication Management, Manage Communications, and Monitor Communications. A project communication plan example can help guide the development of a robust and realistic communication management plan. Oil and gas projects require specialized project management skillset due to their complexity and high-value investments. PMP training can provide the necessary skillset to manage onshore and offshore projects in the oil and gas industry. In addition to developing a communication management plan, it is important for oil and gas companies to have a crisis communications plan in place in case of an

emergency or unexpected event. This will help ensure that key stakeholders are informed quickly and accurately during times of crisis.

18) Plan Risk Management ⇒ Project Risk Management

A project risk management plan is a document that outlines how to identify, qualify, monitor, and control risks throughout the project life cycle. It documents who is responsible for assessing risks, how often risk planning should be done, and how to balance the investment of mitigation against the benefit for the project. The risk management plan also includes a tracking and reporting system for risk events to help analyze the efficiency of the plan and record lessons learned for future projects. Risk analysis and management is an iterative process that should be followed during each phase of the project. For each risk identified, a response must be documented in the risk register in agreement with stakeholders. Risk management not only helps in avoiding crisis situations but also aids in remembering and learning from past mistakes.

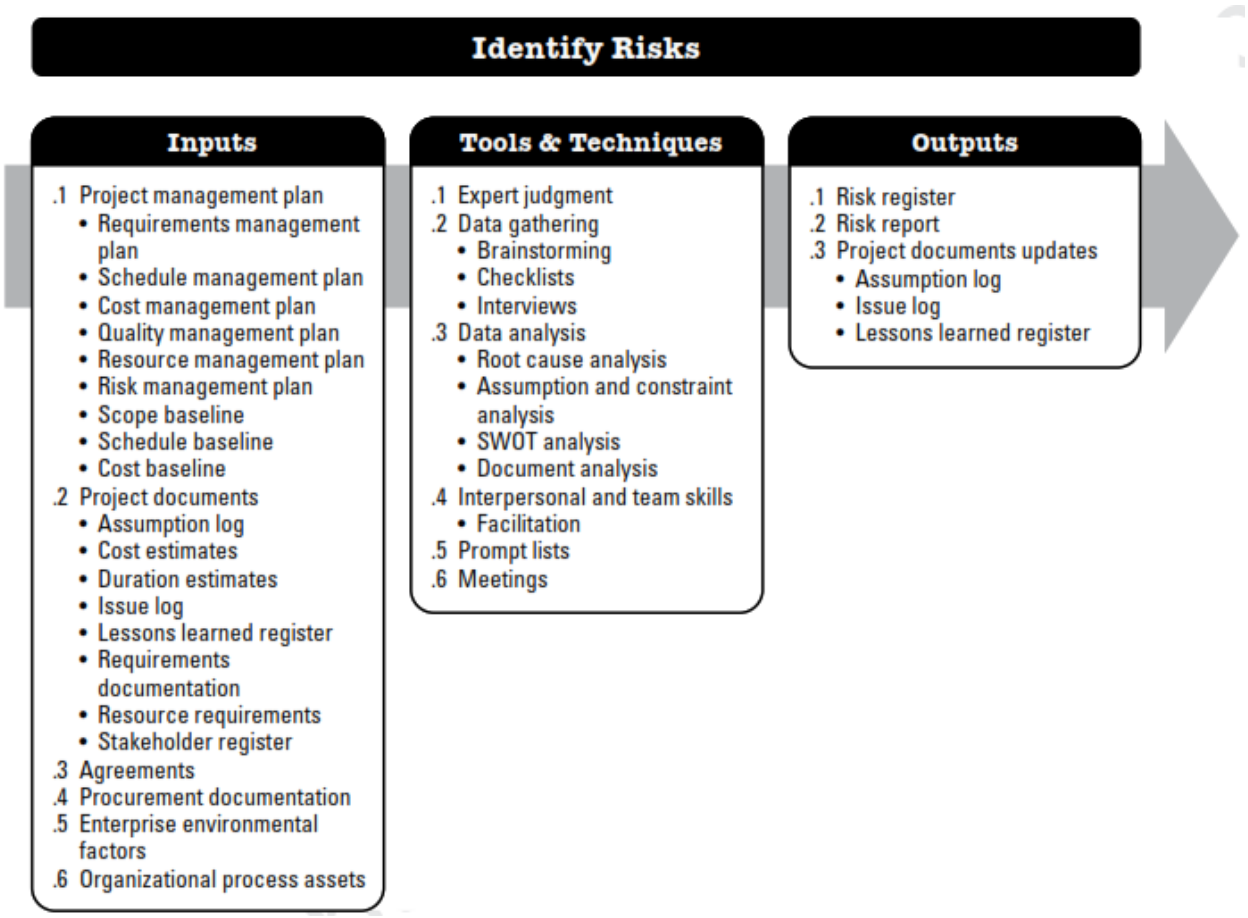


Effective risk management is essential for successful oil and gas projects. There are three main types of risk to manage in oil and gas projects: economic risk, political

risk, and environmental risk. Economic risks include cost risks, which can impact the profitability of an operation in the oil and gas industry. Political risks involve changes in regulations or policies that may affect a project's timeline or budget. Environmental risks refer to the potential impacts of a project on the environment, such as pollution or habitat destruction. Risk management plans should be tailored to each individual project and must be continually updated to meet changing demands. Risk management plans should identify critical risks that have the most potential to impact key project parameters such as cost, schedule, and resources. Additionally, it is important to consider how different risks interact with each other when developing a plan for managing them.

19) Identify Risks ⇒ Project Risk Management

Project risk management is the process of identifying, tracking, and managing potential risks that can impact the overall health and reputation of a business. Risk identification is the first step of the risk management process and involves creating a list of every possible risk associated with a project. There are numerous ways to identify risks, such as using checklists, conducting post-project reviews, engaging stakeholders, and more. It is important to identify risks early in the project as this is when the risk exposure is greatest due to high uncertainty. Once risks have been identified, they should be captured in a risk register which can be used to drive the remaining risk processes.

