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Challenges and opportunities managing “Breenfield” Assets – A case study from Norwegian Continental Shelf

By

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ABSTRACT

This thesis examines the challenges and opportunities in managing "Breenfield" offshore energy assets during Mergers and Acquisitions in the Norwegian Continental Shelf (NCS). The study aims to analyze the dynamics of managing these assets based on existing standards, evaluate the challenges specific to the NCS, and explore methods to address these challenges during mergers and acquisitions.

Key findings reveal that organizational aspects, personnel competence, and cultural differences are the primary challenges in the O&M context. Successful integration requires careful planning, consistent governance, standardization, and effective communication. Addressing personnel and organizational aspects, rather than relying solely on technology, is very important for a smooth transitioning. In addition, challenges include managing organizational changes, regulatory compliance, and harmonizing operational practices, necessitating effective communication, change management, and risk assessment.

This research contributes to asset management by uncovering challenges and opportunities in managing "Breenfield" assets, filling a literature gap in offshore energy asset management during mergers and acquisitions. It also identifies best practices for future scenarios, promoting successful outcomes and a sustainable energy industry.

Despite its contributions, this study has limitations, including limited relevant literature, a focus solely on the NCS offshore energy industry, confidentiality constraints, and a narrow focus on "Breenfield" assets. The research employed qualitative methods, including case study research, literature review, and report analysis.

Overall, this thesis provides insights into managing "Breenfield" assets during offshore energy mergers and acquisitions. It aims to enhance asset management practices, improve efficiency, and facilitate successful integration in the energy sector, benefiting professionals, decision-makers, and future researchers.

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LIST OF ABBREVIATIONS

AT	Arbeidstilsynets tilsynsmøte (The Norwegian Labour Inspection Authority's inspection meeting)
ARP	Asset Reference Plan
APM	Association for Project Management
BSI	British Standards Institution
BMS	Business Management System
CAPEX	Capital Expenditure
CMMS	Computerized Maintenance Management System
DNV	Det Norske Veritas
EDMS	Electronic Document Management System
EI	Energy Industry
EPC	Engineering, Procurement, and Construction
ERP	Enterprise Resource Planning
E&P	Exploration and Production
FMEA	Failure Mode and Effects Analysis
FV	Ferdigstillelse- og vedlikeholdsjobber (Operation and maintenance jobs)
FPSO	Floating Production Storage and Offloading
HSE	Health, Safety and Environment
IFS	Industry Foundation Classes
IAM	Institute of Asset Management
ICAPS	Integrated Commissioning and Progress System
IO	Integrated Operations
IMO	International Maritime Organisation
ISO	International Organization for Standardization
KV	Korrosjonsvedlikehold (Corrosion maintenance)
MD	Maersk Drilling
MRO	Maintenance, repair, and operations
M&A	Merger and Acquisition
MS	Microsoft
NCS	Norwegian Continental Shelf
NMA	Norwegian Maritime Authority
OLF	Norwegian Oil and Gas Association
NORSOK	Norwegian Standard Organization
OGUK	Oil and Gas United Kingdom
O&M	Operation and Maintenance
OPEX	Operational Expenditure
OTS	Oseberg Transport System
PSA	Petroleum Safety Authority
P&ID	Piping and Instrumentation Diagram
PU	Production Unit
PMI	Project Management Institute
PRINCE	Projects IN Controlled Environments
PAS	Publicly Available Specification
RCM	Reliablity Centered Maintenance
RBI	Risk Based Inspection
SDLA	Specially Designed Lifting Appliance
SAP	Systems, Applications & Products

1 INTRODUCTION

1.1 Background of the Study

The energy industry value chain is composed of three main sectors: the upstream, midstream, and downstream sectors. Each sector has its different functions and activities geared towards the production of crude oil and natural gas, refining and processing of crude oil and natural gas respectively, and distribution of petroleum products to final consumers. This is presented in Figure 1. (Martinotti, 2014)

As shown in Figure 1, upstream activities are divided into three main phases: exploration, development, and production. Each of these parts are essential to the energy business. Exploration involves the prospecting or search for crude oil in commercial quantity. After the discovery of crude oil in commercial quantity, the business enters the second phase which is the development of the energy field. Once the development phase is completed, production commences. At each phase, heavy equipment is being utilized and this equipment varies among the phases.

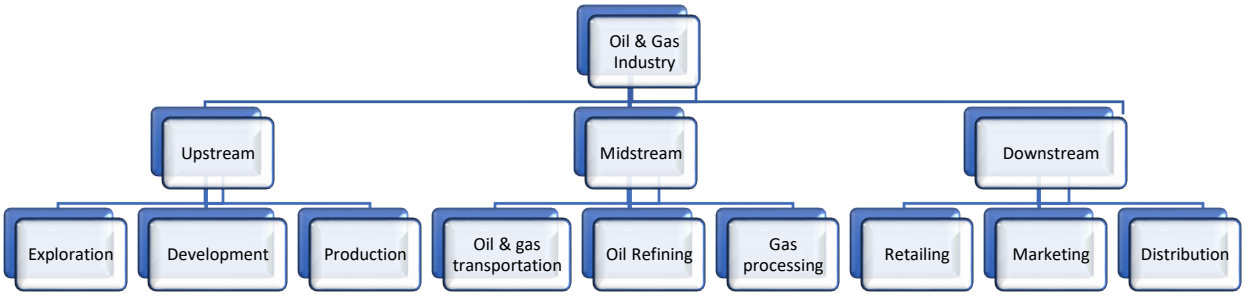

Figure 1 Energy industry value chain

The industry is heavily dependent on heavy equipment and machines. For instance, exploration and production of energy requires the installation of drilling facilities and production platforms, while refineries are built for refining crude oil to obtain petroleum products, and lastly, these petroleum products are distributed using pipelines, trucks, and filling stations. All the equipment and machines that are used in these processes are assets.

Martinotti *et al.* (2014) mentioned that the production phase has the largest opportunity amongst the three phases, because this is the phase that determines a lot of things like energy output, revenue, and profitability of the upstream business. To ensure that production

activities run smoothly, there are several factors that should be put into consideration. These are issues around health, safety and the environment, human resources, asset management, operations management, production efficiency, effectiveness of equipment and machines, and optimal production output. However, one of the most important factors is asset management.

According to (Hastings, 2010), there are five types of asset management specifications which are identified by PAS55 as financial assets, physical assets, human assets, information assets and intangible assets. The focus of this study is on physical asset management. Companies that require physical asset management are organisations that make use of plants, machinery, and infrastructure and some of them include energy industry, transport industry; mining and minerals processing; manufacturing and distribution; aviation; defence and civil works (Hastings, 2010).

Amadi-Echendu *et al.* (2010) stated that the different definitions of asset management typically encompass a wide range of topics, including general management, the operations and production industries, as well as the financial and human capital aspects. While the arenas comprise a variety of activity spheres, the broader conceptualization enables a multifaceted examination of physical assets. In their paper, they described engineering asset management as the comprehensive management of physical assets rather than financial ones.

Asset management in this context is:

"… systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their lifecycles for the purpose of achieving its organisational strategic plan." as per PAS55 published by British Standards Institute.

Also, asset management is defined as "the coordinated activity of an organisation to realize value from assets" (ISO 55000, 2014). It is asserted that an asset decision-making framework that includes organisational structures and information technology and is in line with financial and budgetary considerations is necessary for effective asset management.

Some of the importance of managing energy assets is to minimize operations and maintenance cost, reduce unplanned downtime, optimize production efficiency, enhance effectiveness of energy assets, and maximize production output. “Maximising asset and well integrity (by which we mean optimising production without compromising health, safety, and the environment) increases field recovery, and improves oil throughput” (Martinotti, 2014).

Managing energy assets is a key component in the exploration, development, and production activities. It helps to ensure the smooth running, efficient and effective working of the assets to optimize the outcome of the activities on the field. By implication, every organisation is expected to adopt the best strategy and develop the best plan for effectively managing their assets to derive optimal utility from them (Hastings, 2010).

A clear, well-communicated end-to-end process with clear roles and responsibilities, managers with the knowledge, skills, and experience to comprehend, contribute to, and implement asset management policies, strategies, and whole-life asset management plans, and justified asset policies, evidence-based asset strategies, traceable impacts, and reliable asset information are all requirements for asset management (Lloyd, 2010).

In addition to the foregoing, it is important for every staff of the organisation to possess proficient skills – asset managers are equipped with the skills of asset management for monitoring and maintaining the facilities, while engineers and project managers are equipped with integrity management skills (Amadi-Echendu, 2010). The combination of these skills and strategies is essential for maximising the assets of offshore energy production companies.

1.2 Problem Statement

Greenfield is the term used to describe a new asset, while Brownfield is the term used to describe existing asset. The thesis proposes a new approach for emerging “Breenfield” assets that refer to Brownfield assets being refurbished, repurposed, or acquired by a new company in order to give the asset a fresh start.

In other words, in the energy industry, managing a «Breenfield» asset entails acquiring, revamping, and maintaining a Brownfield assets with the aim of using that asset by different strategy.

Sometimes the cost and risks associated with greenfield assets are far less than the cost and risks associated with Brownfield assets which makes Greenfield assets easier to construct than to maintain Brownfield assets. Managing and maintaining a Brownfield assets in the energy sector entails many factors ranging from data acquisition, data storage, processing and decision making, technical malfunctions' repair, and general replacement of damaged parts.

In the same vein, there are several risks in the production of energy, most especially in offshore Brownfield assets. These risks range from safety risks, health risks, environmental risks, machine malfunctioning, accidents, downtime, and a host of other risks. The health and safety of staff is important. Also, aged offshore structures can cause accidents which may occur because of corroded pipelines, clogged valves, and other structural failures. It is important however, that these structures are monitored and maintained properly to ensure their sustainability.

Unlike greenfield assets, there are several challenges that are faced by asset managers in the field managing Brownfield assets. Some of these asset management challenges are smooth data integration, a foundation for standardization, and life cycle analysis. All these factors are important when transitioning from a Brownfield to a «Breenfield».

For instance, in terms of data integrations, in time past, problems and failures were logged manually on paper records. However, as time went by, logging became semi-automated using software like MS Excel and other spreadsheets. These software tools were prone to error as they still depended largely on human interaction which may likely lead to inefficiency in data capturing. Further, advanced software that store data in databases were adopted. Thus, when data is logged into the software, the data is stored in a database over the internet. Only authorized officers are allowed to retrieve information from these databases. Like the spreadsheets, this software depends on human interaction, which means that it is prone to human errors. Hence, the need for full automation which involves real-time monitoring of the assets using data obtained automatically directly from every part of the assets.

Despite the foregoing, there are several other challenges that will be encountered by asset managers managing «Breenfield» assets. Because of its aim which is to revamp an existing

Brownfield asset for re-use in another production site, the asset manager still must contend with challenges faced by asset managers managing Brownfield assets in addition to the challenges that are faced by managers of greenfield assets.

In other words, «Breenfield» asset managers are likely to face specific challenges like time, difficulties during merger and acquisition, energy and resource management, cultural difference, strategy and philosophy contrast as well as other generic issues to any asset: like production risks, safety risks, health risks, risk of accidents and several other risks, in addition to the requirements of green preservation and environmental footprint, power supply, local support and services, campground facilities for first workers, acceptance by local inhabitants, logistics and access, and potential decommissioning constraints.

The transition phase from Brownfield to «Breenfield» involves, in many cases, the sale and purchase of Brownfield assets in a mergers and acquisition arrangement. This means that a company who owns an existing Brownfield asset may merge with another company or may sell the asset to another company who will then take over the management of the assets. The process of merging two companies into a single entity can be a daunting and overwhelming journey, fraught with numerous important considerations and decisions that need to be made in order to effectively streamline operations, systems, people, and much more.

However, when it comes to the maintenance function of the two entities, the challenges that must be overcome can be particularly complex and multi-faceted. On the one hand, there is the challenge of efficiently migrating from one computerized maintenance management system (CMMS) to another, while also ensuring the integrity and accuracy of all data that is being transferred. On the other hand, there is the challenge of managing the culture shift among maintenance teams and their different philosophies, which can involve a range of issues related to communication, leadership, training, and more. All these challenges must be carefully navigated in order to successfully integrate the maintenance functions of the two companies, and to ensure that the newly merged entity is well-positioned to achieve its operational goals and objectives going forward.

To examine some of these factors, challenges, and opportunities, it is imperative to conduct a study to understand the dynamics of managing offshore «Breenfield» assets. Therefore, this

study aims to conduct a study to analyse the factors and challenges of managing «Breenfield» assets under mergers and acquisition scenario using the Norwegian Continental Shelf (NCS) as a case study.

1.3 The Significance of the Study

The NCS has played a major role in the Norwegian economy for more than half a century, with its energy fields generating significant revenue. However, many of these fields have reached maturity and require careful management. Some of these projects will need to be decommissioned and restored, while others will require new approaches to maintenance.

The significance of the study lies in its potential to contribute to the existing body of knowledge on the challenges associated with managing «Breenfield» energy assets during mergers and acquisition arrangements of different companies operating in NCS. By examining the approaches used by these companies to address these challenges and adapt their maintenance strategies, this study could provide valuable insights for industry professionals and policymakers seeking to improve the efficiency and effectiveness of such operations.

The transition phase in a mergers and acquisition arrangement can be tough because of the numerous activities that must be carried out to ensure smooth transition and effective management of assets after the transition phase. In this phase, existing companies and the new companies that are taking over the existing assets are likely to face many challenges which include maintenance and managing Brownfield assets. Also, there are numerous opportunities that are inherent in the adoption and revamping of Brownfield assets for redeployment in a new field. Thus, the outcome of this study will help to uncover the challenges and the opportunities that are present in managing «Breenfield» assets which will help new companies in their bid to enter a mergers and acquisition arrangement with existing companies.

The novelty of this thesis is that there are no studies in the literature published that examines the challenges and opportunities of automating the management of «Breenfield» offshore energy assets. Filling this gap will be the contribution of this study. Additionally, this research could help to identify best practices that can be replicated in future merger and acquisition scenarios, leading to more successful outcomes and a more sustainable energy industry.

Overall, this study has the potential to make a meaningful contribution to the field and benefit various stakeholders in the energy sector.

1.4 Research Question

The research questions this study aims to provide answers to are:

- What are the dynamics of managing «Breenfield» offshore energy assets in the NCS?
- What are the main challenges NCS offshore energy companies are facing during mergers and acquisition arrangements?
- How do these companies approach and tackle these challenges, and how do they adjust their maintenance strategy accordingly?

1.5 Research Hypothesis

This study adopted a qualitative research design, employing case study research to investigate the challenges of asset management during mergers and acquisitions in the offshore energy industry in the Norwegian Continental Shelf (NCS). The research hypothesis for this study is that there are significant lapses in asset management during mergers and acquisitions in the offshore energy industry in the NCS, as evidenced by a comparison of available literature and interview results from real case studies.

The study begins by conducting a thorough review of available literature on asset management in the offshore energy industry, as well as relevant industry standards and guidelines. This includes documents such as IAM guidelines, PAS55 specifications, NORSOK standard, ISO standard, IAM definitions, and AM groups and subjects. This literature review helps to establish a foundation of knowledge about the dynamics of offshore energy asset management and identify potential challenges and gaps in asset management practices specifically related to mergers and acquisitions in the NCS.

To further explore these challenges, multiple organisations operating in the NCS were selected for a case study using purposive sampling. Data was collected through semi-structured interviews with key personnel involved in the management of «Breenfield» assets, who were experienced industry professionals with up to 10 years of experience as offshore

energy asset managers and direct involvement in mergers and acquisitions. Approximately 10 to 15 interviews were planned to be conducted with different organisations operating in NCS. Based on the findings from the review of literature and the interviews with industry professionals, the research hypothesis of this study posits that there are significant lapses in asset management practices during mergers and acquisitions in the offshore energy industry in the NCS. The subsequent data analysis and interpretation will aim to support or refute this hypothesis, providing insights into the challenges faced by offshore energy asset managers during mergers and acquisitions in the NCS, and potentially contributing to the development of improved asset management strategies in the industry.

