

# Practical Application of Project Management Processes to Planning and Scheduling Fleets of Rigs with Multi Oil and Gas Projects

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**Abstract:** The oil and gas (O&G) exploration and production portfolio consists in capital and technology-intensive, high-risk, and multi complex projects such as exploration, appraisal, development, workover, completion, abandonment, and other maintenance activities. These activities rely mostly on fleets of drilling and workover rigs, a scarce and costly resources that must be appropriately planned and scheduled to ensure availability at the right place and time to execute the various activities in order to deliver expected O&G production targets, minimize production loss and cost, avoid delays and meet delivery dates. This paper investigates the challenges faced by O&G companies when planning and scheduling fleets of rigs with multi projects and operations, identify the crucial project management processes that can be used to effectively manage rig fleets, and offer recommendations for improving the project management procedures used to oversee rig fleets involved in varieties of O&G projects and operations. The research adopted a qualitative literature review method and reviewed the following databases: Google Scholar, Scopus, and Web of Science to uncover relevant articles and publications, identify and give a thorough and organized examination of the existing literature on the subject. The study used two case studies from hypothetical O&G company – “OilCo” and ExxonMobil to demonstrate applicability of project management principles in the real world for planning and scheduling rig fleets with multi projects. The study provides insightful information for O&G industry experts, academics, and decision-makers to enhance effective planning and scheduling of rig fleets with multi projects, improve fleet performance and efficiency, minimize risks and cost, and ensure flexibility and adaptability to shifting projects requirements and external variables.

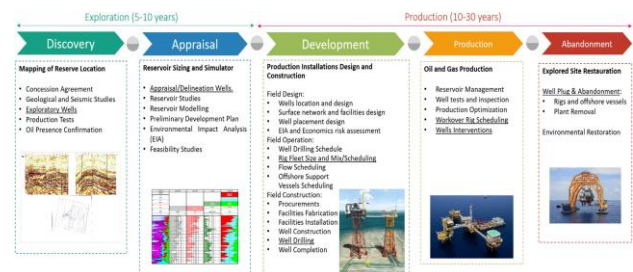
**Keywords:** project management process, planning, oil and gas activities, rig fleets, rig schedule, scheduling

## 1. Introduction

The oil and gas (O&G) industry is a high risk, complex and capital-intensive sector that needs efficient project management process to assure project success. The sector includes a variety of projects with various stakeholders, deadlines, and scopes. To maximize project results, it is crucial to utilize resources, including human capital, machinery, and materials, effectively (Santos et al., 2021). Consequently, managing the complexities of the O&G activities to guarantee project success requires proper understanding of the exploration and production phases, the associated projects/activities and decisions.

The exploration and production of O&G fields has a long-life cycle with activities spread over several decades. It can be categorized into five main phases (IPF School, 2015) as shown in Figure 1, with the associated activities/wells highlighted. From discovery to the field abandonment, rigs are used to drill, complete, maintain, and abandon wells. In the discovery phase, exploratory wells are drilled using rigs to confirm hydrocarbon presence, and in the appraisal phase, delineation wells are drilled to estimate the reservoir properties. In the development phase, wells retrieving O&G from the reservoir (production wells) and wells injecting water, fluid, or gas into the reservoir (injection wells) are drilled and completed using rigs. In this phase the rig fleet size is decided, as well as the operation schedule of the rigs. In the production phase, completed wells often require workover rigs to perform an intervention to increase productivity or correct machinal failures. Finally, the rigs are used to plugged and abandoned the wells – a process in

which the wells are abandoned and cannot be used again after installation of the well barriers or plugs (Santos et al., 2021).



**Figure 1:** Exploration and Production of Oil and Gas Phases and Decisions

*Note:* The 5 O&G Exploration and Production Phases and Decisions with associated wells/activities underlined. Copied from “A Systemic Literature Review for the Rig Scheduling Problem: Classification and State-of-the-Art” by I. M. Santos et al., 2021, Computers and Chemical Engineering 153 107443. Copyright 2021 by I. M. Santos.

Rigs are one of the highly complex, expensive structure and primary resources used in O&G exploration and production for critical activities such as evaluation, drilling, completion and workover operations. Each of these operations requires a specific rig type. There are several types of rigs, each one with specific purpose in terms of operations it can perform and its own technical specifications (Santos et al., 2021). Depending on the location of the well or activity, the rig can be operated in two main environment – onshore or offshore. Figure 2 shows the different types of rig fleets and the environment of operation (onshore and offshore).



Figure 2: Different Types of Onshore and Offshore Rigs

Note: Different Types of Onshore (left) and Offshore (right) Rigs. Copied from “A Systemic Literature Review for the Rig Scheduling Problem: Classification and State-of-the-Art” by I. M. Santos et al., 2021, Computers and Chemical Engineering 153 107443. Copyright 2021 by I. M. Santos.

Based on the various activities/projects in each phase of the O & G exploration and production phases, the rig fleets as the main resources, and the location of the activities (O&G fields or wells), key project management processes can be used in the planning and scheduling development. The process of project schedule development include: 1) plan schedule management that details the project's scope, deadlines, budget, resources, risk management strategy, and communication strategy, 2) define the activities including preparing of the task list per the work breakdown structure, 3) sequence the activities, 4) estimate activity durations, 5) develop schedule and 6) control schedule (PMBOK, 2017). Scheduling method such as bar chart or network schedules can be utilized depending on the level of details and complexity. Each method can be prepared using desktop computer software such as Microsoft Excel, Microsoft Project, Primavera and other advance techniques. Figure 3 shows a hypothetical 2-year rig schedule incorporating fleets of rigs, various activities based on the O&G exploration and production phase and project maturation stages; and duration of the activities.