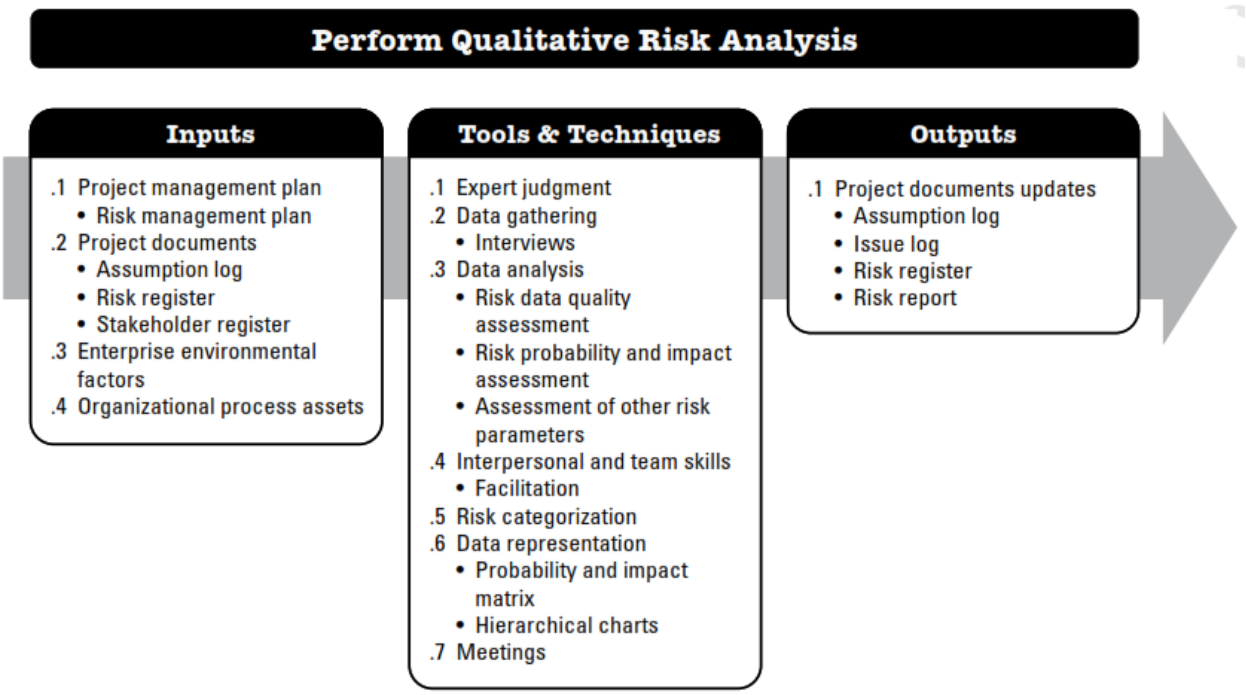


The most common project risks in the oil and gas industry revolve around five key factors: cost risk, operational risk, environment risk, budgeting risk, and regulation risk. Cost risk impacts the profitability of an operation in the oil and gas industry as skilled workers must be retained during periods of slow production and new regulations may warrant higher costs. Operational risks include accidents such as offshore explosions which can have a devastating financial impact for the company. Environment risk is one of the trickiest risks to understand in the oil and gas industry due to society's reliance on oil and gas while also being subject to movements and alternative energy sources. Budgeting risks arise due to uncertainties in the extraction processes such as drilling in unfamiliar or difficult terrains. Regulation risks involve meeting safety requirements, environmental

regulations, and other legal requirements that can be costly if not met. Technology risk is another factor that oil and gas companies face when it comes to using new technology for exploration or production processes. Construction risks are also present during the construction of oil and gas facilities such as collapsing structures, accidents, or delays. Finally, drones can reduce some of these risks by carrying out surveys, inspections, detecting defects such as leaks in remote locations more safely than traditional methods. Overall, project managers must be aware of these potential risks when managing projects in the oil and gas industry. Risk management must continually change to meet changing demands while understanding these potential costs and operational risks that correlate directly with profitability.

20) Perform Qualitative Risk Analysis ⇒ Project Risk Management

Qualitative risk analysis is an essential step in project risk management that helps prioritize risks and assign a rating based on the likelihood of a risk becoming a reality. It involves expert judgment, data gathering, and data analysis to identify potential risks and develop strategies to address them. Qualitative risk analysis is quicker than quantitative risk analysis and should be conducted during the earliest phase of project planning. It should also be revisited throughout the project as new risks may arise or existing ones may change in severity. The goal of qualitative risk analysis is to capture as many risks as possible and prioritize them according to their level of threat.

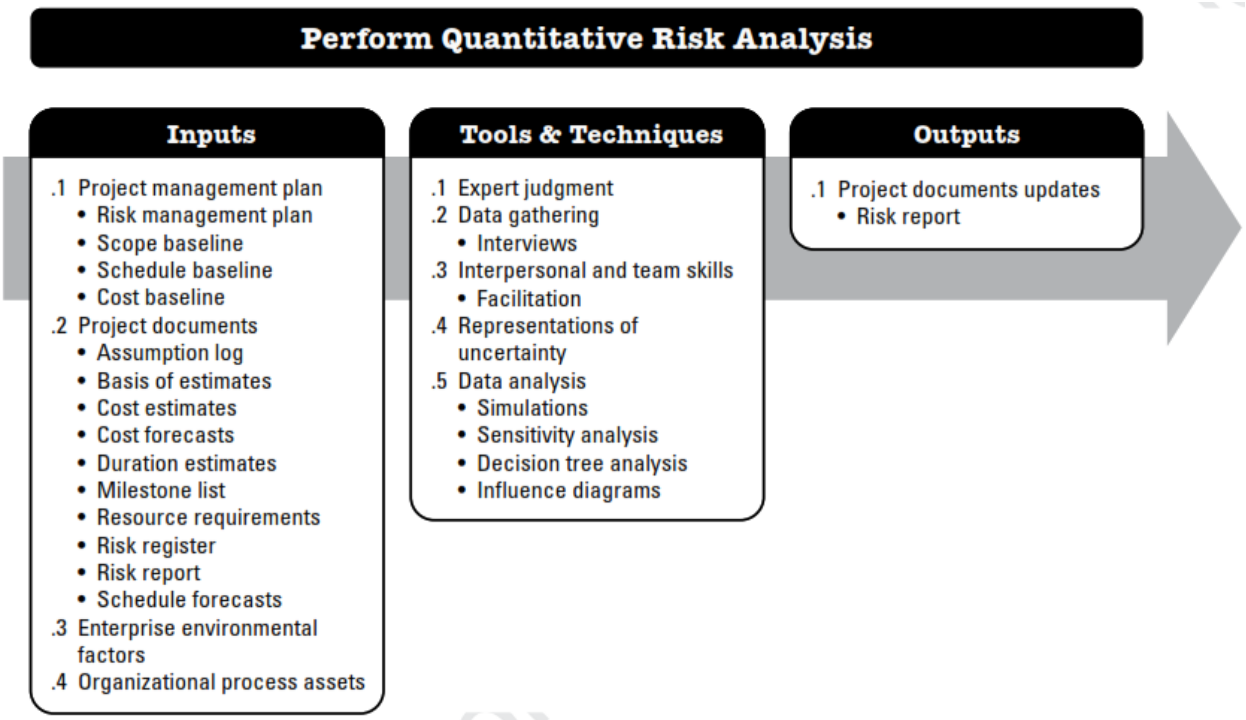


Qualitative risk analysis is an important process in the management of oil and gas projects. It involves identifying, analyzing, evaluating, controlling, communicating, and monitoring risks associated with the project. Qualitative assessments are commonly used in oil and gas risk management and are valuable first steps in the risk analysis process. They add rigor and structure to the common risk assessment method of brainstorming. A case study from Oman oil and gas industry found that qualitative data related to risks in the project were identified through field visits and extensive interviews. Quantitative methods are also used to quantify associated risks in terms of their detrimental effects on projects performances. This quantification allows for a Monte Carlo simulation to be performed which can be used to prioritize risks and provide an accurate assessment of potential impacts on cost and schedule. Environmental impacts must also be taken into consideration when performing a quantitative risk assessment for the oil and gas industry. This includes assessing potential harm to local residents due to spills, explosions, or

toxic fumes. Overall, qualitative and quantitative methods are both important components of risk analysis for oil and gas projects. They allow for a comprehensive assessment of potential risks which can then be managed effectively.