1.6 Limitations

While this study provides valuable insights into the challenges faced during acquisitions of "Breenfield" assets in the offshore energy industry in the Norwegian Continental Shelf (NCS), there are certain limitations that should be acknowledged:

1. The availability of relevant literature on this topic was limited. While efforts were made to review all relevant literature, there were few sources specifically related to the challenges of asset management during mergers and acquisitions in the NCS. This may have limited the scope of the study and potentially overlooked some important factors or perspectives.
2. The study was limited to the offshore energy industry in the NCS and did not include onshore operations. While this focus helped to provide a clear and specific context for the study, it also means that the findings may not be generalizable to other regions or industries.
3. Some of the companies contacted for interview expressed a desire to maintain confidentiality. While this was respected and their identities were protected, it may have limited the range of perspectives and experiences per company included in the study.
4. The study focused specifically on Brownfield assets acquired by different companies ("Breenfield") and did not explore other types of mergers and acquisitions in the offshore energy industry. This narrow focus may have limited the scope of the study and potentially overlooked other important challenges or factors.

Despite these limitations, this study provides valuable insights into the challenges of asset management during mergers and acquisitions in the offshore energy industry in the NCS, and the findings can contribute to the development of improved asset management strategies in the industry.

2 LITERATURE REVIEW

2.1 Asset Management

2.1.1 Introduction and definition

When searching the Internet for information on asset management, it is easy to be carried away by in a sea of results related to investment and finance. However, asset management also encompasses the management of physical assets, which can be further classified into various categories such as strategic, property, facilities, infrastructure, and enterprise asset management. Despite the apparent differences in these types of asset management, they share a common core: the need to effectively manage physical assets to achieve organisational objectives. (IAM, 2015)

Defining asset management requires a broad scope, covering a wide range of areas, including general management, operations, production, financial, and human capital aspects. This broad conceptualisation allows for a multifaceted investigation of physical assets, but it also presents a challenge in that the management of different types of assets involves a multitude of activities and spheres of activity. Therefore, a comprehensive approach to asset management is necessary to ensure the effective management of physical assets and the achievement of organisational objectives. (Amadi-Echendu, 2010)

The ISO 55000 standard has provided a comprehensive definition of asset management that can be useful for understanding its core principles (clause 3.3.1). According to this definition, asset management is "the coordinated activity of an organisation to realise value from assets," where an asset (clause 3.2.1) is an "item, thing or entity that has potential or actual value to an organisation." The notes accompanying the definition of asset management clarify that "realisation of value will normally involve a balancing of costs, risks, opportunities and performance benefits" and that the term "activity" is broadly defined to include "the approach, the planning, the plans and their implementation." (ISO 55000, 2014)

According to Hasting, Asset Management is a set of activities associated with identifying necessary assets, acquiring funding for them, acquiring and maintaining the assets, and disposing or renewing them, all with the goal of efficiently meeting a business or organisational objective. (Hastings, 2010) Meanwhile, The Asset Management Council of

Australia defines asset management as "the life cycle management of physical assets to achieve the stated outputs of the enterprise" (AM Council, n.d.) and "The British Standards Institute's PAS55 defines asset management as "systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks, and expenditures over their lifecycles for the purpose of achieving its organisational strategic plan." (PAS55, 2008) (Hastings, 2010)

According to the asset management standard PAS55, various types of assets can be identified within organisations, including financial assets, physical assets, human assets, information assets, and intangible assets. (Hastings, 2010)

2.1.2 Life cycle

The concept of life cycle activities is easier to understand when it comes to individual components of physical equipment. However, assets usually contribute value in a larger systems context. The life cycle of an asset includes all aspects of managing it from the initial concept to disposal. There are variations in the naming and number of stages and the activities involved in different industries. But the common principle is that it covers the entire process of managing assets. Figure 2 provides examples of the life cycle stages, and Section 2.1.3 of the IAM's Asset Management Conceptual Model identifies the specific life cycle stages used. (IAM, 2015)

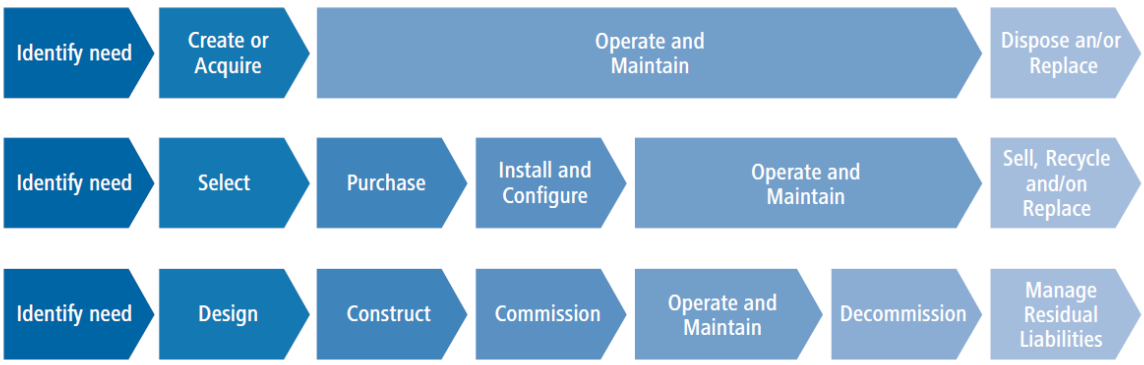

Figure 2 Examples of variations in the description of asset life cycle stages (Ref: IMA Asset Management Anatomy)

In asset management, the life cycle concept can be challenging in certain situations. For example, when dealing with complex asset systems that can have a finite or infinite lifespan

depending on the continuing need for the asset system, and how it is managed. This requires considering various factors such as maintenance strategies, component replacements, modifications, obsolescence, changing functional demands, recycling, and other options for managing the asset system. (IAM, 2015)

Another situation where the life cycle concept can be challenging is when an asset has a series of owners during its life. Each owner may have different objectives, value criteria, and planning horizons, which can affect how the asset is managed and maintained over time. These complexities must be taken into consideration when developing asset management strategies and plans. (IAM, 2015)

2.1.3 Conceptual Asset Management Model

The IAM has a conceptual model for asset management that includes six groups of subjects with a total of 39 asset management subjects. (Figure 3) (IAM, 2015)

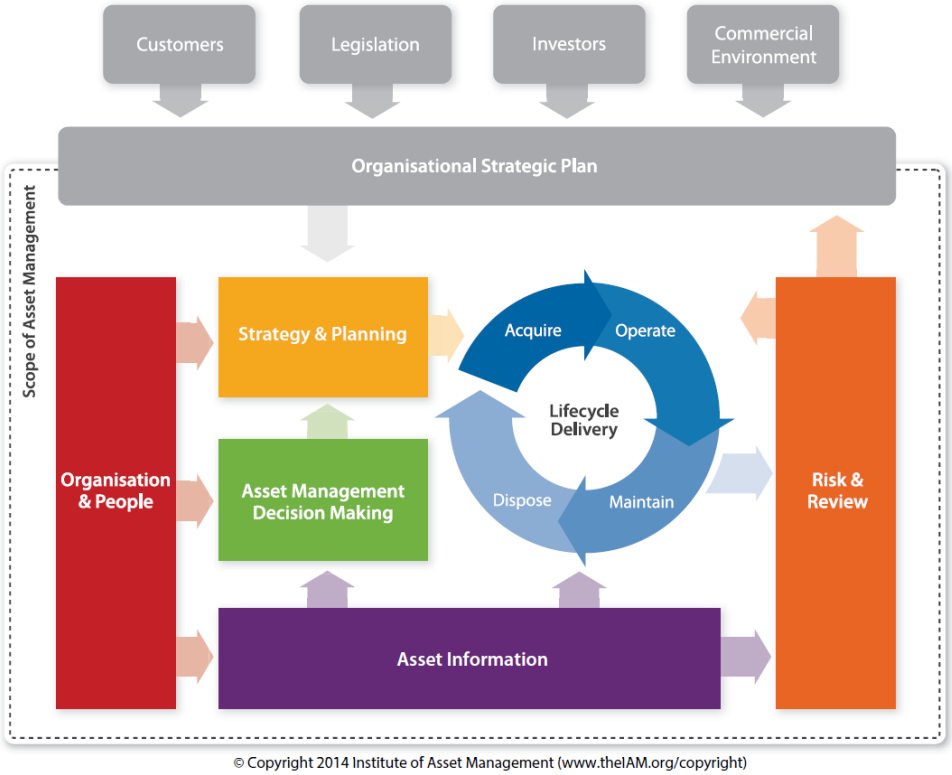

Figure 3 Conceptual Asset Management Model (Ref: IAM 2015)

These subject groups and subjects are aligned with those of the Global Forum's Asset Management Landscape, as depicted in Figure 4. (IAM, 2015)

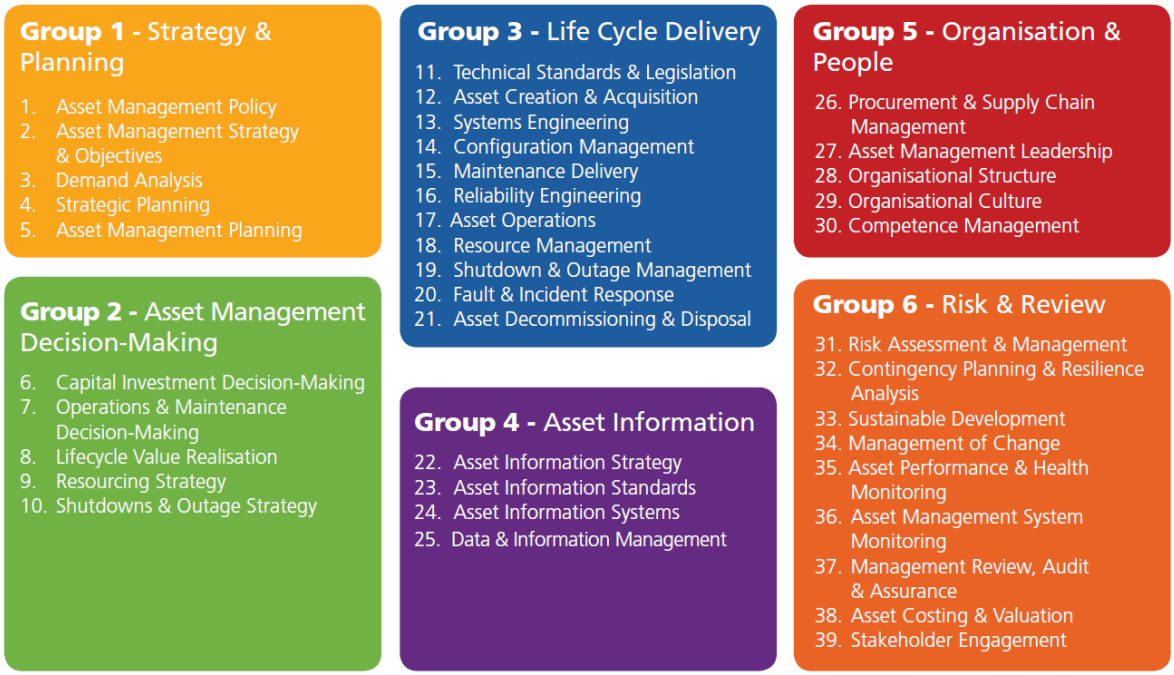

Figure 4 Alignment of the Asset Management Landscape subjects (Ref: IMA 2015)

The conceptual model for asset management by the IAM consists of six subject groups. Here is a summary of each group:

- Strategy & Planning - focuses on aligning an organisation's asset management activities with its overall objectives.
- Asset Management Decision Making - emphasizes effective decision-making for maximising the value of an organisation's assets over their lifetimes.
- Life Cycle Delivery - implements the asset management plans developed in the Strategy & Planning group, with an emphasis on controlling the activities, associated risks, and delivering successful asset management plans.
- Asset Information - emphasizes the importance of asset data and information as key enablers across asset management activities.
- Organisation & People - focuses on implementing an asset management approach that requires a change in an organisation's traditional ways of thinking and working, including organisational structures, roles and responsibilities, and contractual relationships.
- Risk & Review - identifies, understands, and manages risks associated with asset management activities, and establishes effective feedback and review mechanisms to support continual improvement.

In the next section, we will focus on two subject groups from the IAM's conceptual model for asset management: Group 3 - Life Cycle Delivery and a subject of Operations and Maintenance decision making from Group 2 - Asset Management Decision Making. These subjects are highly relevant to the topic of our thesis, which is exploring the impact of maintenance strategies on the life cycle of physical assets in industrial settings. By examining these subjects, we aim to provide insights into how organisations can optimise the life cycle of their physical assets through effective life cycle delivery and operations and maintenance decision making. (IAM, 2015)

2.1.4 Operations & Maintenance Decision-Making

The main goal of maintenance is to prevent or reduce the deterioration of asset performance and manage the risk of failures. It is essential to have a maintenance strategy to ensure predictable and acceptable performance throughout the asset's useful life, including inspections, testing, monitoring, and preventative maintenance regimes. Maintenance is usually funded from operational expenditure (OPEX) and is distinct from capital expenditure (CAPEX). Poor design, procurement, or operating practices can cause defects leading to equipment failure. Techniques like FMEA, RCM, and RBI can help develop effective maintenance strategies. Good decision-making practice for maintenance and operations involves evaluating and bundling activities into planned work tasks through CMMS to minimize the operational impact of shutdowns and outages. (IAM, 2015)

2.1.5 Life Cycle Delivery

The integration of activities across the life cycle can help organisations reduce costs. Implementing good design, procurement and asset operation practices can increase asset reliability and availability, and reduce the need for corrective maintenance, resulting in additional value at a lower cost. (IAM, 2015)

The challenge of asset management during the lifecycle delivery stage is related to integration. This is because a large majority (about 80%) of the costs associated with an asset or asset system occur during the maintenance and operations phase of the lifecycle. (Lloyd, 2010)

2.1.6 Technical Standards & Legislation

All organisations must adhere to relevant legislation and internal and external technical standards. These requirements should be taken into account when developing asset management strategies and plans, as well as in the delivery of life cycle activities. Organisations should have processes in place to identify relevant requirements and incorporate them into their policies and processes. It is good practice to have independent individuals audit compliance and report results to an independent compliance committee within the organisation. (IAM, 2015)

Organisations can minimize the risk of maintenance-related issues and ensure the long-term success of the merger or acquisition by addressing these challenges early on and developing a comprehensive maintenance strategy that takes into account technical standards and legislation. (IAM, 2015)

2.1.7 Asset Creation & Acquisition

In this section, it is discussed how organisations can acquire additional assets to achieve their asset management objectives. This can be done through purchasing already operational assets or accepting the handover of assets constructed by others. The creation, installation, and commissioning of assets are part of this process, including the approval and release of funding, arrangements for handover to operations, and the monitoring of costs. The development of requirements, analysis, design, and strategies for verification and validation are also part of this process. (IAM, 2015)

The creation phase is often managed as a project or program of work, consisting of multiple projects with their own deliverables and success criteria aligned with the asset management plan(s). Project management methodologies, such as APM, PRINCE, and PMI, are used to control activities and ensure delivery and governance. The project cycle is divided into phases separated by governance gateways that approve, or halt, progress to the next phase. These phases include the concept phase, definition phase, implementation phase, and handover and closeout phase. The involvement of personnel with experience in operating and maintaining similar assets in the concept phase can improve the likelihood of achieving project success criteria. (IAM, 2015)

This section is pertinent to mergers and acquisitions in the oil and gas industry as it discusses how organisations can acquire additional assets to attain asset management objectives. During a merger or acquisition, organisations may acquire new assets and need to integrate them into their existing asset management strategy and plan. The processes discussed in this section can help organisations to effectively integrate new assets into their existing asset management system. It is also important for organisations to consider the maintenance challenges associated with integrating new assets and develop appropriate maintenance plans and strategies. (IAM, 2015)

2.1.8 Maintenance Delivery

As already mentioned above, in asset management, maintenance delivery involves effectively and efficiently managing processes and resources to deliver maintenance and inspection regimes selected through operations and maintenance decision-making. This requires cross-functional coordination and integration of activities across different departments such as Operations, Engineering, Finance, HR, IT, and specialist support functions.