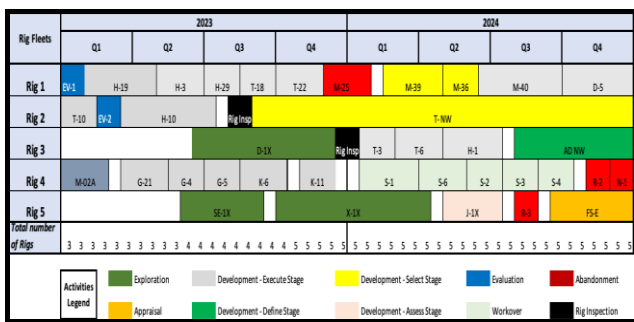


Figure 3: Hypothetical Rig Schedule

Note: Hypothetical Rig Schedule showing rig fleets with multi activities based on the various O&G exploration and production phases and project maturation stages. Source: Figure developed by the author.

The drilling process must have careful preparation, and well planning is arguably the most difficult element of that process (Haaskjold et al., 2020). Without proper planning, the drilling project may fall short of its goals and potentially provide safety risks. Good planning aims to maximize net

present worth by drilling a well that securely achieves the goals outlined in the well proposal. Integration of diverse engineering disciplines, organizational policies, and personal observations are all part of the planning process. The goal is to safely drill a well that achieves excellent objectives at the lowest possible cost, risk, and time. To ensure that the drilling project meets its objectives, good project planning is essential. With agile project management approaches, project managers may guarantee that rig fleets planning and scheduling are fluid and adaptable to adjustment for knowledge gained from the project, increased understanding of the risk, shifting project needs and value-added activities, and other external variables. ExxonMobil, for instance, has adopted an agile project management methodology that enables the business to adjust to shifting market conditions and project requirements (PMI, 2017).

This study intends to investigate how project management practices can be used to plan and schedule rig fleets with multi-O&G projects. To give a thorough and organized examination of the existing literature on the subject, a qualitative literature review will be conducted. The study will concentrate on finding the challenges faced by O&G companies when planning and scheduling fleets of rigs with multi projects and operations, identify the crucial project management processes that can be used to effectively manage rig fleets, evaluate the effects of project management strategies on the efficiency, cost, and performance of the O&G companies, and offer recommendations for improving the project management procedures. This research paper will provide insightful information for O&G industry experts, academics, and decision-makers to enhance effective planning and scheduling of rig fleets with multi projects, improve rig fleets performance and efficiency, minimize risks and cost, and ensure flexibility and adaptability to shifting projects requirements and external variables.

### 1.1 Problem Statement

The O&G industry is a critical sector for global economy with operations involving a wide range of complex, expensive and high-risk projects such as exploration, appraisal, development, production, and abandonment activities. Moreover, these activities rely on fleets of drilling and workover rigs, one of the most critical, scarce and costly resources, for well construction, or maintenance activities to develop and produce hydrocarbon from various oil and gas fields. Depending on the rig type, market and its operational specifications, rig leases are typically between US\$200,000 and US\$700,000 per day. An offshore well typically cost average of US\$30 million, with most falling in the US\$10 to US\$100 million range (Devold, 2013). Consequently, rig fleets must be appropriately planned and scheduled to ensure the rigs are available at the right place and time to execute the various activities in order to deliver expected O&G production targets, minimize production loss and cost, avoid delays, and meet delivery dates.

### 1.2 Significance of the Study

This research will explore the challenges faced by O&G companies when planning and scheduling fleets of rigs with

multi projects and operations, identify the crucial project management processes that can be used to effectively manage rig fleets, evaluate the effects of project management strategies on the efficiency, cost, and performance of the O&G companies, and offer recommendations for improving the project management procedures. The findings of this study will provide insightful information for O&G industry experts, academics, and decision-makers to enhance effective planning and scheduling of rig fleets with multi projects, improve rig fleets performance and efficiency, minimize risks and cost, and ensure flexibility and adaptability to shifting projects requirements and external variables.

### 1.3 Objectives of the Study

The objective of this study is to explore the practical application of project management processes to planning and scheduling fleets of rigs with multi-O&G projects. Specifically, the study aims to explore the challenges faced by O&G companies when planning and scheduling fleets of rigs with multi projects and operations, identify the crucial project management processes that can be used to effectively manage rig fleets, evaluate the effects of project management strategies on the efficiency, cost, and performance of the O&G companies, and offer recommendations for enhancing the efficiency of project management procedures used to oversee rig fleets involved in variety of O&G projects and operations. By using two case studies from hypothetical O&G company – “OilCo” and ExxonMobil, this research will demonstrate the practical application of project management processes to real world planning and scheduling of rig fleets with multi projects/activities.

### 1.4 Research Questions

- 1) What are the main project management procedures and methods that may be used to efficiently plan and schedule rig fleets in the O&G sector?
- 2) What difficulties do project managers have while managing fleet of rigs with multi projects in the O&G sector, and how can these challenges be solved to improve rig fleets performance and efficiency, minimize risks and cost, and ensure flexibility and adaptability to shifting projects requirements and external?