21) Perform Quantitative Risk Analysis ⇒ Project Risk Management

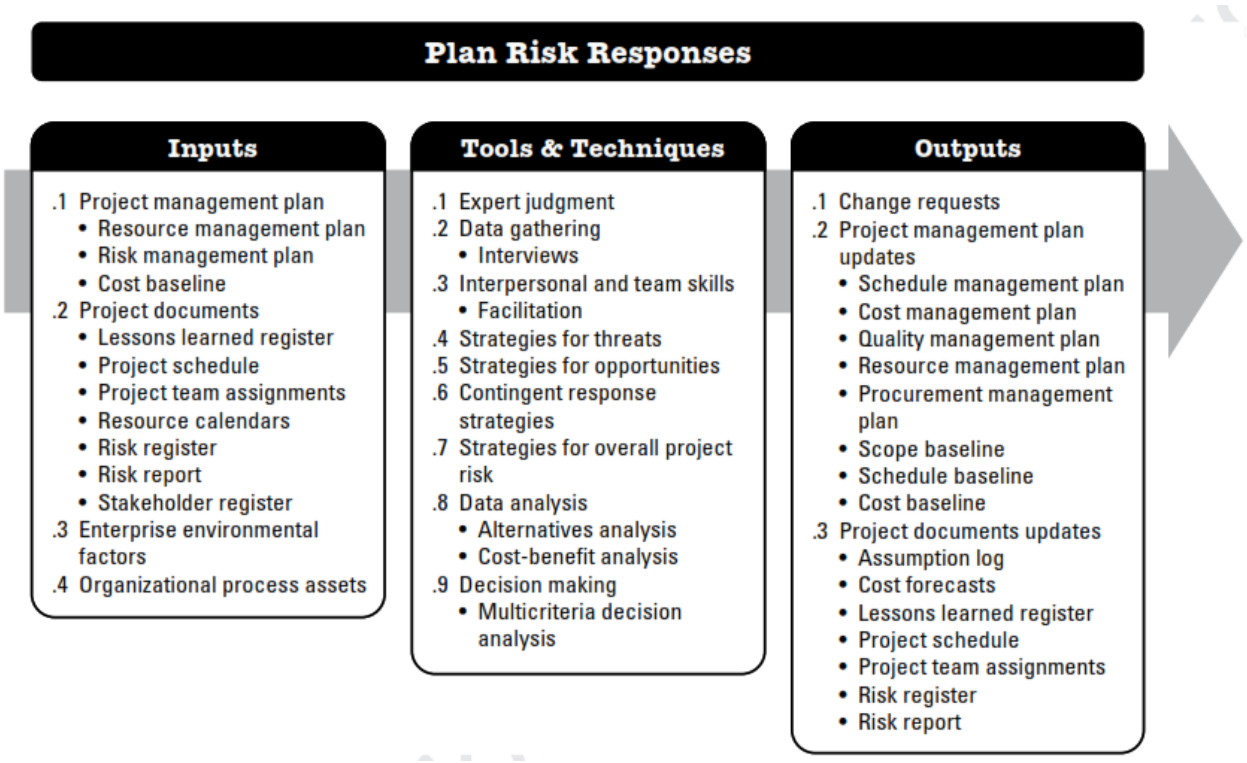
Quantitative risk analysis (QRA) is a tool used in project risk management to numerically evaluate the influence of risks on project elements. It is performed to understand the probability and impact of risks on a project or organization using numerical data. QRA takes the probability and impact of risks into account, creating a quantitative risk assessment (QRA). It provides detailed information regarding the probability and impact of a given risk, allowing project managers to develop effective mitigation strategies for the risks or include appropriate contingencies in the project estimate. QRA is also used to evaluate individual risks that have been identified during qualitative risk analysis.



Quantitative risk analysis is an important process for oil and gas projects, as it helps to measure the impact of delays, identify potential risks, and prioritize them in order to minimize their effects. This type of risk analysis involves using a Monte Carlo simulation to quantify the risks associated with a project and assess their potential impacts on cost and schedule. A case study from Oman's oil and gas industry was used to demonstrate how this type of risk analysis can be applied in practice. The research found that Monte Carlo simulation can be used to accurately quantify the pre- and post-mitigation costs of a project, allowing project managers to prioritize their risks and make informed decisions about how best to manage them.

22) Plan Risk Responses ⇒ Project Risk Management

Risk response planning is an important part of project risk management. It involves determining ways to reduce or eliminate any threats to the project, and also the opportunities to increase their impact. Risk response planning includes identifying trigger conditions and warning signs of a risk occurrence, documenting detailed actions to be implemented if a specific risk occurs, and evaluating the effectiveness of the risk response plan. The four main strategies for responding to risks are changing the scope of the project, extending the schedule, changing project resources, and accepting the risk. When creating a risk response plan, it is important to consider how much time and funding will be needed for implementation. Additionally, changes may need to be made to other areas of the project management plan such as schedule, cost, and scope. Risk response plans should be communicated to stakeholders in advance during project planning.