Maintenance delivery plans are developed using maintenance specifications and standards, asset inventorial information, condition and performance information, and techniques for bundling and scheduling maintenance tasks. This helps prevent or mitigate deterioration of asset performance, manage the risk of failures, and ensure assets continue to meet service and performance requirements. (IAM, 2015)

2.1.9 Asset Operations

Asset operations refer to the processes used to operate assets in order to achieve business objectives. Operators need to be provided with information and training on how to operate the assets within the appropriate design, maintenance, and operational parameters. In some cases, an asset operations strategy may be developed to outline the approach and resources needed to manage and implement operations, along with a plan to ensure that the assets meet their functional requirements, are operated within specified parameters, meet health and safety requirements, achieve defined levels of performance, and provide a basis for modifying operating parameters based on experience. (IAM, 2015)

In the context of mergers and acquisitions in the oil and gas industry, understanding and managing assets is a critical aspect of achieving business objectives. The acquirer needs to evaluate the assets of the target company and assess their condition, performance, and compliance with legal and regulatory requirements. It is also essential to consider the maintenance and operational parameters of the assets, as well as the strategies and plans in place for their operation. (IAM, 2015)

2.1.10 The asset reference plan (ARP)

The Asset Reference Plan (ARP) is an integrated plan that considers both long-term and short-term issues and their impact on the asset's performance, cash flow, resources, and profitability.

During a merger or acquisition, the Asset Reference Plan (ARP) becomes even more crucial as it provides a complete and consolidated overview of the assets involved in the merger or acquisition. It helps in evaluating the strengths, weaknesses, opportunities, and threats associated with the assets and provides a basis for quantifying and optimising activities for the best net value to the asset owner or parent organisation. (Lloyd, 2010)

Having an ARP in place during a merger or acquisition allows for better decision-making and strategic planning. It helps in identifying potential synergies and risks associated with the assets, and enables effective integration of the assets into the merged or acquired entity. The ARP serves as a reference point for aligning asset strategies, plans, and performance objectives, and ensures that the assets are operated and maintained in a manner that maximizes their value and supports the overall business objectives of the merged or acquired entity. (Lloyd, 2010)

2.2 Asset Management in Oil and Gas

The oil and gas industry is one of the most successful sectors in using the asset management approach, according to Woodhouse (Lloyd, 2010). The integrated asset management concept has been developed with varying degrees of success in different sectors. However, organisations in the downstream oil industry, like petrochemical organisations, have been some of the slowest to apply asset management approaches and techniques. Even though

many manufacturing companies have adopted good practices, such as total quality and lean, they lack the overarching structure that balances long-term values with short-term results and actions.

The offshore oil and gas industry has an asset-demanding nature of fixed platforms, floating platforms, and subsea production units. These assets need to be managed with reference to HSE risk management and productivity. However, Shea and Hollywood (Hollywood & Shea, 2013) point out that it is surprising that the offshore oil and gas industry is not very familiar with asset management and the newly-developed asset management standard, ISO 55000.

Woodhouse (Lloyd, 2010) also notes that it was the North Sea oil and gas industry that developed many of the core principles of integrated, optimised, and lifecycle physical asset management. The asset management model emerged from a series of serious events in the 1980s that threatened the whole existence of the oil and gas industry. In the 1980s, the oil price fell below the production cost, all the easy oil was produced, and the Piper Alpha disaster killed 167 people.

The oil and gas industry has been a pioneer in integrated, optimised, and lifecycle physical asset management. The industry developed the asset management model after a series of serious events in the 1980s that threatened the whole existence of the industry. The successful projects implemented in BP and Shell showed that an approach to lifecycle asset management, along with radical changes in culture, processes, roles, decision-making processes, performance measures, and risk management processes, was key to achieving optimal asset management. (Lloyd, 2010)

2.2.1 Greenfield, Brownfield, and Breenfield Assets

Brownfield, Greenfield, and Breenfield are widely used terms in the energy sector, especially in oil and gas exploration and production. While these terms are not officially defined in any industry standard or regulatory document, they have become commonly accepted and understood within the industry.

Figure 5 Brownfield, Greenfield and Breenfield

Brownfield - refers to an oil or gas field that has already been developed and has existing infrastructure in place. This could include things like drilling rigs, pipelines, storage tanks, and other equipment and facilities used in oil and gas production. Brownfield assets may be old and in need of maintenance or upgrading to remain productive, but they are typically less expensive to develop and can produce oil or gas more quickly than starting from scratch.

Maintenance is a critical component of Brownfield asset management, as it ensures that assets continue to operate safely, reliably, and efficiently over their lifespan.

One relevant case study in Brownfield asset management on the Norwegian Continental Shelf is the redevelopment of the Oseberg field, which was originally discovered in 1979 and began production in 1988. The field had experienced declining production in recent years, but Statoil (now Equinor) implemented a redevelopment program in 2016 to increase production and extend the life of the field (Equinor, Statoil annual report, 2016). The program involved drilling new production wells and upgrading existing facilities to improve efficiency and reduce operating costs. The redevelopment program was successful, and the Oseberg field is expected to continue producing until 2040 (Equinor, Equinor Annual report, 2021)

Brownfield asset management in an oil field requires a comprehensive approach to maintenance. This approach should include regular inspections and assessments of infrastructure, with the aim of identifying potential issues before they become problems. Additionally, maintenance teams should have a clear understanding of the criticality of different assets, so that they can prioritise maintenance activities accordingly.

An effective maintenance program in a Brownfield oil field should also include a well-defined maintenance strategy, which outlines the types of maintenance activities to be performed, the frequency of these activities, and the resources required. This strategy should be based on an understanding of the operating conditions and demands placed on the assets, as well as their expected lifespan and reliability.

In contrast, **"Greenfield"** refers to an undeveloped oil or gas field that has no existing infrastructure. This would require significant investment in new drilling rigs, pipelines, storage tanks, and other equipment and facilities to extract and transport the oil or gas. Greenfield assets are generally more expensive and time-consuming to develop than Brownfield assets, but they offer the potential for higher yields and longer-term profitability.

One notable example of Greenfield asset management on the Norwegian Continental Shelf is the development of the Johan Sverdrup oil field (Equinor, 2020). The Johan Sverdrup is one of the largest oil fields in the North Sea, with estimated reserves of up to 3.2 billion barrels of oil equivalent. The field was discovered in 2010, and the development plan was approved by

Norwegian authorities in 2015. The field began production in 2019, and is expected to produce for several decades (Olsen, 2017).

The management of the Johan Sverdrup field involved a wide range of stakeholders, including the field operator Equinor, government regulators, and local communities (Equinor Sustainability, 2021). The project was developed using a phased approach, with different parts of the field developed over time. This approach allowed the project team to manage risks and ensure that the field was developed in a safe and efficient manner.

Another example of greenfield asset management on the Norwegian Continental Shelf is the development of the Aasta Hansteen gas field. The Aasta Hansteen field is located in the Norwegian Sea, and is the deepest offshore field ever developed in Norway, with a water depth of up to 1,300 meters. The field was discovered in 1997, but development did not begin until 2013. The field, with Equinor owning a 51% stake, Wintershall (24%), OMV (15%), and ConocoPhillips Skandinavia (10%), began production in 2018, and is expected to produce for several decades (NS Energy).

Effective greenfield asset management on the Norwegian Continental Shelf requires careful planning, stakeholder engagement, and the use of innovative technologies to manage risks, ensure safe and efficient development and promote sustainability.

"Breenfield" - is a relatively new term that has emerged in recent years to describe projects that aim to combine the benefits of both Brownfield and greenfield approaches. Breenfield assets involve developing new oil or gas resources while reusing existing infrastructure (Brownfield). This can reduce the costs and environmental impact of new development while maximising the use of existing resources.

Breenfield assets constitute a significant opportunity for future expansion and development within the context of the Norwegian Continental Shelf. One notable case study of «Breenfield» development on the Norwegian Continental Shelf is the Maersk Inspirer rig that was acquired by Repsol Norge AS and has gone through several modifications to meet the requirements.

Repsol Norge AS, the operator of the Yme field, has agreed to take over the day-to-day operations of the Mærsk Inspirer jack-up rig from Maersk Drilling (MD) on behalf of the Yme license. The agreement involves the sale of the rig to Havila Sirius AS, who will lease it to the Yme licensees under a bareboat charter. Repsol Norge AS holds a 55% working interest in the Yme field, while Lotos Exploration and Production Norge AS, KUFPEC Norway ASA, and OKEA ASA hold 20%, 10%, and 15% working interests, respectively. The Yme field was discovered in 1987 and is located in Blocks 9/2 and 9/5 in the Egersund Basin, around 100 km off the coast of Norway. The Maersk Inspirer rig has undergone significant modifications to its structure to accommodate new facilities, ensuring compliance with safety regulations and environmental standards. Repsol's Yme New Development Project involves the commissioning of a new wellhead module on existing facilities at the Yme field, as well as upgrades and modifications to the Maersk Inspirer rig prior to installation in the field. The goal is to connect to existing wells and installations on the seabed offshore. (Repsol, 2021)

Repsol's maintenance management at the Yme field has challenges due to ongoing projects and changes. A supervisory inspection found seven areas of non-conformity related to inadequate management, outdated documents, insufficient programs, and poor planning. (Mihajlovic, 2022)

The development of "Breenfield" assets, similar to the Maersk Inspirer, presents a significant opportunity for growth and development in the Norwegian Continental Shelf. Although these projects are complex and challenging, they offer the potential for substantial economic benefits, as well as the opportunity to further develop Norway's expertise and leadership in the oil and gas industry.

2.3 Operation and Maintenance during Merger and Acquisition (M&A)

Mergers and acquisitions, commonly referred to as M&A, are quite common in many industries, including the oil industry. In some cases, one company may acquire the entirety of another company, as Shell did when they purchased BG Group a few years ago. (Shell Global, 2016) However, it's also common for a company to buy individual assets from another company, such as when Chrysaor bought some assets from Shell after they were deemed to have been completed. (Financier, 2017) When one company buys another, they inevitably

absorb all their operations, assets, and staff into the new company. This includes updating and migrating all the associated documentation, which could be stored in various locations and may include duplicate or missing documents.

The documentation associated with the assets that the new company has acquired can be quite technical, including drilling reports, interpretation reports, operations reports, HSE reports, and other intellectual capital that the previous company had accumulated. Even though the new company now owns these assets, the operations still need to carry on, and all the information contained within these documents needs to be absorbed by the new company to ensure continued operation and growth. This can be a challenging and time-consuming process, but it is essential to make sure that the new company has access to all the necessary information to manage and maintain these assets effectively.

The process of merging two companies begins with the announcement of the merger, and preparations are made to ensure operations can continue without interruption. The next step is migrating all the data and documents from both companies into one system, which can be complicated if they use different technologies. Sorting through potentially millions of poorly organised documents and identifying duplicates and the definitive version is a challenge. The merged company needs to find a way to manage all the information and make it accessible to users. They may already have some of the data, but there is still a need to understand and incorporate data stored by third parties off-site, or risk losing it.

2.3.1 Challenges

Mergers and acquisitions bring opportunities for growth and synergy, but they also pose significant challenges. Figure 6 highlights the main challenges faced during operating such assets based on available literature findings.

Figure 6 Main challenges of Mergers and Acquisitions

Time

When two companies merge or one company purchases assets from another, the process of integrating data and information can take a significant amount of time, ranging from one to two years depending on the scale of the purchase. The buying company must ensure that operations continue without disruption during this period, but integrating information is often left until later. This can result in decision-making based on incomplete or outdated information, which hinders the potential benefits of the merger or acquisition. (M-Files, 2019)

Data Management

One of the challenges is the management of data, as people from each organisation may work in silos and use only the data they are familiar with, not realizing the availability of other data. Purchasing just one asset presents similar challenges. The data must be extracted from the selling company's databases and systems and transferred to the buying company's

equivalents or new systems. If the selling company is not certain of all the documents and data related to the assets, then they cannot be sure that they have given them all to the buying company.

Integrating data from different systems can be costly and time-consuming, and if the data is extracted into a flat file, the file name needs to be related to the data inside it. If the selling company does not provide all the necessary information to the buying company, then valuable information could be lost forever. (M-Files, 2019)

Resources

The process of integrating data and information during a merger or acquisition is a significant undertaking that requires a lot of work from both the buyer and the seller. It can be time-consuming, costly, and complex, but it is essential to ensure that the benefits of the merger or acquisition can be realized. (M-Files, 2019)

Knowledge share

Additionally, if an employee from the purchased company leaves, they take their knowledge with them, which can be a significant loss for the buying company if not captured beforehand.

Cultural and Organizational challenges

Mergers can be challenging for companies due to the significant organisational anxiety that they can create. The merger process involves changing the operating model and culture of one or both companies, which can challenge the core identity, purpose, and daily work of the organisation. Even small tactical changes such as new expense policies or cafeteria options can have a significant impact on employees' emotions and morale. These "organisational emotions" need to be anticipated and addressed to ensure effective integration and prevent poor business performance, loss of critical talent, and leakage of synergies.

To protect the sources of value, both financial and organisational, merging companies must shift the day-to-day behaviour and mindsets of their employees. However, many companies struggle to implement successful change programs, with only one-third of leaders regard them as successful. Organisational concerns like the difference in culture and changed operating models are major contributors to the failure of mergers to meet expectations,

accounting for almost 50% of the issues according to a ten-year survey of M&A executives by McKinsey. (McKinsey, 2008-2018)

One of the main challenges is that management tends to focus mostly on changes that directly help capture a deal's value targets; neglecting these kinds of factors can help to maintain and enhance the company's health. Organisational design is always top of mind in the early stages of merger planning, but cultural differences are often ignored until difficult issues arise. At this point, the company's base business may have already suffered, top talent may have looked for external opportunities, and capturing synergies may have become more difficult.

The challenges of cultural differences and changed operating models described above can also impact the maintenance team's ability to work together to ensure a seamless transition. Maintenance teams may have different processes, procedures, and standards, and it is crucial that they find ways to work together efficiently and harmoniously. (Kaetzler, 2019)

MRO Inventory Management

Another challenge during M&A can be combining maintenance, repair and operations (MRO) master data from different companies. Maintenance, repair, and operations (MRO) inventory management is crucial to maintaining productivity and reducing downtime in industries like oil and gas. Following an M&A deal, companies must manage and standardize data coming from acquired companies' disparate ERP systems, which can jeopardize the merger's success if managed poorly. For maintenance teams, this means that without a common understanding of MRO master data, combining systems can be challenging, resulting in higher costs and increased error potential. Best-in-class data management is key to ensuring safety, increasing productivity and reducing costs in the long term. Therefore, maintenance teams must prioritize sound master data management and governance to drive substantial business value, improve process safety, reliability, and resiliency. (Popa, 2023)

The failure of M&A deals is often caused by the inability to properly manage and share data. To ensure successful mergers or acquisitions, it is crucial to have sound master data management and governance in place. High-quality data is a valuable asset that plays a significant role in driving business success. Effective data management is essential to improve safety, boost productivity, and reduce costs in the long run. (AddEnergy, 2023)

In this context, the decision regarding spare parts inventory is crucial, as it can significantly impact production costs and process safety. Spare parts inventory for drilling and production machinery is often expensive and difficult to manage compared to raw materials inventory, which is more demand dependent. (Popa, 2023) (Ali, 2020)

Therefore, effective MRO inventory management systems are essential in industries that rely heavily on spare parts inventory, as they can significantly impact the efficiency and profitability of the business. This is particularly relevant in the context of mergers and acquisitions, where companies must combine disparate systems and manage data effectively to avoid jeopardizing the success of the merger. (Ali, 2020)

If the maintenance strategies for a certain equipment boundary were inadequate for the operating demand and did not include the necessary maintenance required by legislation and if there were fundamental tasks missing from available work instructions, then these challenges can be addressed by identifying the equipment that needed strategy alignment and optimisation. They reviewed existing client data and documentation and developed new maintenance strategies. These strategies were workshopped with the maintenance team to get their input and approval. Finally, the company supported the loading of the new strategies into the client's EDMS. (AddEnergy, 2023)

CMMS

In the context of mergers and acquisitions, there are several challenges that arise when integrating maintenance functions. One significant challenge is the merging of different Computerized Maintenance Management System (CMMS) software, such as SAP and Maximo. While these are common CMMS programs, they have distinct structures and asset identification methods. For instance, Maximo may not identify assets at the lowest component level, whereas SAP can identify assets at the component or construction level. This disparity makes it difficult to determine how assets are identified within the CMMS and at what level. Without a comprehensive understanding of both CMMS programs, integrating them in an organized manner becomes a considerable challenge. To address this challenge, it is crucial to have individuals familiar with both CMMS programs who can decode the data, transfer all assets, and effectively integrate the systems. (AddEnergy, 2023)

Another challenge that arises after integrating all assets into a single CMMS is dealing with unidentified assets. This issue often stems from the acquiring company's previous acquisitions, resulting in a lack of visibility and documentation for certain assets. Over time, this can escalate into a significant problem, as work orders may be generated and maintenance may be performed on equipment that is not properly recorded in the CMMS, or in some cases, maintenance may not be performed on equipment that is entirely missing from the CMMS. Capturing data for these missing assets is crucial but is often overlooked until it becomes a pressing issue. Internal teams may be preoccupied with their regular job responsibilities, and companies may hesitate to allocate the necessary budget and effort to identify and capture data for these assets. However, delaying this process can lead to increased operational risks and inefficiencies. To overcome this challenge, various methods can be employed, such as conducting desktop asset verification through Piping and Instrumentation Diagrams (P&IDs) and performing field walk downs and physical asset verification.