## 2. Knowledge of the Issue

In the oil and gas sector, where numerous projects and activities are conducted concurrently, project management is widely acknowledged as being crucial. Rig fleets planning and scheduling is a difficult operation that necessitates the application of effective project management techniques. Several studies have been conducted considering theoretical perspective involving quantitative and analytical methods, such as mathematical programming, heuristic, and data science techniques including some literature review (Santos et al., 2021), but limited studies considering practical perspective of application of project management processes to rig fleets planning and scheduling. Exploring the practical application of project management techniques to the planning and scheduling of fleets of rigs with multiple O&G

projects is the goal of this literature review.

The series of processes followed during project initiation, planning, execution, monitoring and controlling, and closure phases are known as project management procedures. According to PMBOK (2017), the five basic categories of project management procedures are integration, scope, time, cost, and quality.

The identification of project objectives and limitations is the first stage in applying project management procedures to the planning and scheduling of rig fleets with multi projects. This entails setting project constraints like budget, schedule, and resource constraints as well as outlining the project scope and goals (Varajo et al., 2022).

Managing many projects and activities at once is one of the main challenges the O&G sector faces. This calls for the application of sophisticated project management approaches, including the use of project management software, project scheduling tools, and the integration of project management procedures with other business procedures. By employing these methods, it is possible to guarantee that the project will be completed on schedule, within budget, and to the satisfaction of all stakeholders.

A study by Li et al. (2020) illustrated that project schedules in the O&G industry are frequently complicated and dynamic, with many interdependent tasks that must be managed to satisfy project objectives. According to the authors, successful project completion depends on employing efficient project management procedures, including the usage of project scheduling software. As per Ochieng et al. (2018), the location of the project affects the effective management and delivery of O&G projects. For instance, managing O&G projects in remote locations will be more challenging than managing projects in urban areas. Employee productivity will be less in remote places since it will be more difficult to find labour and resources there than in cities (Ochieng et al., 2018). The authors discovered that by offering precise and consistent instructions for coordinating and tracking progress, the adoption of project management techniques can assist to improve the effectiveness and efficiency of rig fleet operations. Furthermore, according to Li et al. (2020), the application of project management procedures can aid in the early detection and resolution of problems, hence averting delays and cost overruns.

To visualize project schedules and spot bottlenecks and key routes, many O&G businesses use project scheduling tools like Gantt charts as shown in Figure 4, and the critical path method (CPM) (Atin and Lubis, 2019). These tools aid in the creation of detailed project schedules that include all the tasks necessary to complete a project. These schedules may be employed to monitor progress, spot potential issues, and make necessary adjustments. They may also be employed to make sure that all tasks are carried out in the right order and that resources are allocated as effectively as possible.

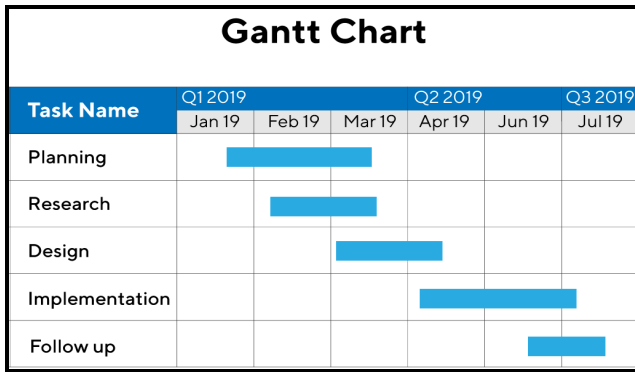


Figure 4: Project Management Gantt Chart

Note: Project Management Gantt Chart. Copied from “Implementation of critical path method in project planning and scheduling” by S. Atin and R. Lubis, 2019, IOP Conference Series: Materials Science and Engineering, Vol. 662, No.2, p.022031, IOP Publishing. Copyright 2019 by S. Atin and R. Lubis.

According to Burghate (2018), incorporating a work breakdown structure (WBS) into the project management strategy depicted in Figure 5 facilitates breaking the project down into more manageable tasks.

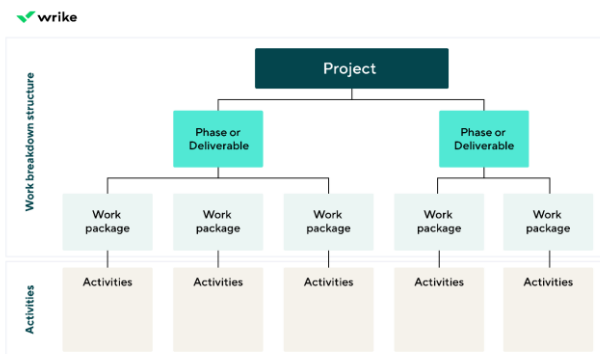


Figure 5: WBS in Project Management

Note: WBS in Project Management. Copied from “Digital twin for the oil and gas industry: Overview, research trends, opportunities, and challenges” by T. R. Wanasinghe et al., 2020, IEEE Access, 8, 104175-104197. Copyright 2020 by T. R. Wanasinghe.

In the O&G industry, using project management software is an essential part of project management. The usage of project management software automates several project management tasks, such as resource allocation, budget tracking, and progress monitoring. Several project management techniques, in addition to project management software and project scheduling tools, are essential in the oil and gas industry. For instance, many businesses use the critical path method (CPM) to plan and schedule their projects (Ahmad, 2020). The CPM is a project management method used to establish a project’s critical path. By identifying the key path, project managers may focus their efforts on ensuring that these procedures are completed on schedule (Ahmad, 2020).