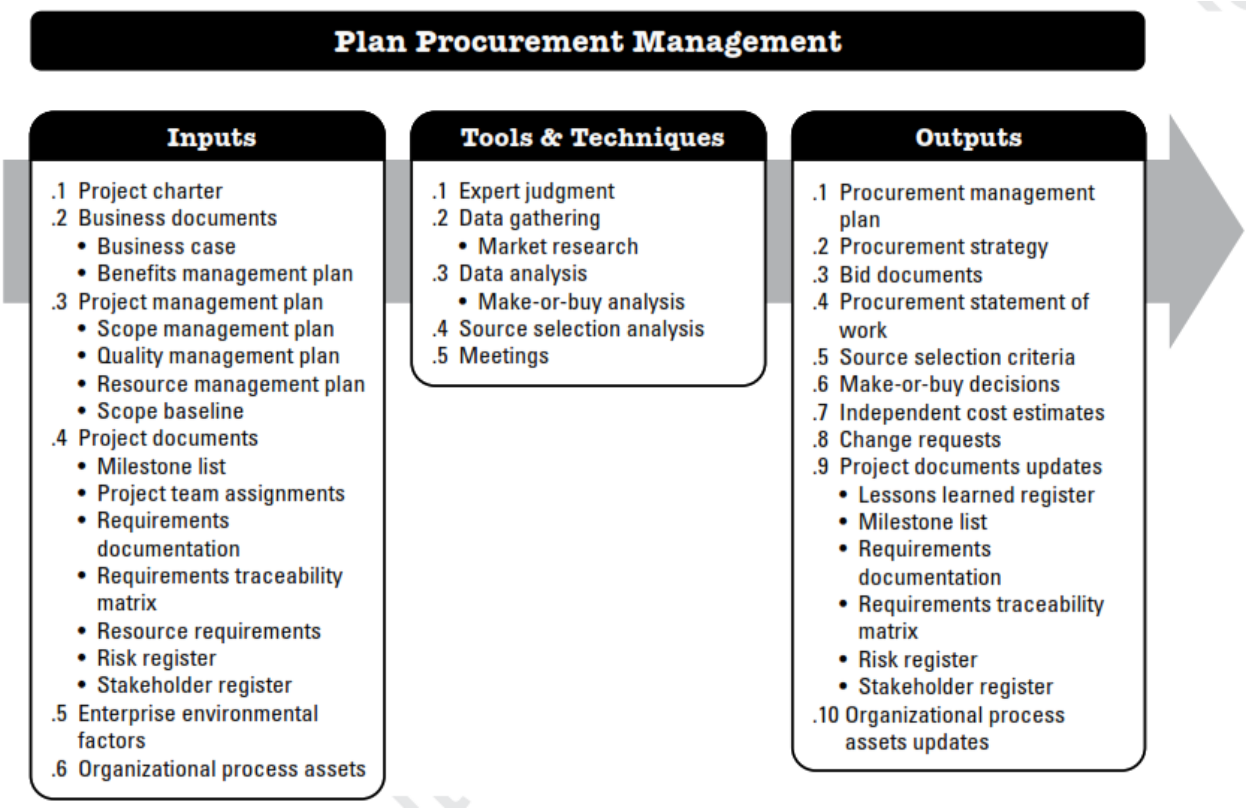


Risk management is an important process in the oil and gas industry, as risks can significantly impact project cost and schedule. Risk analysis of project schedules helps to identify risks and minimize their impact by performing risk mitigation efforts. The system-level hazard is uncontrolled methane gas surging up the well. Risk management in the oil and gas industry involves developing a project risk management plan, identifying and assessing risks, leading or delegating responses for each risk identified, gaining agreement from key stakeholders for the project risk response plan, updating the risk response plan, reviewing risk response strategies, and understanding the crucial challenges and lessons learned associated with oil and gas project risk management. Tools and techniques for project risk identification include alternative risk analysis assessment formats such as reserve estimation techniques, Monte Carlo simulations, decision trees, sensitivity analysis, scenario planning, etc. Risk responses may include avoidance strategies such as

canceling or postponing a project; transfer strategies such as insurance or outsourcing; mitigation strategies such as reducing uncertainty or

23) Plan Procurement Management ⇒ Project Procurement Management

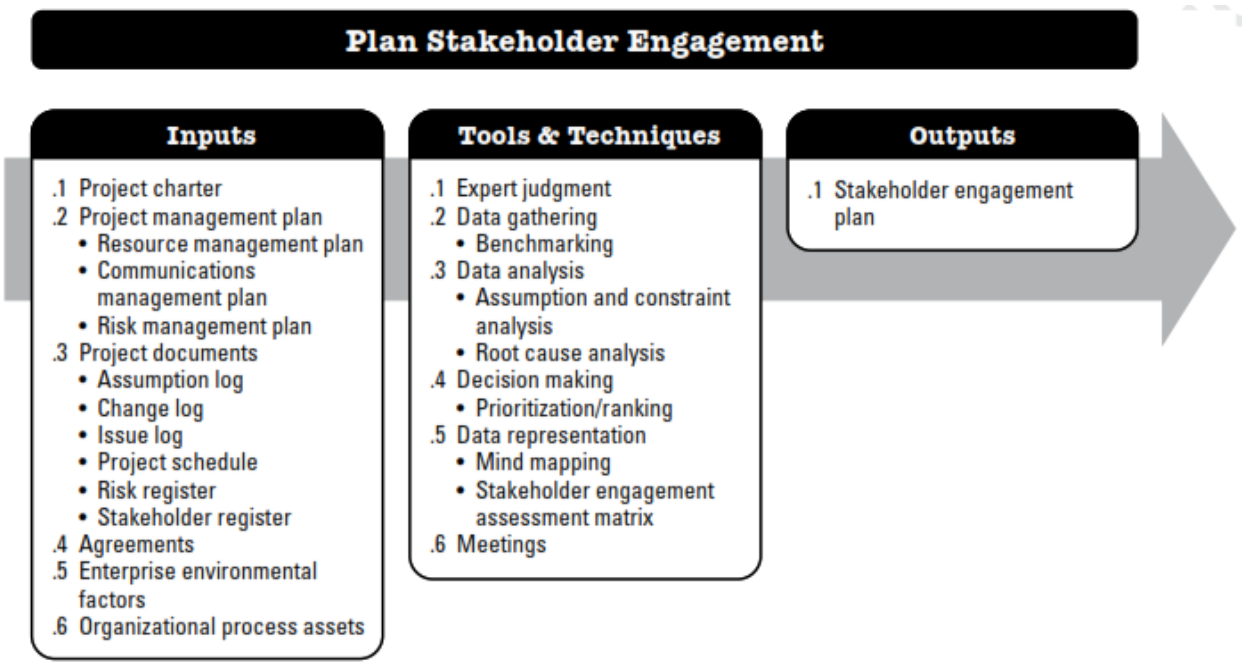
A project procurement management plan is a document that defines the project scheduling requirements and outlines the steps needed to enter into a contract. It helps to ensure that all stakeholders know the procuring organization's expectations and that the project stays on track and within budget. The plan procurement management process identifies what resources are needed for the project, evaluates potential sellers, and determines who is responsible for obtaining relevant items. It also helps to mitigate risks associated with procurement and define costs. The plan procurement management process is influenced by the requirements of the project schedule and vice versa.



Oil and gas companies can reduce costs and improve supply chain resiliency by adopting strategic procurement strategies. These strategies should include collaborative supplier relationship management, negotiations with large suppliers, and optimization of procurement processes. Additionally, understanding the typical stages of a project such as design, construction, operation, and maintenance is essential for successful procurement management.

24) Plan Stakeholder Engagement ⇒ Project Stakeholder Management

Project Stakeholder Management is the process of managing stakeholder expectations throughout the lifecycle of a project. It involves creating a plan to interact effectively with stakeholders and support projects interests. This plan includes inputs such as a stakeholder register, organizational culture, structure, political climate, and lessons learned from previous projects. The outputs of Project Stakeholder Management include a stakeholder engagement assessment matrix and a stakeholder engagement plan. The process of Project Stakeholder Management is critical to the success of every project. It involves creating a stakeholder management plan that documents the approach to increase support and decrease negative impacts of stakeholders throughout the life of the project. This plan should identify key stakeholders, their interests, involvement, and level of authority. It should also include strategies for communication and working with stakeholders to meet their needs/expectations, address issues as they arise, and foster appropriate stakeholder engagement.