In addition, conducting a thorough analysis of the bill of materials or spare parts can help identify all the components comprising a piece of equipment. This analysis not only aids in capturing missing data in the CMMS but also assists in developing an optimal spare parts strategy, including determining which parts should be kept on hand. These efforts are essential for filling in the gaps in CMMS data and ensuring accurate information for each asset, enabling efficient maintenance planning and execution, and ultimately reducing operational risks while enhancing overall asset management. (AddEnergy, 2023)

Staff Integration and Cultural Alignment

Apart from technical challenges, merging companies must also address the integration of staff and the cultural aspects of the acquired company. This task can be complex and time-consuming, as each company has its unique approach to maintenance. Unifying everyone and aligning them with a common goal requires involvement from the operations and maintenance teams from the beginning. Workshops facilitated by industry experts can help staff adapt to the new working culture, and training becomes crucial for merging two company cultures. It is important to recognize that existing workers have been following specific maintenance practices for a long time, which may differ from those desired by the

acquiring company. Bringing everyone together as a team and establishing a shared goal of running the company efficiently serves as a solid starting point for unifying the team. (AddEnergy, 2023)

Document control

Document control poses a significant challenge during mergers and acquisitions. The review and organization of numerous documents from both parties can be a daunting task. However, proper documentation is critical for successful maintenance operations, as the absence of comprehensive documentation can make it difficult to maintain complex equipment and result in substantial financial losses in the event of downtime. To tackle this challenge, a clear structure and dedicated teams for document control tasks are essential components of an effective integration process. (IAM, 2015)

3 METHODOLOGY

3.1 Introduction

In this chapter, research methods presented for studying the NCS's "Breenfield" asset management dynamics. Beginning with an overview of necessary research techniques and study designs, this chapter delves into a number of interconnected topics. To gather information, this study employed a qualitative methodology, with interviews serving as the primary data collection tool.

3.2 Ethical Considerations

Any scientific investigation, including the current one, must adhere to a set of ethical guidelines. Ethical considerations were given before to conducting this study to protect the rights and confidentiality of the participants.

Informed consent

- Before beginning the interview, informed consent was sought from all participants. All participants were given clear information about the study's background, goals, and procedures of data collecting. They were also made aware of the fact that declining to participate in the interview would have no repercussions on their part.

Confidentiality

- Individuals' right to privacy was respected throughout the research process. Participants' names were withheld from the study to protect their privacy. All participant information was treated as strictly secret and maintained safely to prevent any tampering.

3.3 Research Strategy

This study aims to examine the challenges of managing "Breenfield" energy assets under M&A arrangement using the NCS as a case study. The specific objectives are to:

- Examine the dynamics of managing "Breenfield" offshore energy assets based on existing standards and guidelines.
- Evaluate the challenges of managing "Breenfield" energy assets in the NCS under the mergers and acquisition arrangement.
- Discover the methods that have been put into place to address the challenges in managing "Breenfield" energy assets during mergers and acquisitions involving various companies operating in the NCS.

The research hypothesis for this study is that there are significant lapses in asset management during mergers and acquisitions in the offshore energy industry in the NCS, as evidenced by a comparison of available literature and interview results from real case studies.

To investigate the challenges, this study adopts a qualitative research design, employing case study research. The study begins by conducting a thorough review of existing literature on asset management in the offshore energy industry, as well as relevant industry standards and guidelines. This includes documents such as IAM guidelines, PAS55 specifications, NORSOK standard, ISO standard, IAM definitions and AM groups and subjects. This literature review helps to establish a foundation of knowledge about the dynamics of offshore energy asset management and identify potential challenges and gaps in asset management practices specifically related to mergers and acquisitions in the NCS.

To ensure the reliability and validity of the data obtained from these reports, the study focused primarily on investigation and audit reports. The reason behind this selection was that these reports are conducted by impartial, third-party organisations, and are typically more objective in their analysis of the challenges faced by companies during mergers. Moreover, these reports provide a comprehensive overview of the challenges encountered during, before or after mergers and acquisitions, along with detailed information on how these challenges were resolved.

By reviewing these reports, especially audit reports that were conducted on the assets during or after the mergers, the study was able to identify the challenges that were particularly relevant to the oil field, especially in the NCS. These challenges included issues related to asset management, regulatory compliance, operational efficiency, financial management, and employee integration. The insights gained from these reports helped to identify gaps in the current literature on asset management practices in the oil and gas industry, specifically during the mergers and acquisitions process, and provided valuable insights for the current study.

To further explore these challenges, multiple organisations operating in the NCS are selected for a case study using purposive sampling. Data is collected through semi-structured interviews with key personnel involved in the management of "Breenfield" assets, who are experienced industry professionals with more than 10 years of experience as offshore energy asset managers in maintenance and operations, and who have direct involvement in mergers and acquisitions. Due to confidentiality concerns, the names of the companies and respondents cannot be disclosed. However, it should be noted that a total of 17 semi-structured interviews were conducted with various organisations operating in the NCS, as described in Chapter 4 where the results are presented.

Based on the findings, the research hypothesis posits that there are significant lapses in asset management practices during mergers and acquisitions in the offshore energy industry in the NCS. The subsequent data analysis and interpretation will help to provide insights into the challenges faced by offshore energy asset managers during mergers and acquisitions in the NCS, and potentially contributing to the development of improved asset management strategies in the industry.

3.4 Limitations

This study provides insights into the challenges faced during M&A of “Breenfield” assets in the offshore energy industry in NCS, but there are certain limitations to consider. As it was already mentioned in first chapter, the limited availability of literature on this topic, the focus solely on the offshore energy industry in the NCS, confidentiality concerns with some companies, and the narrow focus on Brownfield assets acquired by different companies are

all limitations of this study. However, despite these limitations, the study still offers valuable insights into the challenges of asset management during mergers and acquisitions in the offshore energy industry in the NCS, which can aid in the development of improved asset management strategies.

4.1 North Sea

According to Ministry of Petroleum and Energy of Norway (Ministry of Petroleum and Energy, 2021), the discovery of a large land gas field Groningen in the Netherlands in 1959 led geologists to believe that the same rock formation could be found in the North Sea. This led to the discovery of a gas field off the English East Coast in the 1960s. Initially, oil and gas exploration in the North Sea was unsuccessful, but in 1969, oil was finally discovered. The subsequent development of the North Sea became one of the largest investment projects in the world. The North Sea is shared between several countries, including the UK, Norway, Denmark, Germany, Netherlands, Belgium, and France. The Norwegian Continental Shelf (NCS) is one of the major regions for oil and gas exploration in the North Sea, and it has been a significant contributor to the Norwegian economy over the past few decades. As a result, the oil and gas industry in Norway has become one of the most advanced and innovative in the world, with a strong focus on safety, environmental protection, and sustainable practices.

4.2 The Norwegian Continental Shelf

The Norwegian Continental Shelf (NCS) is a vast underwater plateau that extends from the coast of Norway into the North Atlantic Ocean. The NCS spans a massive approximate 2.28 million square kilometres, which makes it six times greater in size than mainland Norway, Svalbard and Jan Mayen combined (NPD, 2022)(Fig 5). It is a geologically complex area, with a long history of sedimentation and tectonic activity of the rifted basin and passive margins as present within the Barents Sea, which has resulted in the

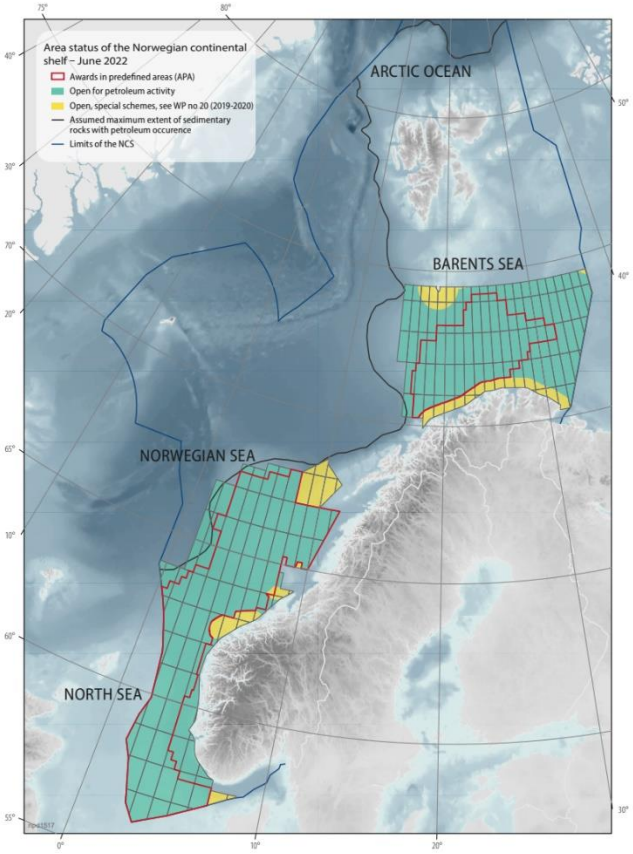

Figure 7 Area Description of NCS (Ref: NPD 2022)

formation of numerous oil and gas reserves (Faleide, 2010).

According to the Norwegian Petroleum Directorate, in its 2022 resource report, a total volume of resources was estimated at 15.864 billion standard cubic meters which is broken down as 9.258 billion standard cubic meters (Sm3) of oil, and 6.606 billion Sm3 of gas (NPD, 2022).

The NCS has been extensively explored and developed since the discovery of the Ekofisk field in 1969, with the first commercial production beginning in 1971. Since then, Norway has become a major oil and gas producer, with the NCS being the largest offshore oil and gas producing region in the world (Ministry of Petroleum Energy, 2014).

The oil and gas industry on the NCS is heavily regulated by the Norwegian government, with strict safety and environmental regulations in place to minimize the impact on the environment. The government also owns a majority stake in the major oil and gas companies operating on the NCS, including Equinor, Aker BP, and Total (Szulecki, 2021).

In recent years, there has been increasing focus on the environmental impact of oil and gas production on the NCS, with calls for a transition towards renewable energy sources (IEA, 2020). The Norwegian government has set ambitious targets for reducing greenhouse gas emissions and has also established the Longship project to support the development of carbon capture and storage technology (Norwegian Ministry of Petroleum and Energy, 2019-2020).

Despite these challenges, the NCS continues to be an important source of energy and revenue for Norway. According to the Norwegian Ministry of Petroleum and Energy, the oil and gas sector accounts for around 25% of Norway's GDP and 52% of its total exports (Harbo, 2008). Offshore energy asset management in the Norwegian Continental Shelf is a complex and dynamic process that requires a systematic approach. Studies have shown that qualitative research methodologies provide an opportunity to explore and understand the complexities of offshore energy asset management in the Norwegian Continental Shelf.

Oil and Gas companies operating in NCS require more than just physical equipment assets to achieve organisational goals. According to (Lloyd, 2010), finding an oil reservoir, constructing extraction platforms, operating and maintaining them, and disposing of them all involve

physical infrastructure, personnel, knowledge, support systems, logistic systems, data information, and supplier relationships. To achieve maximum value from NCS assets, all these elements need to be combined to provide the optimum lifecycle value to the entire system. The offshore production infrastructure in NCS is complex, with various production assets such as gas-treatment units, power stations, heliports, and hotels. These assets, along with operational processes and personnel requirements, define the necessary resources. Asset management in NCS acknowledges that the overall output of all these systems and processes represents the asset performance in NCS. (Figure 6)

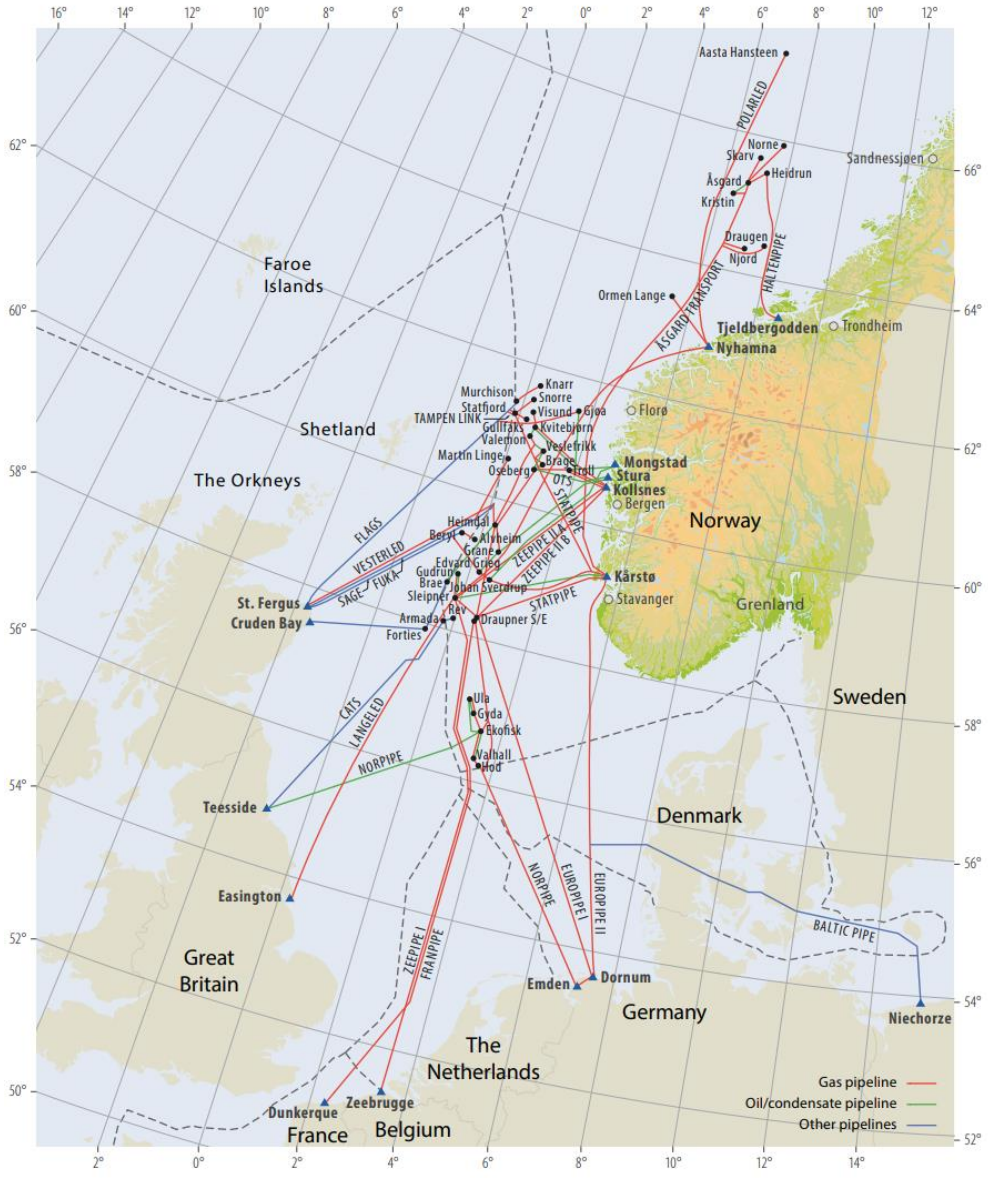

Figure 8 Infrastructure on the NCS (Ref: NPD 2022)

Considering the complexity and criticality of asset management in the offshore energy industry, particularly in the Norwegian Continental Shelf (NCS), it is important to understand the challenges and best practices in managing assets during mergers and acquisitions. To shed light on this issue, a case study research approach can be employed to investigate specific examples and gain insights into effective asset management strategies in the NCS.