The management of projects using Earned Value Management (EVM) is a standard procedure in the O&G

sector. By comparing actual progress to planned progress, EVM is a project management tool that is used to monitor progress and spot potential problems (Proao-Narváez et al., 2022). When performance is running behind schedule, project managers can use EVM to pinpoint the problem areas and take appropriate action to resolve them (Roao-Narváez et al., 2022). Resource allocation is a critical factor in project management. It involves the allocation of people, equipment, and materials to the project tasks (PMBOK, 2017). In the context of planning and scheduling fleets of rigs, this involves the allocation of rigs to specific projects and activities, taking into consideration factors such as availability, location, and cost (Santos et al., 2021).

It is worth noting that a key challenge in project management in the O&G industry is the need to coordinate the activities of multiple stakeholders. As indicated by Shakeri et al., (2021), effective communication and collaboration are crucial for ensuring that projects are completed successfully as shown in Figure 6. The authors argue that project management processes should be designed to facilitate effective communication and collaboration among all stakeholders, including project managers, engineers, technicians, and other personnel.



Figure 6: PMI Talent Triangle

Note: PMI Talent Triangle. Copied from “What do project managers need to know to succeed in face-to-face communication?” by H. Shakeri et al., 2021, Economic Research-Ekonomiska Istraživanja, 34(1), 1094-1120. Copyright 2021 by H. Shakeri.

Risk management is also a critical component of project management processes in the planning and scheduling of fleets of rigs (Lenkova, 2018). This involves the identification of potential risks and the development of risk mitigation strategies (PMBOK, 2017). In the O&G industry, potential risks include equipment failure, operational disruptions, and changes in project scope (Rodrigues-da-Silveira et al. 2020). According to Li et al. (2020), the oil and gas business uses project management methods to manage and control project risks. The oil and gas business is characterized by high levels of uncertainty and risk, as shown by Kassem (2022), which can have a substantial impact on project outcomes.

Project control and monitoring components as described in Figure 7 in the project management processes help in mitigating risks by incorporating risk management processes in the planning and scheduling of rig fleets (Salazar-Aramay et al., 2018). This involves the continuous monitoring of project progress, comparing actual performance against project plans and schedules, and adjusting as needed (PMBOK, 2017). A study by Trzeciak and Jonek-Kowalska (2021), indicates that monitoring and controlling processes are critical to the success of the project, as it ensures meeting of project objectives, identifying of any issues and addressing them promptly.



**Figure 7:** Project Control and Monitoring

*Note:* Project Control and Monitoring. Copied from “A Guide to the Project Management Body of Knowledge (PMBOK Guide)” by Project Management Institute (PMBOK), 2017, Project Management Institute, Inc. Copyright 2017 by Project Management Institute (PMBOK).

In conclusion, a review of the literature suggests that the practical application of project management processes can have a significant impact on the planning and scheduling of fleets of rigs with multi projects in the O&G industry. By enabling the integration of multiple projects, improving the accuracy of project schedules, reducing the risk of project delays, and improving resource allocation, the use of project management processes can help organizations to achieve their goals and objectives.

### 3. Research Methodology

The main goal of this study is to investigate how project management practices can be used to plan and schedule fleets of rigs with multi-O&G projects and activities. The primary emphasis of this topic is on the actual application of project management techniques in the planning and scheduling of fleets of rigs for several O&G projects and operations. It looks at the difficulties fleet managers have in the O&G sector and how technology might be used to help project management procedures (Fernández et al., 2018). The objective is to maximize fleet performance, raise productivity and efficiency, lower risks, and guarantee flexibility and adaptability to shift project requirements and outside variables. The overarching objective is to increase corporate results and success factors. To achieve this

objective, this research will conduct a literature review to give a thorough and organized overview of existing literature on the subject.

The search method will be used to discover pertinent literature as part of the data-gathering procedure for this study. Based on predetermined inclusion and exclusion criteria, the literature will be screened. Project management, fleet planning, scheduling, the oil and gas activities, and multi-project management are examples of search terms. Peer-reviewed journal papers, conference proceedings, and books released mostly during the last five years were the items included in the search. To glean pertinent knowledge, the supplied literature will be read and examined. To find important themes and patterns, this data will be categorized and synthesized. Coding and categorizing the data into themes and patterns are both steps in the data analysis process. To offer a summary of the literature on the practical application of project management methods to planning and scheduling fleets of rigs with multi oil and gas projects and activities, the data will be combined and evaluated.

The research will provide review’s conclusions narratively, backed up by pertinent passages from the literature. As a result, the study will thoroughly analyse the relevant literature and offer insights into the applicability of project management methodologies in the O&G sector, particularly in the planning and scheduling of fleets of rigs with multi oil and gas projects.

#### 3.1 Research Findings

To ensure safe and effective drilling operations, well planning is a complicated process that integrates several engineering disciplines and company regulations. The Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT) are two well-planning approaches used in the O&G industry. With the use of these tools, project managers may pinpoint the crucial tasks that could stall the drilling operation and create backup plans to reduce risks.

Project managers can efficiently plan and arrange fleets of rigs by utilizing a variety of methods and strategies as shown in Figure 8. They could, for instance, utilize a Work Breakdown Structure (WBS) to divide the project up into smaller parts and assign duties to other teams (Heidary et al., 2018). They can also utilize critical path analysis to pinpoint important tasks and deadlines and make sure they are met on time (Zuoqian et al., 2022). Technology can be used to support project management procedures and enhance planning and scheduling for drilling rigs. For instance, BP has put in place a digital project management system that optimizes fleet performance and lowers costs by using artificial intelligence and machine learning (BP, 2022).