Stakeholder mapping in the oil and gas industry involves identifying key stakeholders and understanding their interests, needs, and expectations. The main stakeholders in offshore oil and gas developments include national oil companies, governments, local communities, and affected sea users. Stakeholder interaction is important to ensure that the project is successful by aligning the stakeholders' interests. This can be done through regular meetings with governing bodies such as provincial politicians, consultation and workshops to provide and gain information, and regular consultation of affected businesses, communities, NGOs, and the general public. The corporate governance model of a company in the oil and gas industry can influence its stakeholder engagement score. This score is determined by factors such as stakeholder power, stakeholder engagement score, stakeholder engagement activities, sustainability practices, CSR reporting practices, environmental performance measures, social performance measures, economic performance measures. Companies in this sector are increasingly

required to improve their social performance due to societal pressure to reduce environmental impacts.

6

Key Deliverables in Planning Process Group

The Planning Process Group is one of the five PMBOK (Project Management Body of Knowledge) Process Groups. It consists of 24 processes that establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives. The most important deliverable from this process group is the Project Management Plan, which contains almost 19 documents. The Executing Process Group is another one of the five PMBOK Process Groups. This process group involves doing the actual work to create the project's deliverables. It also involves spending most of the budget and producing stakeholder change. The Monitoring and Controlling Process Group is another one of the five PMBOK Process Groups. This process group involves tracking progress against baselines established in the Planning Process Group, such as for Scope, Cost and Schedule, as well as taking corrective action when necessary. The other two PMBOK Process Groups are Initiating and Closing. The Initiating Process Group

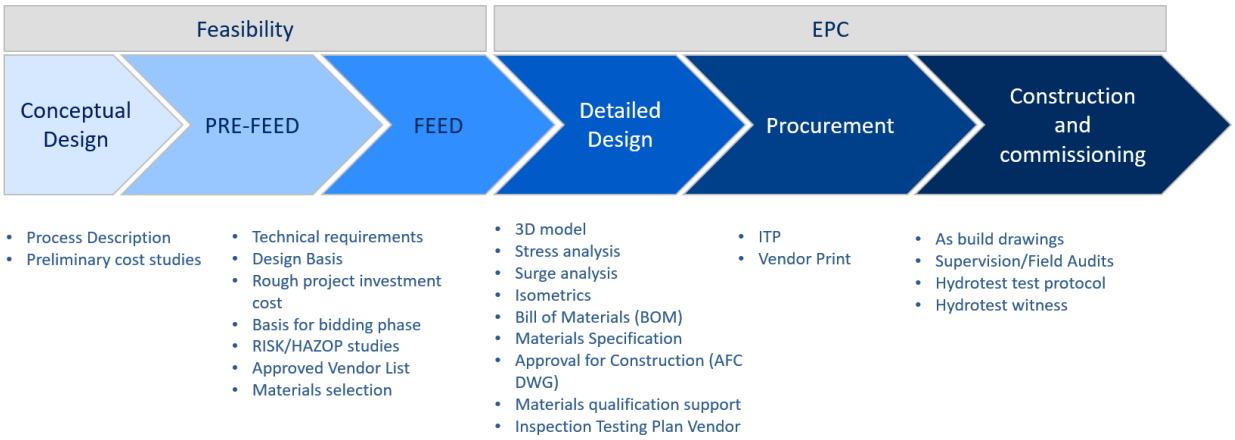
involves justifying the need for whatever deliverables are being produced, while the Closing Process Group involves formally closing out all activities related to a project or phase.

- Project Management Plan
- Subsidiary Plans
- Baselines (scope, cost, Schedule)
- Requirement Traceability matrix
- WBS
- Project Schedule
- Budget
- Scope Statement
- Risk Register
- Procurement Documents

7

Phases/Stages of Oil and Gas Projects

The executive method of oil and gas project scheduling management involves 12 major stages, such as scheduling feasibility, project execution plan, HSE Plan, Management/review of vendor drawings, financial planning to manage the budget, workflow and production deadlines. Project managers or executives must be involved in the process from start to finish. To ensure successful completion of projects within a time frame, it is important for companies to use project management software that optimize resources and track progress. Additionally, best practices and experienced talent are essential but not enough; companies must also continuously improve their general project management skills by balancing trade-offs among costs, schedule, technical solutions and stakeholder requirements.



7.1) Feasibility Study

A feasibility study is an important step in the development of oil and gas projects, as it helps to evaluate the potential for responsible hydrocarbon production within a given area. Feasibility studies typically involve establishing scope, objectives and terms of reference for the study, developing a study basis including oil and gas development data, well site PVT data analysis, etc.

The aim of these studies is to analyze the technical capability and economic success of developing an offshore field or real oil field under a production sharing agreement (PSA).

A Feasibility Study/analysis is a process to determine the validation of an idea. The feasibility Study ensures that a project is legally, technically, and economically justifiable. It tells the owner/client whether a project is worth the investment.

In some cases, a project may not be beneficial. Various Parameters like requiring too many resources, low market demand, and unavailability of nearby resources, etc. can contribute to such assessment. Such projects are not profitable.

Types of Feasibility

Four types of feasibility assessments are done before proceeding with a project. These are:

- Economic Feasibility.
- Legal Feasibility.
- Operational Feasibility.
- Scheduling Feasibility.

7.2) Concept Development / Conceptual Design

Conceptual design is the first step of the multiphase process involved in creating a new product. It involves developing a design basis that outlines the operating characteristics of the project, as well as allocating additional funds for proceeding with pre-FEED activities such as flow assurance and environmental assessment. This phase also includes preliminary sizing calculations to provide an estimate of costs, and long-term planning by means of special techniques known as "Field Development Conceptual Design" (FDCD).

Conceptual design is a set of disciplines that contributes to identifying the optimal design at nominal operating conditions of industrial processes/products in the field of engineering.

Deliverables of Conceptual Design:

- PFD (Process Flow Diagram).
- Functional requirement.
- Process Design.
- HMB (Heat and Material Balance).

7.3) Pre-FEED (Preliminary Front-End Engineering Design)

Pre-FEED (Preliminary Front-End Engineering Design) is a preliminary step taken before basic engineering level work and is sometimes undertaken to confirm the technical and economic feasibility of the project. It involves developing the project design basis and placing boundaries to constrain and define the concept, as well as allocating additional funds for proceeding with engineering and design. The final product of this stage is a FEED Package which contains all essential information from the basic engineering drawings/FEED. This package includes documents such

as scope definition, cost estimation, risk assessment, scheduling, procurement strategy, etc. that are used by EPC contractors during detailed engineering phase.