4.3 Case study 1. Martin Linge

4.3.1 Background

Martin Linge, an oil and gas field under development west of the Oseberg field in the North Sea, has estimated recoverable resources of over 300 million barrels oil equivalent. (Figure 7)

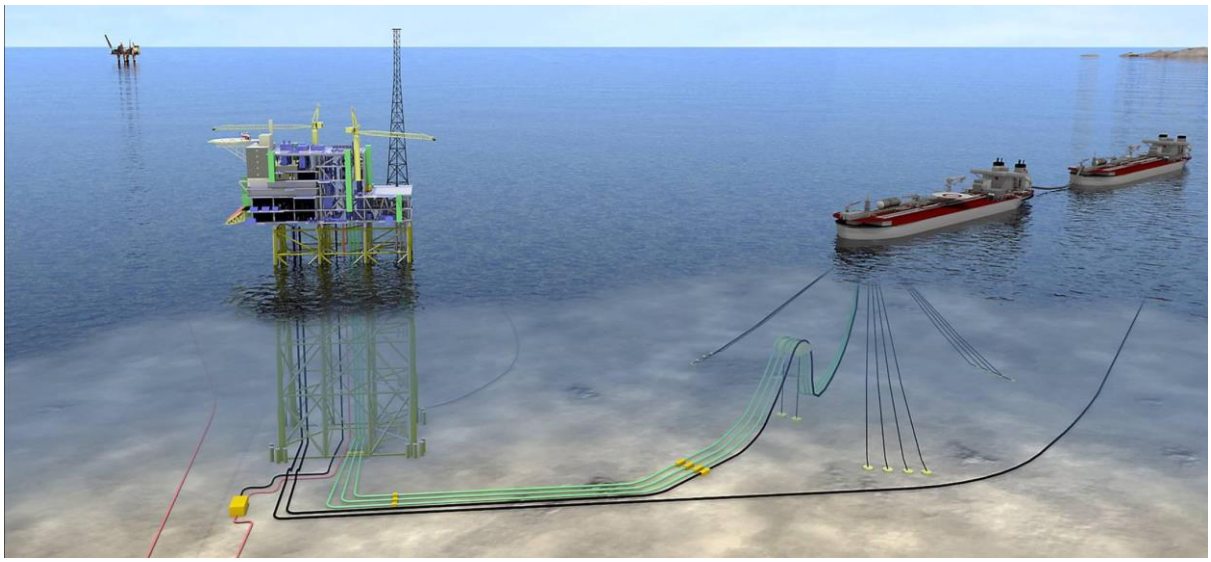

Figure 9 Martin Linge infrastructure (Ref: Norwegian Petroleum)

The expected production lifetime extends into the 2030s. Statoil (now Equinor) had acquired Total's equity stakes in the Martin Linge field (51%) and the Garantiana discovery (40%) on the Norwegian continental shelf (NCS) for a consideration of USD 1.45 billion. The project had experienced schedule delays and cost increases due to delayed topside engineering, construction, and currency impact. Start of production was planned to the first half of 2019. The field is still running, and operations are controlled remotely from an onshore digital operations center, enabling reduced operational expenditures. (Scandoil, 2017)

4.3.2 Modifications

As first contractor, Wood had been awarded a contract to provide Brownfield modifications services for Equinor's Martin Linge offshore installation on the Norwegian Continental Shelf (NCS). The project, scheduled to come on stream in 2020, delivered by Wood's team based in Stavanger. (Wood, 2019)

The Martin Linge installation is one of the most advanced on the NCS. As per information shared on Wood's website the platform was planned to be powered and operated remotely from an onshore control centre (Wood, 2019), which was confirmed by Equinor that it is powered by the world's longest alternating-current sea cable, measuring 163 kilometers from the onshore substation at Kollsnes in Western Norway. The platform was connected to shore power in December 2018, and the storage vessel on the Martin Linge field followed suit, making it the world's first storage vessel to receive power from shore. Martin Linge is also the first platform on the Norwegian continental shelf to be put on stream from shore. As already mentioned above, the production wells and processing plant are operated from the control room in Stavanger, and offshore operators use tablets to interact with their colleagues in the onshore control room, enabling cost reductions in the operating phase. (OE, 2021)

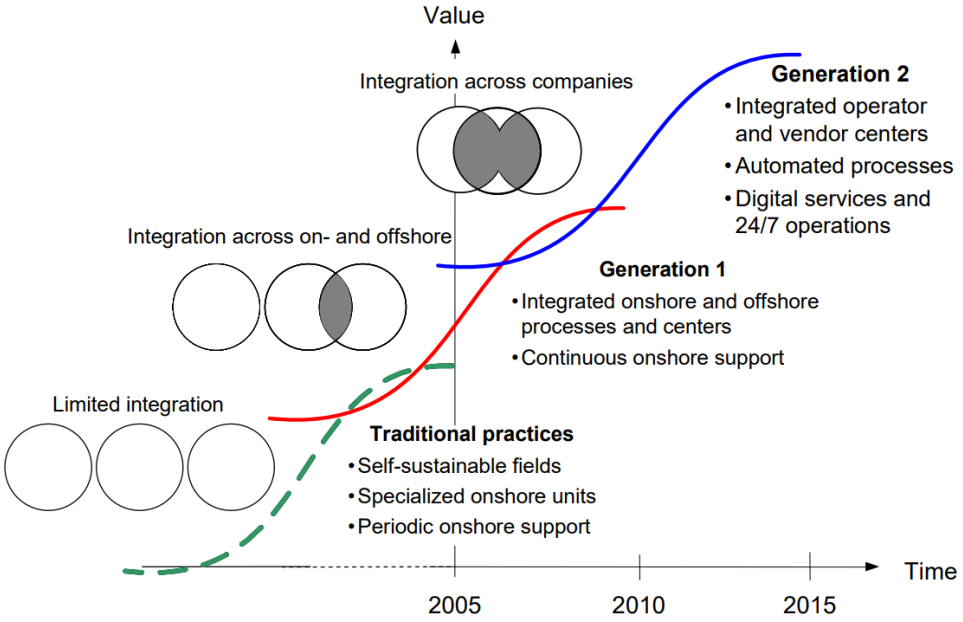

Figure 10 Integrated work process steps (Ref: OLF 2005)

The Martin Linge platform's implementation of extended integrated operations is another prime example of the benefits of real-time data and collaborative work processes in the oil and gas industry. By utilizing technology that enables safer, quicker, and better-informed decisions, the platform has been able to achieve greater efficiency, safety, and reduced operating costs. The platform's operations and maintenance philosophy is based on the integration of all aspects of integrated operations, including people, technology, and organisation. (HFC, 2018)

The concept of integrated operations involves collaboration across disciplines, companies, and organisational and geographical boundaries in order to achieve safer and better decisions faster. This collaboration is made possible by real-time data and new work processes that enable teams to make more informed decisions with greater efficiency. (OLF, 2005)(Figure 8)

The main objectives of this modification were to enable quicker and better-informed decisions in a distributed organisation, based on real-time information available to all disciplines independent of location, throughout the field's lifetime. This is achieved through full condition monitoring and performance of equipment and systems, with access to all field data from onshore, including data needed for production optimisation and drilling performance. (HFC, 2018)

By working closely and collaboratively with selected vendors and service contractors, following the OLF IO generation 2 model, the Martin Linge platform aims to create working arenas and utilize technology that is suited for making safer, quicker, and better-informed decisions. This approach not only helps the platform achieve its objectives, but also offers several benefits, including reduced downtime, increased efficiency, improved safety, and reduced operating costs. By leveraging real-time data and implementing integrated and remote operations, the platform is able to make better decisions faster, ultimately maximising its production potential and delivering value to its stakeholders. (HFC, 2018)

As part of Equinor's continues efforts to enhance its integrated operations, another new project has been launched to design the first Onshore Control Room where the main control is managed from onshore. The offshore control room will be a mirror image of the onshore design. The project was originally ordered by Total E&P Norge AS and after M&A it is now owned by Equinor. The main objective of this implementation was to ensure a satisfactory

working environment and safety standard in compliance with Norwegian laws, regulations, and company standards. As per agreement Eldor company was responsible for executing and documenting Human Factor analyses for the Onshore Operation Centre and the same time registering and managing the systematic follow-up system for an actions and issues that arise during implementation stage. In addition, it was required to create a human-centered design approach according to ISO 11064, NORSOK, and other relevant regulations and standards, optimize organisational and operational efficiency, and develop a detailed layout of the Onshore Operation Centre. Main challenge was creating a work environment which is efficient and safe for operation by considering human needs limitations and possibilities. (ELDOR, 2012-2021)

4.3.3 Challenges

During the preparation of Martin Linge PU for operation, Equinor underwent an inspection aimed at evaluating its compliance with official and internal requirements related to the management of major accident risk, barriers, and maintenance. The purpose of this inspection was to ensure a safe and efficient transition from mechanical completion to operation, while also verifying Equinor's follow-up on previous orders given to former operator Total E&P Norge AS. The inspection was conducted to identify any potential challenges that may arise during the platform's operation and to ensure that Equinor has the necessary systems in place to manage them effectively.

Operation and maintenance were a key focus of the inspection, particularly in relation to the company's follow-up on safety-critical equipment. This was in response to an order given to the former operator Total E&P Norge AS following an inspection carried out at the Samsung shipyard in March 2017. The inspection found deficiencies in the company's operations procedures, which did not adequately describe the current and future phases of the project.

As per inspection results, previous order was given a positive effect on the work with operation and maintenance, but there were still minor deficiencies, such as equipment lacking identification marks, some equipment was not maintained properly, and several cases was founded when equipment could not be identified or traced in ICAPS.

Another challenge that was mentioned in the report is related to the Martin Linge platform's fire and explosion strategy. The inspection found that the strategy did not fully comply with

the Norwegian Petroleum Safety Authority's requirements, and that the platform's fire and gas detection system was not fully operational during the inspection.

Overall, the inspection report indicated that Equinor needs to enhance its preservation and maintenance procedures, specifically focusing on safety-critical equipment to ensure safe and efficient operation of the Martin Linge PU. The report also suggested that the company should improve its risk management and decision-making processes, as well as enhance its barrier management to prevent potential major accidents. Additionally, the inspection revealed the need for Equinor to establish a better understanding of the asset's risk profile and maintain effective communication with its contractors and suppliers to ensure compliance with relevant regulations and standards. (PSA, 2018)

4.4 Case Study 2. Brage field

4.4.1 Background

In a recent transaction worth €108 million (NOK 1.1 billion), OKEA has acquired Wintershall Dea's 35.2% share in the Brage field (Figure 9) and 6.46% share in Ivar Aasen (Wintershall Dea, 2022) and one expected to come into production in Q3 2022, adding immediate cash flows and significantly increasing production, reserves, and resources. Except including a contingent payment structure, the acquisition also allows OKEA to maintain commodity diversification and enter the mainland Europe gas market. The company plans to leverage its operator capabilities and organisation, further strengthened by competent and experienced Wintershall Dea team, and identified annual cost synergies in the order of USD 4-7 million across OKEA's operated assets. (OKEA, 2022) With this acquisition, OKEA has become the leading mid-late life specialist operator with a focus on extending the lifetime of mid to late-life fields. Same time for Wintershall Dea it is part of their strategy to build on its strength as one of the largest subsea operators on the shelf and the transaction is a significant step for OKEA in expanding its portfolio and gaining a foothold in NCS. (Wintershall Dea, 2022)

"Through this acquisition, OKEA establishes a new operated position, enhances the scale and diversification of our portfolio and strengthens our position within existing core areas."

OKEA CEO, Svein J. Liknes (OKEA, 2022)

Acquired Brage field offers significant production upside potential to be realized through infill drilling. OKEA's future plans include identifying further infill drilling opportunities, unlocking synergies from Draugen/Brage operations, improving cost and efficiency, extending economic field life, reducing CO2 intensity, increasing production, and evaluating opportunities to increase/accelerate gas production. (OKEA, 2022)

The Brage field is situated in the northern region of the North Sea, 125 kilometers west of Bergen, and has a water depth of 140 meters. It was discovered in 1980 and started production in 1993. The field's production, drilling, and accommodation facility is an integrated steel jacket structure. The oil extracted from the field is transported through a pipeline to the Oseberg field and then to the Sture terminal via the Oseberg Transport System (OTS) pipeline. Additionally, the field is linked to Statpipe via a gas pipeline. (Wintershall Dea, 2022)

Figure 11 Brage field (Ref: Blueday.no)

4.4.2 Modifications

In recent years, OKEA has undergone a significant transformation from a smaller exploration company to an operator with a focus on extending the lifetime of mid to late life fields. This transformation has been facilitated in part by OKEA's technology partner, Cegal. Cegal has provided industrial software, operations, and cloud services to OKEA and functions as the company's IT department. Cegal's work has been instrumental in the production takeover of Draugen from Shell in 2018 and the recent takeover of Brage from Wintershall Dea in 2022. In both instances, Cegal helped to transfer necessary business data and information to new applications, resulting in a radical simplification of the IT platform and a halving of the number of applications. The transfer time for both takeovers was less than six months, which is far shorter than similar transfers. (Cegal, 2023)

4.4.3 Challenges

Having examined OKEA's management system and the process of taking over the facility, it is important to note that the recent inspection done by third company revealed several deviations and points for improvement in asset management of the field after the merger. (PSA, 2023) These findings highlight some of the challenges that companies may face during the merger of Brownfield assets in the offshore energy industry in the NCS. The inspection revealed 3 deviations and some points for improvement:

4.4.3.1 Documentation

The inspection uncovered a number of challenges related to the handling of lifting equipment and associated documentation requirements. Specifically, OKEA had failed to follow its own management system for identifying technical, operational, and organisational weaknesses, errors, and deficiencies in the handling of specially designed lifting equipment in the drilling area. At the Brage oil field, Odfjell Drilling is responsible for handling drilling operations and must adhere to the local addendum to NORSOK R-003, which includes a checklist for verifying relevant documentation such as certificates, expert inspection, user manual, and serial number. However, the verification process was found to be flawed, relying on confirmation from a supplier on land rather than proper inspection. This is concerning given that SDLA equipment has been involved in several serious lifting incidents on the NCS due to poor design and incorrect use. Therefore, it is clear that the proper handling and documentation of lifting equipment poses a significant challenge for companies operating in the offshore energy industry in the NCS. (PSA, 2023)

4.4.3.2 Follow up issues

During the inspection, challenges were identified in OKEA's use of contractors for projects and lifting operations. Specifically, several pulleys and shackles were found without accompanying documentation such as certificates or user manuals. This lack of documentation raised concerns about the technical and operational weaknesses, errors, and deficiencies in OKEA's management system. Interviews revealed that this lifting equipment was assumed to have come on board Brage from suppliers without OKEA's control or oversight. Furthermore, OKEA did not have control over the equipment used by contractors and did not ensure that their

management system met OKEA's requirements for loose lifting equipment on board. These challenges highlighted the need for better control and oversight of contractors and their equipment in order to ensure the safety and proper functioning of OKEA's operations. (PSA, 2023)

4.4.3.3 Maintenance program

The problem identified in this case is a deviation from OKEA's own requirements for maintenance and control of equipment, which could pose health, safety, or environmental risks. The company had recently switched from using SAP to using STAR as a maintenance system, and it was found that the history of maintenance from the period before STAR was implemented could only be found in SAP. (PSA, 2023)

One specific example of the deviation was observed in an electric lift on the BOP deck that had been on board since 2014. Daily and weekly maintenance was carried out using generic forms, but it was not clear whether the maintenance program for lifts in STAR was based on the manufacturer's recommendation. In SAP, maintenance was only registered in the form of an annual expert check, which is not in line with industry best practices. (PSA, 2023)

Another example was the control of loose hoses, which was found to be inadequate. Several loose hoses with strips of different colors were observed, some of which had no strips at all. It was found that strips with the year's color marking should be used in connection with the control of loose hoses, but this requirement was not followed up sufficiently. The procedure that describes the color marking of the year on loose hoses was found to only relate to disposal of hoses, and the supplier who was commissioned to check all the hoses was told to mark them with strips in this year's color marking, but this was not properly enforced. (PSA, 2023)

4.4.3.4 Improvement points:

The report highlights a concern related to maintenance task prioritization on the OKEA platform. There are discrepancies between the information on prioritization in two different systems, namely SAP maintenance system and the STAR system. As a result, maintenance tasks are not being classified correctly. For instance, a work order with lower HSE criticality was given emergency-immediate priority while a higher HSE criticality work order took a

longer time to be addressed. This inconsistency suggests that the prioritization criteria are not being applied consistently and in line with regulatory requirements. Additionally, there is a lack of clarity around how FV - O&M maintenance and KV- Corrosion Maintenance jobs are prioritized as the current criteria do not take into account the job classification.