Figure 8: Project Management in Oil & Gas

Note: Project Management in Oil & Gas. Copied from “Status, trends, and enlightenment of global oil and gas development in 2021” by W.A.N.G. Zuoqian et al., 2022, Petroleum Exploration and Development, 49(5), 1210-1228. Copyright 2022 by W.A.N.G Zuoqian.

An additional crucial component of project management in the oil and gas industry is the scheduling of fleets of rigs with multiple activities. Allocating resources, such as rigs, staff, and equipment, to various projects and activities is a part of the scheduling process. Critical Chain Project Management (CCPM) and Resource-Constrained Project Scheduling (RCPS) are scheduling techniques used in the industry. For instance, a significant Middle Eastern oil and gas corporation scheduled the drilling of numerous wells in a difficult onshore area using the CCPM methodology (Al-Hemoud et al., 2019). The technique assisted the project team in determining the essential paths and prioritizing the tasks to complete the project within the allotted time and financial constraints.

Fleet planning and scheduling in the oil and gas sector can benefit from project management techniques as shown in Figure 9, which can lead to better business results including cost savings, enhanced productivity, and increased efficiency. A centralized fleet management system, for instance, was put in place by the global oil and gas corporation Royal Dutch Shell, enabling them to maximize fleet utilization and cut idle time by up to 20%. Significant cost reductions and higher productivity were the outcomes of this (Hopkins et al., 2021).

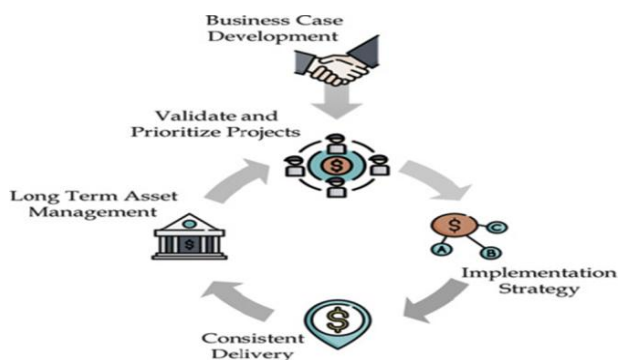


Figure 9: Project Management Process in Oil & Gas Sector

Note: Project Management Process in Oil & Gas Sector. Copied from “Factors affecting transaction costs and collaboration in projects” by H. Haaskjold et al., 2020, International Journal of Managing Projects in Business, 13(1), 197-230. Copyright 2020 by H. Haaskjold.

A variety of tools, strategies, and procedures are used in project management processes to manage projects successfully. By including all stakeholders in the planning process, project managers may guarantee that the planning and scheduling of numerous oil and gas projects and activities are in line with organizational goals and objectives. ExxonMobil, as an illustration, has a committed project management team that works with stakeholders to guarantee that all initiatives are in line with the long-term objectives of the business.

Operational risks, high maintenance costs, and poor visibility (for offshore operations) are all problems associated with rig fleets management in the O&G sector. Using real-time tracking technologies, such as global positioning system (GPS) and internet of things (IoT) sensors, to track the location, health, and performance of the rigs can help project managers address these difficulties (Varajao et al., 2022). For instance, Royal Dutch Shell as shown in Figure 10 has put a real-time tracking system in place for its fleet of rigs, lowering downtime and maintenance expenses. Furthermore, aided in its improved cash flow (Hopkins et al., 2021).

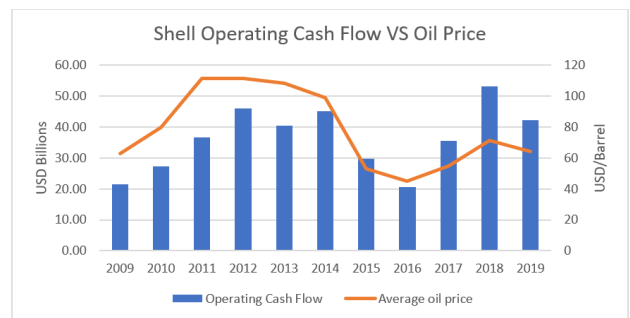


Figure 10: Shell Operating Cash Flow vs. Oil Price

Note: Shell Operating Cash Flow vs. Oil Price Statistics. Copied from “Okpabi and others vs. Royal Dutch Shell Plc and another” by S. Hopkins et al., 2021, UKSC 3, N. Ir. Legal Q., 72, 148. Copyright 2021 by S. Hopkins.

The following are the key project management processes used in planning and scheduling fleets of rigs in the O&G industry:

- 1) Create a thorough project plan: The first step in successfully managing rig fleets is to create a thorough project plan. Every project and activity that each rig is participating in, together with its schedules, dependencies, and resource needs, should be listed in the project plan. Contingency measures should be included in the plan in case there are unanticipated delays or problems.
- 2) Assign resources and schedule activities: Following the creation of the project plan, the next stage is to allocate resources and schedule activities. This entails figuring out the personnel and tools needed for each project and activity as well as the best schedule for each rig. To reduce downtime and make sure that all projects are completed on time and within budget, the schedule should be optimized.
- 3) Establish a monitoring and control system: A monitoring and control system should be put in place to make sure that the project plan is carried out successfully. This

entails putting in place routine reporting systems to monitor progress, spot potential issues, and implement remedial measures as needed (Ochieng et al., 2018). The project plan may vary, so the monitoring and control system needs to be adaptable.