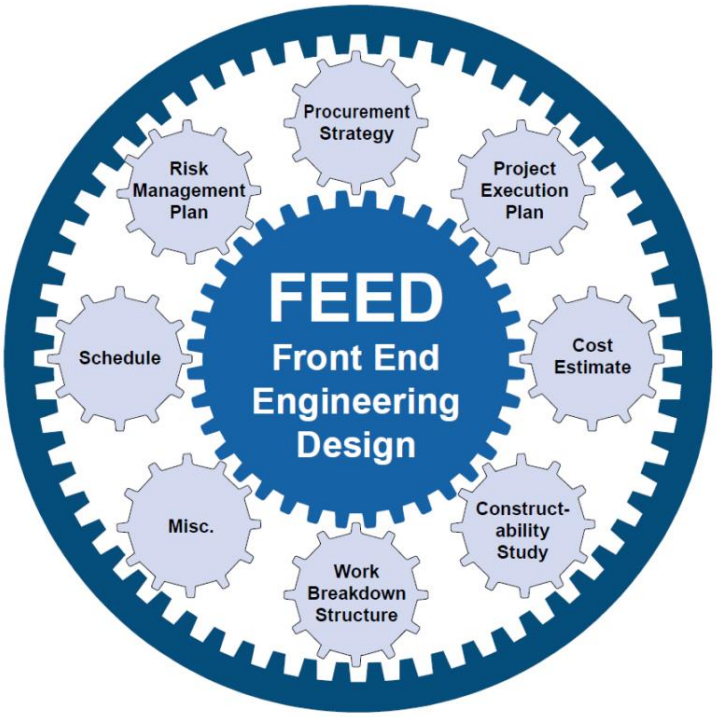
Front End Engineering Design (FEED) is an engineering design approach adopted prior to detailed engineering, procurement, and construction. It involves the preparation of a number of preliminary documents which are used as the start-up for further development. The main deliverables of the FEED stage include Project Execution Plan, P&ID drawings (Piping & Instrumentation Diagrams), Equipment Lists & Specifications, Operating Philosophy, Master Document Register (MDR), HAZOP or SIL reports (process safety studies), Final Plot Plan, Instrument Layout Drawings, Piping Purchase Specification, Piping Layout Design Basis, Piping Stress Analysis Design Basis, Noise Data Technical Specifications, Project Technical Specifications, Infrastructure Strategy Document, Detailed Engineering and Procurement Schedule Construction Schedule.

7.4) FEED (Front End Engineering Design)

Front-End Engineering (FEE) or Front-End Engineering Design (FEED) is an engineering design approach used to control project expenses and thoroughly plan a project. It involves the preparation of detailed technical specifications, cost estimates, schedules, and other documents for a proposed construction project. The FEED process typically includes components such as conceptual design, feasibility study, basic engineering, detail engineering, procurement management, scheduling, quality assurance/quality control, risk assessment, and more.

The main deliverable of the FEED (Front End Engineering Design) phase is the FEED package, which contains a wide variety of outputs such as unit plot plans, equipment layouts, pipe-rack sections, pipe thickness calculations and valve

selection. Other deliverables may include instrumentation diagrams, process flowcharts and detailed design drawings.



7.5) Detailed Engineering

Detailed engineering in oil and gas projects involves the preparation of documents such as process deliverables, construction documents and drawings up to AFC (Approved for Construction) stage, as well as other documents generated by the Process Department. It follows the FEED stage and precedes the P&F (Production and Field) stage.

Deliverables of Detailed Engineering:

- Equipment List.
- Process data-sheet.
- Management/review of vendor drawings.
- Thermal rating and vibration analysis of heat exchangers.

- Review of P&ID – Jointly with Client.
- Valve List
- Control valve datasheet.
- Relief valve datasheet.
- Detailed piping drawings, including isometrics and stress calculations.
- Bill of Quantity (BOQ).
- MTO (Material Take-off)
- Start-up procedures, Operating and Commissioning manuals.

7.6) Procurement Phase

The procurement phase of oil and gas involves a comprehensive approach to delivering key solutions such as spend analysis, contract management, supplier performance monitoring, and risk mitigation. Common challenges faced by industry professionals include cost savings, improved efficiency, increased visibility into the supply chain, and better collaboration with suppliers. Oil and gas companies must also consider their ability to respond to changing market conditions in order to remain competitive. To achieve this goal, they should adopt a more strategic approach to procurement that includes asking suppliers for price reductions while still maintaining quality standards.

The oil and gas procurement process involves the buying of drilling equipment, machinery, and other machines used in exploration. It may also include transportation, processing or storage of the product. Procurement optimization is a key part of this process as it helps to establish better demand management and reduce costs. There are three basic types of procurement used in the oil and gas industry: direct procurement, indirect procurement, and service procurement. Oil and gas procurement services can help companies cut costs through enhanced

efficiencies by providing supply chain strategies such as improved visibility into supplier performance, increased collaboration between stakeholders, and more efficient contracting processes.

The procurement phase in oil & gas projects involves several stages, including pre-FEED, FEED, detailed engineering and post-FEED. Pre-FEED is the first stage of the project life cycle and includes activities such as market testing, cost analysis, risk assessment and supplier selection. This is followed by creating and submitting a purchase request, evaluating and selecting suppliers/vendors, negotiating terms of a contract with the selected vendor, managing contracts and deliverables, assessing and refining procurement processes and closing out contracts when they are completed or expired. Post-FEED involves activities such as monitoring progress against schedule, reviewing performance metrics and making adjustments to ensure that all requirements have been met. It also requires regular communication between stakeholders throughout the process to identify any potential issues early on. Finally, it involves signing off on documents related to the project such as delivery orders, invoices etc.

7.7) Onsite and Offsite Fabrication

On-site and off-site fabrication are two different methods of construction that have their own advantages and disadvantages. On-site construction involves all work being performed sequentially on the job site, while off-site construction typically refers to modularization and pre-fabrication prior to installation. Off-site construction can reduce noise, air pollution, and disturbance from moving construction vehicles and machinery in the surrounding area, but it also requires more time for completion due to the need for detailed planning and coordination

between multiple parties. Additionally, there is a risk of delays or cost overruns due to unexpected changes during the process.

Offsite fabrication is a manufacturing process that involves planning, designing, fabricating, transporting and assembling building elements for rapid site installation. It typically refers to modularization and off-site assembly as well as pre-fabrication prior to installation on-site. Offsite fabrication can be divided into three main categories: modular, volumetric, and pre-assembled systems. Onsite construction techniques allow for design customization with limitless possibilities, but it also requires more time and labor than offsite fabrication. Additionally, the cost of materials used in both processes may vary depending on the project's requirements.

Onsite and offsite fabrication are both viable options for oil & gas projects. Off-site construction involves prefabricating equipment and systems into modules in a controlled manufacturing facility, which can reduce overall risk due to fewer inherent risks such as permit delays, weather delays, environmental conditions etc. It also offers access to skilled manpower required for large-scale facilities, faster timelines, improved quality control measures and the ability to transport components from factory to site. However, on-site construction allows for more flexibility in terms of design and details and is better suited for renovations or add-on accessibility.

7.8) Construction Phase

The construction phase of oil and gas projects involves several steps, including determining possible routes for the new pipelines, acquiring the right-of-way (ROW) to build, operate and maintain the pipeline, planning and design phases

such as feasibility study, concept design, front-end engineering design (FEED), bidding process, permitting process, environmental impact assessment (EIA), construction management plan (CMP), commissioning process, startup activities and maintenance. Additionally, there are strict procedures that must be followed during the planning, design and construction stages of an energy project which include safety protocols, cost estimation and scheduling.