4.5 Case Study 3. Maersk Inspirer

4.5.1 Background

The Maersk Inspirer is a jack-up rig that belongs to the MSC CJ70-150 MC class and was built in 2004. Later, it was converted into a Mobile Offshore Drilling & Production Unit to provide drilling and production services simultaneously in the Volve field offshore Norway for Equinor between 2007 and 2017. In late 2018, the rig underwent an upgrading and modification process at Aker Solution's yard in Egersund, which lasted until December 29, 2020. Finally, on December 31, 2020, the Mærsk Inspirer was successfully installed in the Yme field in the Southern North Sea. (Repsol, 2021)

Few years ago Repsol Norge AS, the operator of the Yme field, has signed an agreement to take over the day-to-day operations of the Mærsk Inspirer jack-up rig from Maersk Drilling (MD) on behalf of the Yme license. The agreement was involved the sale of the rig to Havila Sirius AS, who will lease it to the Yme licensees under a bareboat charter. According to Vidar Nedrebø, the Managing Director of Repsol Norge AS, this move will enable the extraction of further contractual and operational synergies on behalf of the Yme license. (Repsol, 2021)

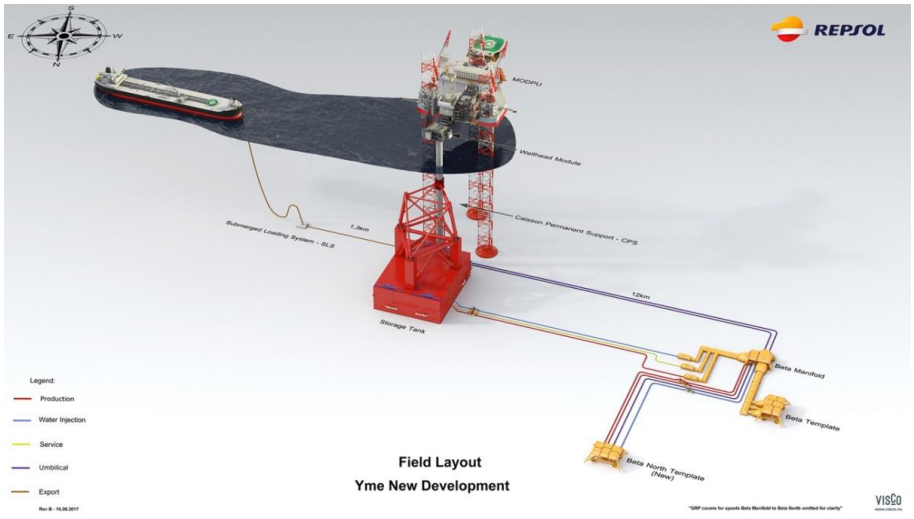

Figure 12 Yme New Development Field Layout (Ref: Yme New Development 2017)

During the transition phase, Repsol Norge AS worked closely with MD to achieve a successful handover and ensure a smooth transition. The employees who are in scope was planned to be transferred to Repsol Norge AS in accordance with the Norwegian Working Environment Act. (Repsol, 2021)

Repsol Norge AS holds a 55% working interest in the Yme field and the Yme New Development Project, while Lotos Exploration and Production Norge AS, KUFPEC Norway ASA, and OKEA ASA hold 20%, 10%, and 15% working interests, respectively. The Yme field was discovered in 1987 and is located in Blocks 9/2 and 9/5 in the Egersund Basin, around 100 km off the coast of Norway.(Figure 10) (Repsol, 2021)

4.5.2 Modifications

Initially, Maersk Inspirer was operated by Maersk Drilling and has been used by a number of operators over the years, including Equinor, Talisman, and Repsol. The rig is designed to handle a range of operations, including drilling, production, and processing of hydrocarbons. The projects were challenging as it required significant modifications to the rig's existing structure to accommodate the new facilities, while ensuring compliance with safety regulations and environmental standards. (Exarheas, 2021)

In 2006, while operating under Equinor, Maersk Inspirer underwent a significant upgrade with the installation of an integrated production module. This module was capable of producing 56,000 barrels of oil and 53 million cubic feet of gas per day, providing an essential addition to the field's production facilities. In order to accommodate the new process module, the drilling rig was skidded to the side, and modifications were made to the vessel, including the strengthening of the transom to withstand combined loading of the cantilever with hook load, setback, and BOP tensioning. Additionally, the wellhead module was reinforced to withstand conductor tension, and the heavily cantilevered process module was installed. The installation of a 15-slot drilling template for the production risers, arranged in three banks of five, completed the modification process, enabling Maersk Inspirer to operate in a dual drilling and production role. (Brouwer, 2016)

Repsol's Yme New Development Project involves the installation of a new wellhead module on top of existing facilities at the Yme field, as well as upgrades and modifications to the

Maersk Inspirer Mobile Offshore Drilling and Production Unit prior to installation in the field. The goal is to connect to existing wells and installations on the seabed offshore. (Repsol, 2021)

In April 2018, Repsol awarded Proserv, an energy services firm, a contract to upgrade and construct new subsea production control equipment for the Yme field redevelopment. (Ganta, 2021)

Going back into the history of Inspirer, in September 2006, the process module and wellhead module for the Statoil-operated Volve field were completed and set to be shipped from Thailand to Haugesund, Norway. The 3,500-tonne process module and 500-tonne wellhead module were transported on the Eide Transporter vessel, with an expected arrival date of October 20th. Before installation on the Maersk Inspirer jack-up rig, the platform required modifications and reinforcements at the yard. The drilling was scheduled to commence in early 2007. The jack-up platform was designed to carry out various functions, such as drilling, processing the well flow, exporting surplus gas and stable oil, treating produced water, and accommodating personnel. (DiscoverVolve, 2005)

In 2007, the development plan for Maersk Inspirer did not include power from shore. However, in 2013/14, a revised plan was being prepared due to structural deficiencies in the production facility at the Yme field. The licensees were interested in power from shore to reduce emissions and costly diesel consumption. Although a power from shore solution was feasible, it was not viewed as the best option due to increased weight on the rig, increased operating costs, and minimal benefits compared to overall emissions. The existing gas turbines on the rig provided the possibility for waste heat recovery units, which could provide heat. However, this solution would require the removal and storage of equipment and its re-installation at the end of production. (Repsol, 2017)

In 2012, Maersk FPSO gave Ramboll Oil & Gas an EPC contract to enhance the Maersk Inspirer jack-up drilling rig in the Volve oil field. Recently, Repsol awarded Maersk Drilling a contract to use the same rig for five years with a five-year extension to redevelop the Yme field. To make the rig suitable for use in the Yme field, Aker Solutions has been awarded a contract by Maersk Drilling for modification work on the production module. The work is set to start immediately and conclude at the end of 2019 and will be carried out at the company's fabrication facility in Egersund. (Aker Solutions, 2017)

The processing unit will comprise of components for segregating and stabilizing oil, a fuel gas facility, a module for compressing and exporting gas, a water treatment system for the produced water, and a system for injecting water. (DiscoverVolve, 2005)

As of January 2022, Norwegian E&P company OKEA announced that the Maersk Inspirer jack-up rig has been successfully towed to the Yme oil field, operated by Repsol. The rig had been undergoing modifications and upgrades before being towed from the Aker Egersund yard to the field on December 31, 2021. The Yme project is now moving towards the hook-up and commissioning phase, with onshore work on the production unit for the field completed and the rig safely installed at its targeted position. (Ganta, 2021)

4.5.3 Challenges

Repsol's asset management challenges at the Yme field are highly relevant to the topic of mergers and acquisitions. As companies merge or acquire assets, they often face a range of challenges, including inadequate resources, processes, and organisation for effective asset management. In the case of Repsol, their asset management at Yme field is facing significant challenges due to ongoing projects and changes involving multiple actors. These challenges were highlighted during a supervisory inspection conducted by PTIL in 2022. (PSA, 2022) The inspection identified seven non-conformities, including poor maintenance management, outdated governing documents, insufficient maintenance programs, and inadequate planning and prioritization. These challenges underscore the importance of effective asset management during mergers and acquisitions to ensure the successful integration of new assets and the continued safety and profitability of operations.

4.5.3.1 Inadequate management of maintenance

In the inspection of Repsol's management of maintenance, it was found that the company had deficiencies in several areas related to the activities, resources, processes, and organisation necessary to ensure effective maintenance management. As part of the changes Repsol is implementing on the Yme field, restructuring of maintenance management is an essential component. However, several ongoing projects, such as the takeover of Mærsk Inspirer, the change of maintenance system from IFS to SAP, the transfer of procedures from Maersk to Repsol, the harmonization of management systems, and the harmonization of the management system in Repsol on a global level, made it challenging to follow the processes.

During the inspection, it was observed that there was varying knowledge and perception of how the management systems for maintenance should be used, and some areas of responsibility were not sufficiently clarified. For example, there was a different understanding of roles and responsibilities in the handling of the sweat log and findings, follow-up of the Special Drilling Lifting Appliance (SDLA), update and content in the barrier panel, job descriptions within onshore maintenance, and follow-up of the classification of rig systems according to the report. (PSA, 2022)

The report indicates that Repsol had implemented organisational changes without proper consideration of existing roles and responsibilities, particularly within maintenance. This resulted in uncertainties regarding key positions and tasks. Additionally, interviews conducted during the inspection revealed that resources for onshore maintenance projects and operations were insufficient. (PSA, 2022)

The overall findings highlighted that Repsol lacked the necessary activities, resources, processes, and organisation to adequately manage maintenance. Seven non-conformities were identified, including inadequate management of maintenance, poor identification of barriers, outdated governing documents, inadequate classification, insufficient maintenance program, inadequate labeling of systems and equipment, and inadequate planning and prioritization. These issues highlight the challenges that arise from organisational changes and insufficient resources during mergers and acquisitions in the asset management industry. (PSA, 2022)

4.5.3.2 Inadequate identification of barriers

Repsol's identification of barrier elements was found to be flawed, according to an inspection report. The company's performance standards, which describe equipment and systems for the Yme field, were not fully comprehensive, and there was no full agreement between the impact classification and the defined equipment in the performance standards. Some equipment was classified as Safety Environment Critical Equipment without being classified as "high" on HSE, and some fire doors and navigation lights were not defined as barrier elements even though the company believed they were. The systems for leak detection on underwater facilities were also not defined as barrier elements, and there were no established performance requirements or maintenance programs to verify performance. The

high alarm load in the control room was not reflected in the inspection meeting (AT) or in the barrier overview. (PSA, 2022)

4.5.3.3 Insufficient updating of governing documents

The inspection found that some technical and governing documents for maintenance were not updated, and Repsol was aware that procedures were not used in the management of maintenance. The company used IFS as a maintenance system, but some work processes for Workmate were described in outdated documents that were still valid in the system. The inspection also found that manual updates to P&ID drawings in the control room were not properly recorded or implemented in the electronic versions. (PSA, 2022)

4.5.3.4 Inadequate classification

The report states that parts of systems and equipment at Yme are inadequately classified with regards to their impact on health, environment, and safety. Repsol's governing document for classification refers to NORSOK Z-008, but there are inconsistencies in its usage. Repsol was unable to present the maintenance analysis where the impact classification of equipment and components was described. The verification of the maintenance system showed that 6410 tags/equipment were not classified, and some equipment had a lower total criticality than individual values of the impact classification. Examples of manual valves and hydraulic control valves were given, which were not classified correctly. There was also no clear answer on how Containment was handled in the functional analysis. (PSA, 2022)

4.5.3.5 Insufficient maintenance program

The audit found that Repsol had inadequate prevention measures in place for failure modes that could pose a risk to health, safety, or the environment. The maintenance system (IFS) did not fully correspond to equipment marked in the field, and there were several examples of equipment not classified according to NORSOK Z-008 standards. Repsol could not present the maintenance analysis for impact classification, and there was a lack of maintenance programs for several equipment types, such as sampling stations and torch ignition panels.

Loose hoses were observed in the field without a strategy for marking, registration, and maintenance, and temporary equipment did not have a maintenance program. The company also lacked a preventive planned activity for assessing internal and external degradation of

rigging equipment in view of the risk of failure mechanisms such as external leakage. ISO 14224 was not used to collect fault mechanisms in the maintenance system (IFS) according to governing documents and interviews.

Overall, the audit revealed a lack of consistency in the use of standards and procedures for maintenance and classification, as well as a lack of preventive measures for potential failure modes that was affected by merger and acquisition between Repsol and Maersk. (PSA, 2022)

4.5.3.6 Inadequate labeling of systems and equipment

The inspection revealed that the facilities' equipment was not appropriately labeled or marked, leading to safety risks and challenges in maintenance and operation. Valves and fire pumps lacked proper markings or had none at all, and labels were missing on various equipment, including a valve with a long stem in the pump room, cable entries for new fire pumps, drainpots in the WH module, and flexible pipes out of the HP Mud Pumper. This situation makes it difficult to operate safely and maintain the equipment effectively, posing risks to personnel safety and the environment. (PSA, 2022)

4.5.3.7 Insufficient planning and prioritization

During the audit, it was observed that the preparation of a comprehensive plan for carrying out the maintenance program and corrective maintenance activities was deficient. The work processes for establishing and following up work orders were not fully followed, and the quality check had shortcomings in its implementation. Several work orders were found that did not follow the codes that the procedures describe, which means that the management system shows different assemblies than intended. This indicates that the routines are not followed consistently and that there is room for improvement in the quality check.

The audit team was informed that not all jobs are registered in the IFS system. Simpler jobs, such as clearing and cleaning, are done without a work order, and the work performed or elapsed time is not recorded. This lack of documentation and record-keeping can lead to difficulties in tracking maintenance and corrective actions, as well as identifying areas that need improvement.

In addition, support processes such as scaffolding, insulation, and stripping were not part of the work order, and hours for planning or elapsed time were not recorded. This means that

it is difficult to track the amount of time and resources that are required for these activities, and can lead to inefficiencies and delays in the maintenance program.

Furthermore, the audit team observed that there was equipment that was not in use placed around the facility, some of which were wooden pallets. This lack of proper storage and organisation can lead to safety hazards, as well as difficulties in identifying and accessing equipment when needed.

Overall, the deficiencies in the preparation of a comprehensive plan for carrying out the maintenance program and corrective maintenance activities indicate that there is room for improvement in the maintenance processes and quality control at the Yme facility. (PSA, 2022)

4.6 Interview overview

This section provides a comprehensive summary of the interviews conducted during the research process. More than 100 representatives from various oil companies, mainly those involved in asset management and maintenance, were contacted to participate in the study. Out of the 100 contacted, 17 interviews were conducted, providing valuable insights and perspectives on the challenges and opportunities associated with mergers and acquisitions in the oil and gas industry, particularly in the Norwegian Continental Shelf (NCS). This section will highlight the *interview questions* used and the *selection process* of the interviewees.

4.6.1 Interview questions

1. Where do you see bigger challenge lie in merge and acquisition project, is it personnel / competence, capacity, organisational, technological?
2. Have your organisation been audited after the merger? Have you had challenges in compliance with regulatory requirements?
3. What are the significant challenges you encountered compared to the planned activities for asset acquisition/ merge? If any, can you describe how your organisation responded to asset management challenges in this case?
4. During the merger and acquisition process, did your company face challenges in terms of culture change and getting people to adapt to the acquiring company's culture? If

yes, how did your company manage and address this challenge to ensure successful maintenance operations?