- 4) Control stakeholders and convey development: Finally, put in place a stakeholder management and communication strategy to guarantee that all stakeholders are informed and involved throughout the process. To ensure that everyone is informed of the status of the project, any potential dangers, and any necessary corrective steps, this calls for regular communication with internal and external stakeholders, including project sponsors, rig operators, and regulatory bodies.

## 4. Case Study Analysis

Let's consider a hypothetical case study of an O&G firm called "OilCo." & "ExxonMobil Ltd." to illustrate the practical application of project management techniques in planning and scheduling fleets of rigs in the O&G industry.

### 4.1 Case 1: OilCo

#### 4.1.1 Challenges

OilCo utilizes a fleet of drilling rigs to extract oil and gas from the formation. Each of these rigs, which is dispersed over numerous sites, is actively engaged in several ongoing projects and operations (Bertels et. al., 2016). Recent difficulties the corporation has had controlling and coordinating its fleet of rigs have resulted in delays, cost overruns, and missed deadlines.

To address these challenges, OilCo decided to implement a project management approach to its rig fleets management operations. The next stage after creating the project plan, was allocating resources and scheduling tasks (Bertels et. al., 2016). This involves figuring out the personnel and tools needed for each project and activity, as well as the best schedule for each rig. OilCo created a thorough project plan using the project management methodology that included all the activities needed for each project, the necessary staff and tools, and the duration to complete each task. Contingency strategies were also included in the strategy in case of unforeseen delays or problems. OilCo assigned resources and scheduled tasks after the project plan had been created. Thereafter, a monitoring and control system was put in place to make sure the project plan was carried out successfully. This required putting up consistent reporting systems to monitor progress, identify potential problems, and implement remedial measures as needed (Bertels et. al., 2016). The project team would alter the schedule and provide extra resources. For instance, if the seismic survey was postponed because of bad weather that the rig could still finish the Gulf of Mexico drilling and maintenance operations on time.

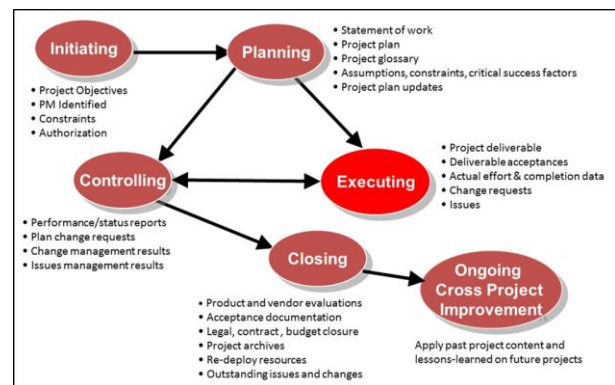
Finally, OilCo adopted a stakeholder management and communication plan to make sure that all stakeholders were informed and involved throughout the process. This required constant communication with project funders, rig operators, and regulatory organizations, among other internal and

external stakeholders. OilCo used a stakeholder leadership and interaction approach to make sure all stakeholders were aware of and participating in the process. To make sure that everyone was informed of project progress, potential dangers, and any required corrective steps, this required regular contact with key stakeholders, rig operators, and regulatory bodies.

#### 4.1.2 Recommendations

This study provides some recommendations below for O&G business regarding planning and scheduling of fleets of rigs with multiple activities:

- 1) Create a thorough project plan: Oil and gas businesses should create a thorough project plan as shown in Figure 11 that precisely describes the parameters, schedule, budget constraints, risks, and parties involved in each project. To ensure that everyone is on the same page regarding the project's objectives and expectations, this plan should be frequently updated and distributed to all stakeholders.



**Figure 11:** Comprehensive Project Management Plan

*Note:* Comprehensive Project Management Plan. Copied from "A systematic review of big data analytics for oil and gas industry" by T. Nguyen et al., 2020, IEEE Access, 8, 61183-61201. Copyright 2020 by T. Nguyen.

- 2) Develop a system for resource allocation and activity schedule that takes the capacity of rigs, staff, and other resources into account. This is important for oil and gas firms. To make sure this system is maximized for efficacy and efficiency, it should be examined and updated regularly.
- 3) Create a control and monitoring system: Oil and gas businesses should set up a monitoring and control system to check project progress about the plan, spot potential hazards, and implement corrective measures as needed. To make sure that this system is efficient at identifying and resolving difficulties, it should be constantly reviewed and improved.
- 4) Establish a stakeholder communication and management strategy: Oil and gas businesses should establish a stakeholder management and communication strategy that entails routine communication with all stakeholders, such as project sponsors, rig operators, and regulatory bodies (Lotfi et al., 2022). This will guarantee that everyone is always kept informed and involved and that any possible problems are quickly detected and fixed.

#### 4.1.3 Conclusion

In conclusion, OilCo was able to efficiently plan and schedule its fleet of rigs across numerous projects and activities by introducing a project management approach to its fleet management operations. This led to increased productivity, lower expenses, and better project outcomes. OilCo was able to overcome the difficulties it had previously encountered in managing its fleet of rigs by developing a thorough project plan, effectively allocating resources and scheduling activities, putting in place a control and monitoring system, managing stakeholders, and communicating progress. Due to the company's ability to complete projects on schedule and under budget, performance and, profitability both increased.