The oil and gas construction process typically begins with the planning for new capacity far in advance of transporting the first barrel of oil, refined petroleum product, or first cubic foot of natural gas. This is followed by construction staging areas and storage yards, clear cutting the right-of-way (ROW), caveating the trench, pipe transport, stringing and assembly. Rigging up is also part of the process which includes setting the substructure and rig floor, installing handrails, guardrails, stairs, walkways and other safety features. Gas turbine/compressor package installation as well as lube oil system install and utility systems are also part of the process. During actual on-site construction companies in the oil and gas sectors have to refocus on achieving a better flow efficiency.

7.9) Erection and Installation Phase

The erection and installation phase in oil and gas projects involves the arrangement of equipment/elements or tools for the installation purpose. This is part of mechanical completion, which includes welding or mechanical joint assembly to complete the system. Pre-commissioning activities start after construction, erection, and installation are executed by the contractor, while tank farms, terminals, fire stations, etc. require site preparation and foundation construction

as well as vertical and horizontal tanks. Commissioning activities may include oversight of construction of Oil Refineries, Rolling Mills, etc.

The erection and installation sequence in oil & gas involves several steps, including data preparation for its various components, fabrication planning, pipe supports fabrication and erection, testing of the pipelines, insulation of the pipes, and mechanical completion works such as all pipe-work installed, supported, tested, insulated, etc. This is part of the critical path of an Oil & Gas Project which includes stages such as design phase, procurement phase, construction phase, commissioning phase, startup phase, operation and maintenance phase, decommissioning phase, etc.

The critical path of an oil & gas project is the pipework, which is by far the most time-consuming activity at the job site. This is because engineering progress has proved to be linear from 20 to 80%, with a slope which depends on the number of man-hours and ranges from 6 to 9%/month. Project scheduling involves time-phased sequencing of network activities subject to precedence relationships, time constraints, and resource limitations. Pipe-work is therefore likely to be the critical path of any facilities project in the oil & gas industry.

7.10) Pre-commissioning Phase

Pre-commissioning is an important phase of oil and gas projects, as it ensures that all pipeline construction meets the standard safety specifications. It involves preparatory work to get the pipeline into operations, such as introducing design process fluids or safe fluids to systems and subsystems. After pre-commissioning is completed, commissioning activities can be carried out. This includes testing for

leakage, verifying pressure drop across the pipe, and performing other tests to check for any potential issues with the system.

A pre-commissioning checklist for an oil & gas project should include items such as checking the pipeline's safety equipment and fire & gas detection, fuel gas and fuel oil system, slop systems, plant safety equipment and fire & gas detection, and natural gas pipeline commissioning procedures to predict performance, longevity, and improve transport efficiency. Additionally, it is important to ensure that all pipes are properly installed before beginning operations by following a comprehensive pre-commissioning process.

Pre-commissioning is a critical phase of engineering projects that occurs after construction and installation, before the facility or asset is put into operation. It involves various activities such as cleaning, flushing, drying, leak test, hydro-testing of equipment, piping system and other operating systems, de-energized verification and testing including flushing of piping and motor bumps to verify proper rotation direction, and pretesting natural gas lines following an ordered set of steps which allow for satisfactory performance analysis. The purpose of pre-commissioning is to ensure that all pipeline construction was satisfactory and meets standard safety specifications. This will help to identify any issues that may have arisen during construction and resolve them before they become a problem or cause delays.

7.11) Commissioning Stage

Commissioning is an important stage in oil and gas projects, as it ensures that all systems, components and processes are according to the operational requirements of the owner or final client. It involves checking and testing all functions according

to their design parameters in conditions as close as possible to the design conditions, verifying and ensuring that each unit and system of the plant meets safety standards and manufacturing quality mandates, priming pipelines for optimum performance and providing valuable data that can be used to predict performance, longevity and improve transport efficiency. The commissioning process also includes pre-commissioning procedures which help to verify that pipelines were constructed according to standard guidelines before they are granted full operational status.

Commissioning activities in oil & gas projects involve checking and testing all functions according to their design parameters in conditions as close as possible to the design conditions. This includes performance tests, safety checks, and other procedures such as pre-commissioning, commissioning, startup, and initial operation. Pre-commissioning is important for verifying that pipeline were constructed according to standard guidelines, while commissioning provides valuable data that can be used to predict performance, longevity, and improve transport efficiency. The commissioning process also informs many of the operational strategies and decisions companies will follow during in-service years.

The commissioning stage deliverable in oil & gas perplexity is typically performed by the owner and includes energized testing of equipment and integrated systems, using air or water instead of actual process chemicals. This phase also requires vendor commissioning of large and/or skid-mounted equipment, as well as general commissioning consumables. Documentation deliverables such as O&M manuals and training plans should be completed early enough in a project to allow for owner review before they are required for execution. Successful completion of this phase

is indicative of future success of ongoing operations, so it requires appropriate focus and resource allocation.

7.12) Start-up Phase

The start-up phase in oil & gas is the period when hydrocarbons are produced for the first time. It involves careful planning and preparation to ensure that all processes and equipment work together as a system, with 18 target dates covering prestart up, startup, and normal operations developed. This includes commissioning procedures for utilities and services, introduction of process fluids into each system, activating systems and subsystems, setting process conditions with the goal of producing a product or service, and conducting initial production tests. Effective risk management is essential during this period due to potential design flaws, commissioning omissions, infant mortalities, drilling activities still being in progress, and other issues. Tax considerations should also be taken into account at this stage, while effective communication between stakeholders can help ensure successful transition from start-up to operation.

The timeline for the start-up phase in oil and gas varies depending on the type of well and location. Shale wells can be drilled in two to four weeks and brought on line within months, while offshore wells can take much longer, up to 10 years. The entire process from drilling to plateau production typically takes two to three years. During this period, production increases gradually as more and more wells are drilled.

The start-up phase deliverable in oil & gas is the Preliminary Project Plan document, which provides a consistent and uniform procedure for evaluating potential IT projects. This includes activities such as design, technical environment, testing, and

document preparation. It also involves creating an overall process guide to communicate and ensure a common understanding of the project. Additionally, it requires developing a detailed execution plan that outlines all tasks required during each stage of the project.

8

Best Project Scheduling Techniques

There are a variety of project scheduling techniques that project managers can use. Some of the most common methods include:

- The Critical Path Method (CPM)
- Program Evaluation and Review Technique (PERT)
- Fast-tracking or crashing to shorten the duration of a project
- Using Gantt charts to visually represent tasks and timelines
- Mathematical analysis, simulation, or resource-leveling heuristics

8.1) Mathematical Analysis

Mathematical analysis is one of the most widely used project scheduling techniques in project management. It is a method of analyzing the activities and tasks that need to be completed in order to achieve a project's goals. Mathematical analysis involves calculating the duration, cost, and resources needed for each task or

activity. Other project scheduling techniques include duration compression, simulation, resource-leveling heuristics, Gantt charts, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and Work Breakdown Structure (WBS). Each technique has its own advantages and disadvantages depending on the type of project being managed. For example, CPM is useful for projects with multiple tasks that must be completed in sequence while PERT is better suited for projects with multiple tasks that can be completed simultaneously. WBS is a comprehensive breakdown of every task or activity required to complete a project.