5. How does effective communication among stakeholder's impact asset management during merger and acquisition projects? How can you improve communication in your organisation?
6. During the process of merging assets, one common challenge is integrating different Computerized Maintenance Management System (CMMS) software, such as SAP, Maximo, or other specific software, into one unified system. Has your company faced similar challenges during mergers, and if so, what approach was taken to address this issue?
7. During the M&A process, have you encountered the issue of lost or unidentified asset information after integrating all assets into a single CMMS. If so, how did you address this challenge of potentially lost data and ensure proper data capture for these assets at a later date?
8. Were there any significant differences in the maintenance and operations philosophies or strategies between the two assets, and if so, how did you address them?
9. In your experience, what role does digitalization play in facilitating asset management during merger and acquisition projects? Have you implemented any new technologies or digital tools in your asset management processes during merger and acquisition projects? If so, can you discuss the impact of those tools on your operations?
10. After asset acquisition have you used that standardization of maintenance programs in any scale? If so, what was the outcome?
11. Any other challenges you faced during merging?

4.6.2 Selection Process

The selection process for the interviews involved identifying potential interviewees based on their job titles and responsibilities related to asset management, maintenance, and operations during mergers and acquisitions in the oil and gas industry. A list of over 100 representatives from various oil companies operating in the NCS was compiled using publicly available information, including company websites, LinkedIn profiles, and news articles.

Once potential interviewees were identified, they were contacted via email, explaining the purpose and scope of the study, and requesting their participation in an interview. The email also included a consent form and an assurance of anonymity and confidentiality to ensure ethical considerations were met.

Out of the 100 contacts, 17 representatives agreed to participate in the interviews. The interviews were conducted with individuals with more than 10 years of seniority and with varying degrees of experience in the industry. The selection of the interviewees was based on their relevance to the study's research questions, their experience and expertise in asset management, maintenance, and operations, and their availability and willingness to participate.

The interviews were conducted using mostly an open-ended questionnaire, which covered topics such as the interviewees' roles and responsibilities during mergers and acquisitions, the challenges they faced, and their strategies for overcoming these challenges. The interviews were conducted and recorded via video conferencing and lasted between 15 to 60 minutes.

The selection process ensured that the participants had relevant experience and expertise in the field, and their insights provided valuable information for the study.

4.7 Interview overview: Challenges in managing Brownfield assets during M&A under a new Strategy (Breenfield)

The interviews conducted with asset management representatives from various oil companies provided valuable insights into the challenges experienced during mergers and acquisitions in managing Brownfield assets under new strategies. To gather this information, the interviewees were asked a series of questions that covered a range of topics related to their experiences with mergers and acquisitions, as well as their strategies and challenges for managing assets during the transition period. It is important to note that the distribution of responses for each question may vary due to the inapplicability of certain questions to specific candidates. As a result, it should be noted that the unequal distribution of responses is due to the fact that specific questions were not posed to specific individuals.

In addition, due to the sensitive nature of the information shared, the responses to each question will be summarized and shared in a general manner, without identifying specific companies or individuals.

Question 1. Where do you see bigger challenge lie in merge and acquisition project, is it personnel / competence, capacity, organisational, technological?

Merging or acquiring companies presents various challenges, with a primary focus on organizational aspects, personnel competence, and cultural differences (Figure 11). The integration of different organizations, processes, and management systems is considered a major hurdle, requiring careful planning and execution.

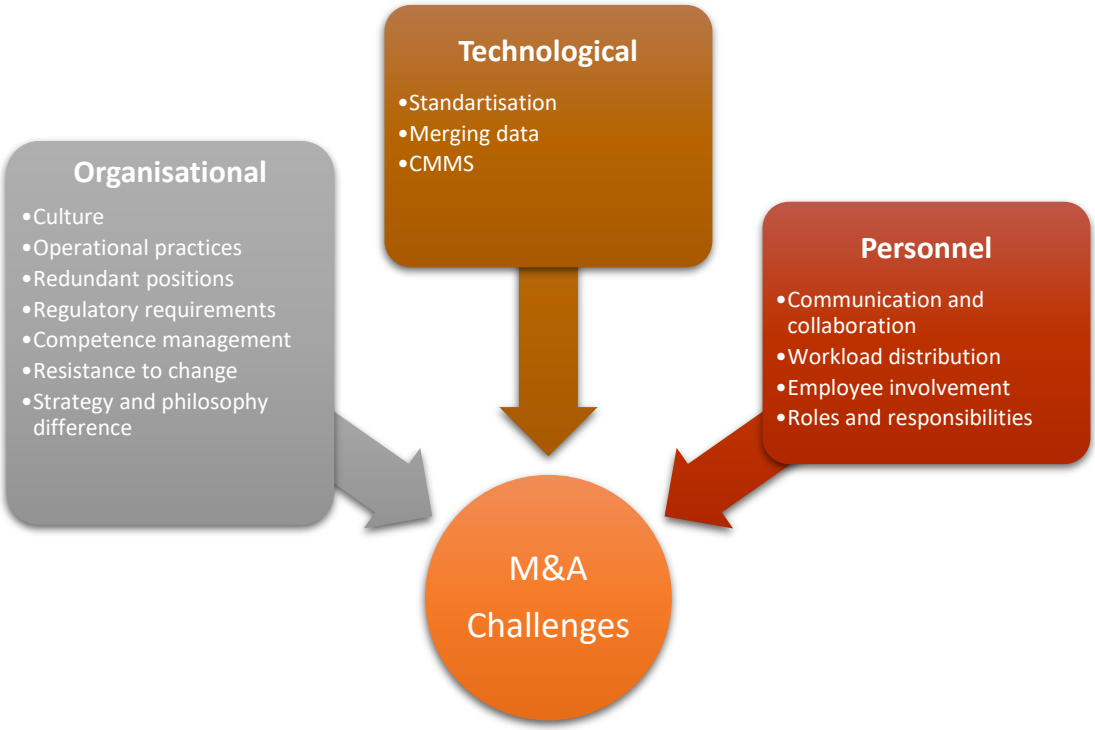

Figure 13 M&A Challenges

Standardization and consistent governance across the merged organization, along with effective communication, pose significant challenges. Technological obstacles arise when integrating various management systems and transferring data from one system to another.

However, while technology is important, the primary pillars of successful integration are the personnel and organizational aspects. Issues such as redundant positions, workload distribution, and the harmonization of operational practices need to be addressed.

Furthermore, compliance with regulatory requirements, strong employee involvement, and the development of common work processes are essential. The merger process also necessitates the establishment of clear reporting structures, the definition of roles and responsibilities, and the proper management of competence and asset integrity.

Mostly, the challenges in merger and acquisition projects revolve around managing organizational changes, integrating diverse cultures, and aligning operational practices according to all the gathered information. ***(Refer to Appendix A for detailed interview results.)***

Question 2. Have your organisation been audited after the merger? Have you had challenges in compliance with regulatory requirements?

During the merger process, companies often undergo audits from both internal and external entities to ensure compliance with regulatory requirements. These audits provide valuable insights and challenges, contributing to a strong compliance record. Close monitoring and a commitment to a continuous information loop are crucial in maintaining compliance throughout the merger. Challenges may arise in terms of tracking and reporting due to differences in asset coding, resulting in increased workload and potential errors. Open dialogue and frequent meetings with regulatory bodies can be an effective approach to address concerns and ensure compliance. While there may be expectations to follow specific steering systems during the merger, transitioning to a more flexible system can be a positive and successful process.

In the case of MOPU, audits from regulatory bodies such as the PSA and the Norwegian Maritime Authority may result in findings that need to be addressed. Adapting to different regulatory frameworks and managing workload within the organization can be a significant challenge. Additionally, differences in regulatory frameworks and mindsets between operators and contractors may pose compliance challenges during acquisitions, requiring adaptation to new regulations and approaches. ***(Refer to Appendix A for detailed interview results.)***

Question 3. What are the significant challenges you encountered compared to the planned activities for asset acquisition/ merge? If any, can you describe how your organisation responded to asset management challenges in this case?

According to interview answers, the asset acquisition/merger process presents significant challenges, including standardization, managing emotional reactions to change, cultural differences, and integrating diverse management systems. (Figure 14)

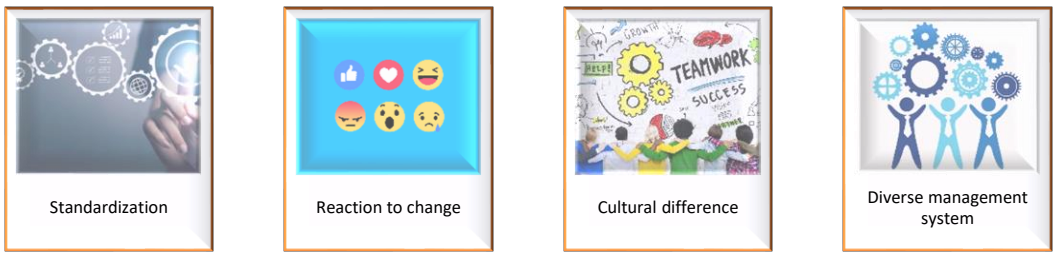

Figure 14 Unplanned challenges during M&A based on interview answers

The expansion of the project scope may lead to a longer timeline, but effective change management and risk assessment processes can mitigate these challenges.

Emotional reactions to the introduction of new systems, such as SAP, should be addressed to ensure acceptance and understanding among employees. Differences in background and positions within the organizations may create tension, and compensating measures can be used to motivate employees and foster positive attitudes.

Cultural differences and pockets of excellence within each company require careful integration to establish a unified culture and management system. Preserving the best practices and knowledge from the acquired company while aligning with the larger organization is crucial.

The planned activities, including changes in top management, reorganization, and the development of a new management system, contribute to a dynamic and innovative approach throughout the merger process. The challenge of merging maintenance concepts and strategies may require a focus on day-to-day operations and asset integrity before developing a common asset strategy. In some cases, the transfer of personnel and systems can be executed smoothly, resulting in a seamless handover with minimal organizational changes. ***(Refer to Appendix A for detailed interview results.)***

Question 4. During the merger and acquisition process, did your company face challenges in terms of culture change and getting people to adapt to the acquiring company's culture?

If yes, how did your company manage and address this challenge to ensure successful maintenance operations?

The companies faced challenges related to culture change, integration of different management systems, and aligning work practices and mindsets. To address these challenges, most of the companies implemented a comprehensive plan that included technical transitions, competency development, clear communication, and change of management processes. In some companies, the project involved bridging the gap between different technologies, standardizing documentation, and establishing a centralized department for maintenance management while on other efforts were made to create a unified company culture through organizational projects, involving employees from both companies, and promoting collaboration and consensus.

Close collaboration with union and safety delegates, continuous communication, and respect for existing practices were emphasized during handling these kinds of challenges. Personnel exchange programs, involvement of the workforce in decision-making, and subject matter expert workshops helped transfer knowledge and ensure successful work processes. Effective communication, adherence to project scope, and systematic documentation were prioritized.

Some companies recognized the challenge of integrating different company cultures and focused on effective communication, collaboration, and knowledge sharing to bridge cultural differences. Adaptation to the acquiring company's culture was acknowledged as an ongoing process that requires continuous effort. Efforts to address cultural disparities between contractor and operator-oriented cultures and leadership training were undertaken. ***(Refer to Appendix A for detailed interview results.)***

Question 5. How does effective communication among stakeholder's impact asset management during merger and acquisition projects? How can you improve communication in your organisation?

Based on interview results, effective communication enables stakeholders to have a clear understanding of project goals, expectations, and processes, facilitating smooth coordination, reducing misunderstandings, and enhancing collaboration. Organizations recognize the challenges of communication and take steps to improve it by using concise language, illustrations, and dedicated communication departments.

Training sessions and workshops empower leaders to effectively communicate important information to their teams. The diverse information needs of stakeholders are addressed through innovative communication approaches. Continuous dialogue, meetings, and online tools facilitate communication, ensuring consistency and alignment among stakeholders.

Involving employees in decision-making, bottom-up approaches, and valuing their input foster engagement and effective communication. Improving information availability and accessibility is crucial to promote collaboration and avoid duplication of work.

Personal interaction, team-building activities, and handover meetings help bridge cultural differences and foster connections. The organization acknowledges the time required for team cohesion and recognizes the benefits of in-person communication to build shared purpose. ***(Refer to Appendix A for detailed interview results.)***

Question 6. During the process of merging assets, one common challenge is integrating different Computerized Maintenance Management System (CMMS) software, such as SAP, Maximo, or other specific software, into one unified system. Has your company faced similar challenges during mergers, and if so, what approach was taken to address this issue?

During merger and acquisition projects, companies often face challenges related to differences in CMMS systems, maintenance standards, and data integration. Standardization is a common approach to address these challenges, with organizations following industry standards such as NORSOK, Z-008, and ISO 14224. The integration process may involve aligning CMMS functionalities, data enrichment, and cleaning, as well as harmonizing maintenance processes and roles within the organization (Figure 15).

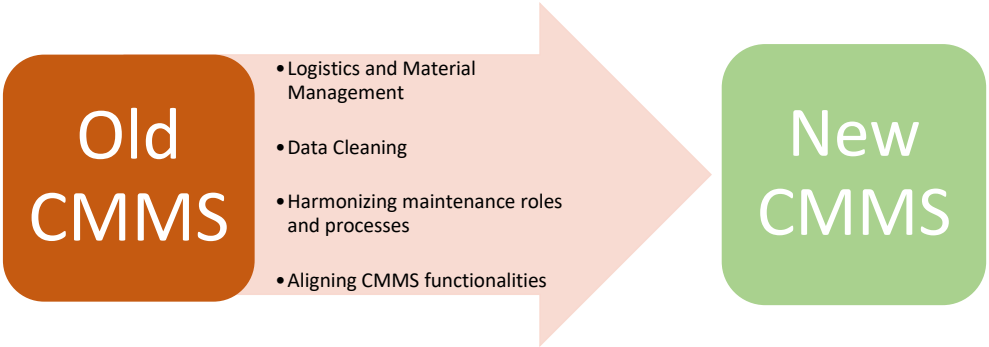

Figure 15 Data transferring process

Communication, effective project management, and a holistic approach are crucial to successfully address these challenges. Transitioning between different CMMS systems requires careful planning, data preparation, and consideration of various aspects such as logistics and material management.

While it is not necessary to have only one CMMS system, organizations often strive for uniformity and consistency across assets. Training, common procedures, and collaboration with IT departments play a significant role in achieving standardized maintenance approaches within CMMS systems. The ultimate goal is to have a common system that is shared across the organization. ***(Refer to Appendix A for detailed interview results.)***

Question 7. During the M&A process, have you encountered the issue of lost or unidentified asset information after integrating all assets into a single CMMS. If so, how did you address this challenge of potentially lost data and ensure proper data capture for these assets at a later date?

Data loss during data migration is a concern that organizations strive to avoid during the transition to new systems. Various approaches and strategies are implemented to minimize the risk of data loss and ensure a successful transfer. Mock sessions and test runs are conducted to validate the migration process and address any missing information.

The focus is on maintaining data integrity and usability in the new system. Robust storage, tracking systems, and backups are used to retain and preserve data, providing confidence in its accessibility and availability.

Meticulous planning, industry methodologies, and data standards guide the data migration process, helping to achieve a seamless transfer. Automated programs and collaboration with data analysts can streamline the identification of missing data and discrepancies. Ongoing efforts are made to clean up and organize data for better management and accessibility. ***(Refer to Appendix A for detailed interview results.)***

Question 8. Were there any significant differences in the maintenance and operations philosophies or strategies between the two assets, and if so, how did you address them?

During the merger or acquisition of assets, it is common for the most companies to encounter differences in maintenance and operations philosophies and strategies. These variations can

be influenced by factors such as asset age, productivity, and company cultures. To address these differences, organizations employ various approaches. These include conducting thorough analyses of existing strategies, identifying areas of excellence or best practices from the acquired assets, and incorporating them into the overall governance and strategy.

Harmonization and standardization efforts are made to align the strategies, combining the strengths of both assets while maintaining consistency.