#### 4.2 Case 2: ExxonMobil

One of the biggest oil and gas businesses in the world, ExxonMobil operates in more than 50 nations. The business runs a sizable fleet of drilling rigs for the exploration and production of O&G from various fields all over the world. The scheduling of these rig fleets is a difficult procedure that needs careful preparation and coordination because it involves numerous operations and stakeholders. Resource availability is one of the important factors that ExxonMobil considers while scheduling its fleet of drilling rigs. This covers not just the actual rigs but also the staff and tools needed for each task. To plan and optimize its drilling schedules, the corporation makes use of sophisticated software systems, considering variables including weather, well productivity, and equipment availability.

##### 4.2.1 Scheduling of Fleet of Rigs

Drilling rig scheduling is a complicated procedure that involves managing logistics, allocating resources, and coordinating operations across various sites. ExxonMobil plans and optimizes its drilling schedules using cutting-edge software systems that consider a variety of variables, including weather, well productivity, and equipment availability. The Drilling Optimization System (DOS) is the name of the software application utilized by ExxonMobil. It is a sophisticated instrument that combines real-time data from drilling platforms, well sites, and other sources to enhance drilling productivity and efficiency.

The technology can offer insightful information to streamline drilling procedures, shorten drilling times, and improve safety. Additionally, it assists in identifying possible problems and hazards that can develop during drilling operations, allowing the business to take preventative action to reduce downtime and boost productivity. ExxonMobil uses machine learning and advanced analytics to enhance drilling performance. Machine learning models used by the business assess drilling operations data, including drilling rate, bit wear, and weight on bit, to spot patterns and trends that can be used to improve drilling procedures. This strategy has significantly increased drilling efficiency while lowering expenses.

##### 4.2.2 Stakeholder Management

Stakeholder engagement is highly valued by ExxonMobil, and the company attempts to forge enduring bonds with the

many parties engaged in each project. This covers collaborators, subcontractors, and neighbourhood groups. The business holds that interacting with stakeholders frequently and early is vital for the achievement of its operations and reduces risks. ExxonMobil, for instance, worked closely with local landowners in Papua New Guinea to address their concerns and ensured that they got their fair share of the project's benefits. To support capacity-building and job creation in the area, the company also collaborated with regional contractors to offer local workers chances for training and professional development.

##### 4.2.3 Recommendations

Based on the analysis above, here are some recommendations for ExxonMobil regarding the scheduling of fleets of rigs with multiple activities and stakeholder management:

- 1) Continually invest in technology: To optimize drilling performance and efficiency, lower costs, and improve safety, ExxonMobil should keep investing in cutting-edge software tools, analytics, and machine learning. The business will be able to sustain its competitive advantage and enhance operational performance as a result.
- 2) Stakeholder involvement should be a priority for ExxonMobil going forward, and the company should make it a point to cultivate close ties with all the many parties engaged in each project and activity. This covers collaborators, subcontractors, and neighbourhood groups. To effectively meet stakeholders' concerns and interests, the corporation should involve them frequently and early in the decision-making process.
- 3) Promote a culture of safety: ExxonMobil should promote a culture of safety throughout all its activities and make sure that all its personnel, including contractors, are properly trained and equipped with the skills and information required to carry out their duties in a safe manner. To make sure that its safety protocols are successful in reducing risks and preventing mishaps, the business should regularly examine and enhance them.

##### 4.2.4 Conclusion

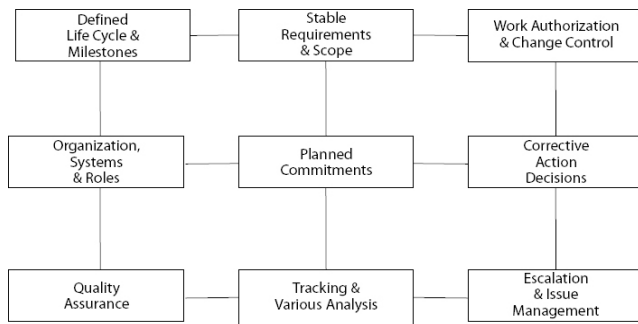
In conclusion, ExxonMobil's strategy for managing the different stakeholder interests in each project and activity as well as scheduling fleets of rigs with diverse activities is based on rigorous planning, optimization, and active stakeholder participation. To improve drilling performance and efficiency, save costs, and increase safety, the organization makes use of cutting-edge software tools, analytics, and machine learning. To reduce risks and guarantee adherence to local laws and regulations, ExxonMobil also places a high priority on stakeholder engagement and seeks to develop solid connections with a variety of stakeholders.

## 5. Discussion and Conclusion

The oil and gas sector is an important one that contributes significantly to the world economy. Nonetheless, the industry faces a variety of difficulties, such as the requirement to manage intricate and substantial projects involving numerous partners and operations (Sweis et al., 2019). Oil and gas project success depends on efficient project management



process steps depicted in Figure 12.



**Figure 12:** Effective Process Management Steps

*Note:* 9 Effective Process Management Steps. Copied from “Causes of delay in Iranian oil and gas projects: a root cause analysis” by R. Sweis et al., 2019, International Journal of Energy, 13(3), 630-650. Copyright 2019 by R. Sweis.