8.2) Scheduling Algorithms

Project scheduling algorithms include Flexible Project Scheduling Algorithms, Critical Path Method (CPM), and heuristic resource constrained scheduling algorithms.

8.3) Duration Compression

Duration compression is a project scheduling technique used to shorten the duration of a project. It can be implemented from the beginning of the project or mid-way through if it is taking longer than expected. Duration compression involves overlapping tasks that can be done simultaneously (fast tracking) and putting more resources into a task to get it done faster (crashing). Duration compression should be used cautiously, as it can lead to bigger problems. It is one of seven project scheduling techniques, which include mathematical analysis, simulation, resource-leveling heuristics, Gantt charts, task lists and calendar. Simulation is another technique that can be used when there are many uncertainties and variables. Project scheduling techniques are important for improving time estimation and

compensating for a lack of resources, as well as creating an accurate timeline and tackling projects in real-time.

8.4) Simulation

Simulation is one of the best project scheduling techniques for dealing with unknown variables that may affect the finish date of a project. This technique involves making assumptions about the resources needed to complete a task and providing a timeline based on those assumptions. Simulation allows for flexibility in creating a detailed project schedule despite not knowing all the details, as it allows for multiple schedules to be created that account for different outcomes. Other project scheduling techniques include mathematical analysis, duration compression, resource-leveling heuristics, Gantt chart, task lists, calendar, critical path method (CPM), program evaluation and review technique (PERT), fast-tracking, crashing. Each technique has its own advantages and disadvantages depending on the nature of the project and the preferences of the project manager.

8.5) Resource-leveling heuristics

Resource-leveling heuristics are prioritization rules used to determine which tasks are allocated resources in order to create a resource-feasible schedule. Resource-leveling heuristics can be used in conjunction with scheduling schemes such as mathematical analysis, duration compression, and simulation. Resource leveling adjusts resource allocation or project schedules to keep resources from being overextended. This can help maintain the quality of project outputs. Resource leveling involves listing required resources for tasks and reassessing their availability when needed. Project management software with resource leveling algorithms can help resolve overallocation conflicts and give greater visibility into

team members' schedules. After using resource leveling to resolve overallocation conflicts, resource smoothing can be used to even out the project schedule. The resource-constrained project scheduling problem (RCPSP) has been studied extensively and is generally accepted as a good approach for solving the problem of resource-leveling heuristics.

8.6) Gantt chart

Gantt charts are one of the most popular project scheduling techniques used in project management. A Gantt chart is a useful way of showing what work is scheduled to be done on specific days, and it helps project managers and team members visualize the milestones of a project schedule in one simple stacked bar chart. Gantt charts can be created manually in a standard spreadsheet or with templates that have built-in automation, or they can be created using Gantt chart software which automates the process to support more advanced features. Gantt charts are effective tools for various roles such as project managers, team members, and stakeholders. They are used for planning projects, tracking progress, collaborating with teams, and managing resources. Other popular project scheduling techniques include mathematical analysis, duration compression, simulation, resource-leveling heuristics, task lists, and calendar.

8.7) Task lists

Task lists are one of the most popular project scheduling techniques used by project managers. Task lists involve listing all individual tasks in order, identifying dependent tasks, and designing a project schedule with these as your starting point. Task lists can be used in conjunction with other scheduling techniques such as Gantt charts, resource-leveling heuristics, and calendars to ensure that projects

are on schedule. Task lists are beneficial for providing visibility and transparency of a project to both the project manager and other stakeholders. Additionally, there are a range of project management software options that come with ready-made calendar templates to match all sorts of project needs. Other popular project scheduling techniques include Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Fast-tracking and crashing, Duration compression, Simulation, Resource-leveling heuristics, Gantt charts, and Calendars.

8.8) Calendar

There are a variety of project scheduling techniques that project managers can use, depending on the specific goals and timeline of the project. Several search results mention the Critical Path Method (CPM), which is a technique that identifies the longest sequence of tasks in a project and helps to determine the earliest and latest possible start and finish times for each task. Another common technique mentioned is the Program Evaluation and Review Technique (PERT), which uses network diagrams to map out all of the tasks in a project, identify dependencies, and estimate durations. Fast-tracking is another option, which involves overlapping tasks in order to speed up the overall timeline. Crashing is similar, but it focuses on adding resources to critical tasks in order to shorten their duration. Many search results also mention using Gantt charts as a way to visually represent all of the tasks in a project along with their start and end dates. This can be helpful for tracking progress and identifying bottlenecks or delays. Other techniques mentioned include simulation, resource-leveling heuristics, task lists, and calendars. Calendars are particularly useful for providing transparency and visibility into the project timeline for all stakeholders involved. Ultimately, choosing the right scheduling technique will depend on your specific goals, timeline, resources, and task list.

References

There are many Books and web sites available with lots of great information. I have listed below some that you may wish to visit:

	Web site
1	https://constructionbydaniels.com
2	https://fielda.com
3	https://georgenwogu.medium.com
4	https://hsseworld.com
5	https://jpt.spe.org
6	https://nigen.com
7	https://onepetro.org
8	https://petrotrainingasia.com
9	https://projectcontrolsonline.com
10	https://theconstructor.org
11	https://whatispiping.com
12	https://www.aktoilservices.com
13	https://www.allaboutpiping.com
14	https://www.brunel.ne
15	https://www.ep-consult.co.uk
16	https://www.hm-ec.com
17	https://www.hsbcad.com
18	https://www.inspection-for-industry.com
19	https://www.opuskinetic.com
20	https://www.pmi.org
21	https://www.prospectus.com
22	https://www.researchgate.net
23	https://www.rettew.com
24	https://www.safeworldhse.com
25	https://www.sciencedirect.com
26	https://www.tamarackgrove.com/
27	https://www.theprojectdefinition.com
28	https://www.wbdg.org

	Books
1	Project Management for the Oil and Gas Industry: A World System Approach (Systems Innovation Book Series) 1st Edition by Adedeji B. Badiru (Author), Samuel O. Osisanya (Author)
2	Statistical Techniques for Project Control (Systems Innovation Book Series) 1st Edition by Adedeji B. Badiru (Author), Tina Agustiady (Author)
3	Comprehensive Project Management: Integrating Optimization Models, Management Principles, and Computers
4	Project Management: Systems, Principles, and Applications, Second Edition (Systems Innovation Book Series) 2nd Edition by Adedeji B. Badiru (Author)
5	Handbook of Industrial Engineering Equations, Formulas, and Calculations (Systems Innovation Book Series) 1st Edition by Adedeji B. Badiru (Author)
6	A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition and The Standard for Project Management (ENGLISH) by Project Management Institute | Aug 1, 2021
7	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Sixth Edition Sixth Edition, Sixth edition by Project Management Institute
8	Project Management in the Oil and Gas Industry 1st Edition by Mohamed A. El-Reedy (Author)