Well planning is a critical phase in drilling projects, and companies in the oil and gas sector recognize its importance. For instance, ExxonMobil, a leading global oil and gas company, emphasizes the importance of planning and executing wells safely and efficiently. To achieve this, they use their Integrated Operations Centre, which provides real-time monitoring and analysis of drilling operations to make informed decisions and optimize performance. Chevron, another major oil and gas company, also prioritizes well planning to minimize costs and risks. They use advanced technologies and tools to create detailed well plans, including geologic modelling, wellbore design, and drilling simulations. These plans are then refined and optimized throughout the drilling process to ensure safe and efficient well completion.

Similarly, BP uses a standardized well delivery process that integrates the expertise of various disciplines, such as geoscience, drilling, and completions, to plan and execute wells (BP, 2022). Their process includes a rigorous risk management approach to identify and mitigate potential hazards and ensure the safety of their workforce. Overall, companies in the oil and gas sector recognize the critical role of good planning in maximizing net present worth and minimizing costs and risks. They employ various methodologies and technologies to create detailed well plans, refine them throughout the drilling process, and optimize performance to achieve their objectives.

The efficient use of resources, including human capital, equipment, and supplies, is necessary for the planning and scheduling of fleets of rigs with different tasks to maximize project outcomes. The best project management techniques for fleet scheduling and optimization include routine maintenance, contingency planning, and risk management (Wanasinghe et al., 2020).

The study also highlights stakeholder management issues and offers suggestions for resolving them with efficient project management procedures. The study findings of Nguyen et al., (2020) has significantly impacted the oil and gas industry. The results will contribute to increasing the efficacy and efficiency of project management procedures

throughout the sector, which will eventually improve project results. The research also helps to build a body of knowledge that both practitioners and researchers can utilize to better understand how to manage projects in the oil and gas sector.

The needs of numerous oil and gas projects and activities can be balanced by project managers utilizing project portfolio management strategies. For instance, Total has put in place a portfolio management system that assigns resources to projects based on their strategic importance and prioritizes projects based on those priorities. Safety risks, regulatory compliance, and supply chain disruptions are among the risks connected to fleet management in the oil and gas sector (Shou et al., 2021). By putting safety procedures in place, staying in compliance with laws, and creating backup plans, project managers can reduce these risks. For instance, ConocoPhillips has put in place a safety program that stresses training and a safety culture to lower the likelihood of accidents.

### 5.1 Fulfilment of the Objective

The purpose of the paper was to investigate the challenges faced by O&G companies when planning and organising fleets of rigs used in various projects and operations, identify the crucial project management strategies that enhance effective management of rig fleets, evaluate the effects of project management strategies on the efficiency, cost, and performance of oil and gas companies, and offer recommendations for improving the project management procedures. By highlighting crucial project management techniques and methods for effective scheduling and planning of rig fleets, outlining how project managers can align the scheduling and planning of oil and gas projects with organisational goals, and offering suggestions for overcoming challenges faced by project managers while managing rig fleets, the study has successfully addressed the research questions and objectives.

### 5.2 Author’s Contribution to the Issue

The author’s key contribution was to bring the attention to a critical subject in the O&G industry through the literature evaluation for the research paper: the practical application of project management techniques to rig fleets planning and scheduling with multi O&G projects. The author has assisted in adding theoretical perspectives in project management research, particularly in planning and scheduling pertaining to fleets of rigs with multi projects and activities, by examining pertinent literature, synthesizing research data and compiling the research findings. This undertaking has the potential to add to project management literature and scholarship, aid professionals in the O&G sector in understanding the practical application of project managements processes in planning and scheduling fleets of rigs with multi project/activities and other non-O&G activities.

### 5.3 New Lessons Learned

This study has given the author fresh perspectives on the challenges of fleet of rigs management in the O&G sector.

The level to which digital technologies are playing an increasingly significant role in enhancing fleet management processes and project outcomes was another lesson learned. The author was also interested to discover how strong effective stakeholder management, leadership and communication contribute to successful management of rig fleets with multi projects.

#### 5.4 Limitation and Future Research

The fact that the research was only based on a limited number of databases and sources from the O&G sector was one of the limitations the author encountered while conducting this research. Therefore, the author suggests other databases and sources to be examined in the future in order to expand the scope of the research and generate more findings. Furthermore, other non-O&G industries involved in fleet management with multi activities can be researched in order to make comparisons on the practical application of project management techniques.

The author suggests relevant research subjects for future study based on this study. Firstly, to account for risk and uncertainty inherent in O&G exploration and production operations, it is possible to study "Practical Application of Project Management Processes to Scheduling Fleets of Rigs with Multi Oil and Gas Projects under Uncertainty". Secondly, "The Development of Effective Performance Metrics for Gauging the Success of Rig Fleets Management Initiatives" can be thoroughly studied. Thirdly, "The Influence of Technological Innovations on Fleets of Rig Management in the Oil and Gas Industry". Finally, "The Importance of Effective Collaboration Between Various Stakeholders in Ensuring Effective Rig Fleets Management Outcomes" is another related research topics that may be studied in the future.

In conclusion, this research is a significant step in the direction of enhancing project management procedures within the O&G sector. The study offers helpful insights into how the industry may enhance its project management practices by investigating the actual application of project management methods to planning and scheduling fleets of rigs with multi-O&G projects and activities.

The review of the literature suggests that the practical application of project management processes can have a significant impact on the planning and scheduling of fleets of rigs with multi projects in the O&G industry. By enabling the integration of multiple projects, improving the accuracy of project schedules, reducing the risk of project delays, and improving resource allocation, the use of project management processes can help organizations to achieve their goals and objectives. The results of this study will be very valuable to professionals, academics, and decision-makers in the O&G sector and beyond.

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