Collaboration, communication, and cross-training initiatives play vital roles in achieving a unified approach. The goal is to create a harmonized maintenance and operations philosophy that considers the unique characteristics of each asset and facilitates efficient resource utilization and knowledge sharing. Ongoing efforts may be required to overcome resistance to change and ensure a smooth transition to the new philosophy.

Additionally, the consideration of regulatory requirements, safety, environment, and practicality is important when implementing strategies and making decisions. ***(Refer to Appendix A for detailed interview results.)***

Question 9. In your experience, what role does digitalization play in facilitating asset management during merger and acquisition projects? Have you implemented any new technologies or digital tools in your asset management processes during merger and acquisition projects? If so, can you discuss the impact of those tools on your operations?

Implementing digital tools and technologies can enhance accessibility, usability, and efficiency in managing assets. Common digital tools used include CMMS systems, custom apps, digital twins, 3D models, and mobile work orders. These tools enable end users to access necessary information, perform tasks remotely, and streamline maintenance and operations processes. It is important to prioritize data integrity and ensure a strong foundation in core systems before implementing more advanced digital solutions.

In addition, the timing of implementing digital tools alongside the merger or acquisition should be carefully considered to avoid capacity constraints. ***(Refer to Appendix A for detailed interview results.)***

Question 10. After asset acquisition have you used that standardization of maintenance programs in any scale? If so, what was the outcome?

During merger the main objective for majority of companies that was interviewed is to establish consistent maintenance practices across all assets, ensuring safety, reliability, and efficiency.

Efforts towards standardization involve conducting maintenance strategy assessments, developing maintenance and test concepts for specific equipment groups, and aligning maintenance practices. However, there are challenges in the standardization process, such as variations in equipment, technologies, philosophies, and organizational structures. These challenges require careful evaluation, justification, and gradual implementation to achieve full standardization.

Despite the challenges, standardization efforts have shown benefits in terms of consistent preventative maintenance, improved safety, and reliability. Ongoing projects focus on creating a unified maintenance concept, implementing FMECA processes, and developing common documentation systems.

The goal is to have a generic maintenance concept that can be applied to each asset while considering asset-specific requirements for complex equipment. ***(Refer to Appendix A for detailed interview results.)***

Question 11. Any other challenges you faced during merging?

Other challenges include data integration and enrichment, managing spare parts across different fields, introducing new CMMS systems, and addressing timelines and complexities in maintenance projects. Despite the challenges, there are positive aspects such as complementary strengths and expertise between merging companies, the opportunity for growth and learning, and the implementation of well-defined systems and procedures.

Collaboration and coordination with relevant personnel, subject matter experts, and operational teams are crucial for successful project planning and execution. The focus is on standardizing and optimizing maintenance practices, improving information management and documentation systems, and ensuring thoroughness rather than rushing through the process. ***(Refer to Appendix A for detailed interview results.)***

5 CONCLUSION

This thesis is aimed to examine the challenges of managing "Breenfield" assets under M&A arrangements, with a focus on the NCS. The specific objectives were to explore the dynamics of managing "Breenfield" assets, evaluate the challenges of managing these assets in the NCS under mergers and acquisitions, and discover the methods used to address these challenges.

The findings of this study highlight various challenges and opportunities associated with managing "Breenfield" assets. These findings contribute to a comprehensive understanding of the dynamics of asset management in the context of organizational changes and integration.

Merging or acquiring companies in the context of O&M present various challenges including organizational aspects, personnel competence, cultural differences, and the integration of diverse management systems but they also offer opportunities for growth and improved management systems. Successful integration relies on crucial factors such as standardization, consistent governance, and effective communication. While technological obstacles may arise during the merging of different systems and data transfer, it is the personnel and organizational aspects that serve as the key pillars of successful integration.

Addressing redundant positions, workload distribution, compliance with regulatory requirements, and the development of common work processes are essential in managing organizational changes. Clear reporting structures, defined roles, and competent asset management play vital roles in the integration process. Internal and external audits ensure compliance with regulatory requirements, while challenges related to tracking and reporting may arise due to differences in asset coding. Close communication with regulatory bodies and adaptability to new regulations are necessary components of a successful integration.

In asset M&A processes, challenges include the standardization of practices, managing cultural differences, and integrating management systems. It is crucial to preserve best practices and knowledge while aligning with the larger organization. Effective communication, change management, and risk assessment processes are necessary to address these challenges. During the merger, effective communication plays a vital role in facilitating coordination, reducing misunderstandings, and enhancing collaboration.

Improved communication strategies include using concise language, employing visual aids, establishing dedicated departments, and involving employees in decision-making processes.

In addition, challenges related to CMMS systems, maintenance standards, and data integration can be overcome through standardization, harmonization, and comprehensive training. Minimizing data loss during migration involves careful planning, testing, robust storage, and backups. Differences in maintenance and operations philosophies can be effectively managed through thorough analysis, collaboration, communication, and cross-training initiatives. The implementation of digital tools and technologies enhances accessibility and efficiency in asset management and same time standardizing maintenance programs is also important and requires careful evaluation and gradual implementation due to variations in equipment and organizational structures.

The implications of these findings are significant for the energy industry. By understanding and addressing the challenges identified, companies involved in mergers and acquisitions can improve the effectiveness and efficiency of asset management. This study contributes to filling the gap in the literature by providing insights into the challenges and opportunities associated with managing "Breenfield" assets during mergers and acquisitions.

While this study provides valuable insights, it is important to acknowledge its limitations. The availability of relevant literature on the challenges of asset management during mergers and acquisitions in the NCS was limited, which may have constrained the scope of the study. Additionally, the focus on the offshore energy industry in the NCS excludes onshore operations and limits the generalizability of the findings to other regions or industries. Furthermore, confidentiality concerns limited the range of perspectives and experiences included in the study. Lastly, the study specifically focused on "Breenfield" assets, and other types of mergers and acquisitions in the offshore energy industry were not explored.

In terms of the research process, a qualitative research design using case study methodology was employed. A comprehensive literature review, analysis of various reports, and semi-structured interviews with key personnel were conducted to gather data and gain insights into the challenges of managing "Breenfield" assets during M&A.

In conclusion, this study sheds light on the challenges and opportunities of managing "Breenfield" energy assets during M&A in the NCS. By addressing these challenges, companies

can enhance their asset management practices and achieve successful integration. This research contributes to the field by filling a gap in the literature, offering practical insights, and guiding future merger and acquisition scenarios. Ultimately, this study has the potential to benefit stakeholders in the energy sector and contribute to a more sustainable and efficient industry.

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APPENDIX A

Question 1. Where do you see bigger challenge lie in merge and acquisition project, is it personnel / competence, capacity, organisational, technological?

Answer 1: *The biggest challenge in a merger and acquisition project is seen as standardization, with the people perspective being the most challenging aspect. Merging companies bring different backgrounds, cultures, and best practices, requiring a willingness to change among the employees. Achieving standardization and consistent governance across the organization is considered the most difficult point to address. Communication is highlighted as a significant challenge, particularly in large organizations, as spreading information to everyone can be challenging.*

Answer 2: *When acquiring assets from other companies, the focus is not just on purchasing the maintenance aspects but also on obtaining the entire package, including people, processes, and the CMMS. The key challenge lies in managing the change process, particularly in terms of integrating different organizations, processes, and management systems. The organization and process integration are considered the most challenging aspects, requiring careful integration of smaller assets into existing systems. While technology is important, the primary focus is on the management process and the competence and organization of the workforce. Ultimately, having the right processes and people in place is crucial for the success of the integration.*

Answer 3: *Merger and acquisition projects present numerous challenges, with a strong emphasis on personnel competence and cultural differences. Individuals from different companies' diverse backgrounds and work approaches pose significant obstacles to integration. Along with personnel issues, the organizational aspect is critical. Creating a well-functioning organizational structure capable of effectively managing the merged entities is a difficult task. It entails distributing and allocating personnel, dealing with legal issues, and ensuring a smooth transition. Technological challenges also arise, especially when integrating various management systems. Transferring and configuring data from one system to another can be a laborious and time-consuming process. The implementation of CMMS is critical in the realm of technological challenges. Organizational challenges, on the other hand, are often*

considered as the most difficult. These difficulties include the possibility of dual roles, the need to balance workload distribution, and the possibility of redundant key roles. While technological challenges must be overcome, personnel and organizational aspects are regarded as the primary pillars of successful integration. Delays must be avoided at all costs during the merger and acquisition process.

Answer 4: *In mergers involving Norwegian companies, the competence of the personnel being acquired is often quite similar, minimizing any significant challenges in that regard. However, organizational issues may arise due to redundant positions that no longer serve a purpose after the merger. On the technological front, different companies may have developed their systems in unique ways, making it challenging to align and streamline processes. This lack of standardization can be resource-intensive and inefficient. Therefore, the primary challenges lie in technology and organization. Technological hurdles, while significant, are considered secondary to the organizational challenges that arise during the merger process.*

Answer 5: *Merging two companies at different levels presents numerous challenges, but with thorough planning and a proper structure, successful integration is achievable. In Norway, strong employee involvement and compliance with regulatory requirements are crucial. Regarding operation and maintenance, merging and aligning different operation philosophies can be challenging. Each company has its unique approaches, management systems, and ways of working, which are often influenced by the size of the organization. When merging, particularly with companies of varying sizes, merging cultures and operational practices requires time and a risk-based approach. It is important to acknowledge the complexity and invest adequate time in the integration process.*

Answer 6: *The biggest challenge in the merger was organizational integration. Combining two complete organizations into one requires addressing issues related to duplicated roles, losing leadership positions, and providing opportunities for employees in the new organization. Technology posed less of a challenge as both companies were using similar systems and could easily share and adopt each other's technology. Capacity and competence were seen as strengths, with an abundance of remote capacity and highly skilled personnel.*

Answer 7: *The major challenge in the merger was implementing common work processes and ensuring compliance with them. Developing and integrating these processes required*

significant effort and a focus on ownership and management systems. The average age of employees posed a challenge as some were close to retirement and had a different mindset towards technology and change. There was a need for a strong management system that emphasized actions rather than relying solely on emails. The focus on competence assurance and understanding offshore processes was highlighted, suggesting the importance of educating onshore personnel about the main processes and their link to asset management and integrity. Misunderstandings around work orders and work permits were also addressed, with efforts made to merge requirements and make the execution of maintenance programs more secure. Overall, asset integrity was deemed a crucial aspect that required a clear understanding.

Answer 8: *One of the key challenges in the merger and acquisition project lies in the strategic level. The strategic objectives and concept may not be clearly defined, leading to confusion in how the operation and maintenance will be addressed and carried out after the merger. This lack of clarity can create challenges when it comes to developing detailed maintenance programs and concepts.*

Another significant challenge is the organizational aspect. Merging two different organizations into one can result in overlapping roles and positions, as well as uncertainties regarding the definition of roles and responsibilities. It becomes challenging to establish clear reporting structures and define roles within the new organizational chart.

Answer 9: *After mergers, it is common for organizations to face the challenge of becoming too large and requiring restructuring. This was the case in the onshore operations as well, where the influx of personnel led to the perception of having too many people. Whether or not this perception is agreed upon is subjective. Nonetheless, restructuring was carried out onshore, and it remains uncertain if a similar restructuring will be implemented offshore. One significant aspect affected by the merger is competence management. Norway has two different systems for competency enhancements, while acquired company had their own system. To ensure compliance and streamline the process, information on certifications, courses, and knowledge had to be gathered into a unified system. The goal was to transition from three systems to two, aligning with our global organization. A bespoke platform called trainingportal.no was established to house offshore certificates and facilitate the updating and tracking of missing certifications to meet regulatory requirements.*

The merger brought about the need for harmonizing competencies and ensuring regulatory compliance through the consolidation of systems and the establishment of a customized training platform.

Answer 10: *The main challenge in acquisitions is often related to organizational aspects.*

Question 2. Have your organisation been audited after the merger? Have you had challenges in compliance with regulatory requirements?

Answer 1: *The interviewed company has undergone several audits during the merger process. These audits, which included both internal and external assessments, were not limited to the end of the merger but took place throughout the process. PSA closely monitored the audits. The company has maintained a positive experience with the audits, as they have provided valuable insights and challenges. No major deviations or significant issues were found during the audits. The company's commitment to a close information loop and continuous monitoring has contributed to its strong compliance record throughout the merger.*

Answer 2: *Most of the big companies undergo regular audits by PSA. Maintenance and maintenance engineering processes have undergone changes, particularly in relation to one asset that is coded differently. This difference in coding poses challenges in terms of KPI tracking and reporting, resulting in increased workload and potential errors. As a result, the company may face difficulties in readily providing requested information.*

Answer 3: *The interviewed company did not undergo a formal audit specifically for the merger process after the merger. However, there was close dialogue and frequent meetings with the PSA throughout the merger process. This approach allowed for transparent communication, explaining the merger plans and execution. The company believes that this open dialogue is a more effective way to address regulatory concerns and ensure compliance, benefiting both the regulatory organization and the operating company.*

Answer 4: *The company has undergone audits from external entities, including regulatory bodies and license owners. They also have an internal audit department. While there were no specific challenges with regulatory requirements, there were expectations to follow a specific steering system during the merger process. However, the company has now transitioned to*

having more freedom in building their own steering system, which has been a positive and successful process overall.

Answer 5: *Acquired asset is a mobile offshore production unit that can be certified as a permanent installation when its legs are fixed. However, it is still classified as a boat, which means it undergoes audits from regulatory bodies such as the PSA and the Norwegian Maritime Authority (SDIR). These audits have resulted in numerous findings that need to be addressed. The challenge lies in adapting to a different regulatory framework and managing the workload within an already LEAN organization. The acquisition of this rig has presented an interesting challenge that requires significant effort from the involved personnel.*

Answer 6: *One of the challenges in the acquisition was the difference in regulatory frameworks and mindset between the operator and the contractor. The transition from one flag to different for the rig posed compliance challenges, particularly in relation to the flag and class regime. The authorities, such as the PSA and NMA, have different approaches and expectations. The contractor mindset tends to be more black-and-white, while the operator mindset allows for evaluation and risk assessment. Adapting to the new regulatory framework and mindset has been a ongoing challenge in the acquisition.*

Question 3. What are the significant challenges you encountered compared to the planned activities for asset acquisition/ merge? If any, can you describe how your organisation responded to asset management challenges in this case?

Answer 1: *The significant challenges encountered during the asset acquisition/merge were related to standardization and the emotional impact of change. The scope of the project expanded over time, resulting in a longer timeline. However, the organization responded well to these challenges by implementing effective change management and risk assessment processes. The introduction of a new system, SAP, caused mixed emotions among employees, with some fearing the complexity of the system. Addressing these emotional reactions and allowing time for acceptance were crucial. Thorough explanations were provided regarding the additional costs and time required for the project.*

Answer 2: *One of the significant challenges encountered during the asset acquisition/merge was the tension arising from differences in background and positions within the organizations. Some individuals might have faced the challenge of transitioning from a higher position in*

their previous company to a lower position in the new company. However, the specific measures taken by the organization to address these challenges were not known. It was mentioned that bonuses and compensating measures were used to motivate employees and foster positive attitudes towards the change.

Answer 3: *The significant challenge in the asset acquisition/merge process is the cultural differences and pockets of excellence within each company. Each company has its own unique culture and ways of working, making it challenging to merge and establish a unified culture and management system. Preserving the best practices and knowledge from the acquired company while aligning them with the larger organization is crucial. There is a risk of losing valuable competency and practices during the integration process, so it is important to have a focus on identifying and adopting the best aspects from the smaller company.*

Answer 4: *The organization has followed the planned activities for the asset acquisition / merge process. The merger is expected to take around five years to fully integrate. There have been changes in top management, which have brought new ideas and impacted the planned activities. The company emphasizes that status quo is not acceptable and encourages a dynamic and innovative approach. New roles and responsibilities were assigned to employees as part of the merger, and a new management system was developed based on the best practices from both companies. The organization has undergone reorganization and is now less dependent on other company. Changes continue to occur regularly throughout the process.*

Answer 5: *The organization has continued with the same maintenance program during the merger process. However, there is a challenge in merging the maintenance concept strategy due to the organization's focus on day-to-day operations and ensuring asset integrity. Developing a common asset strategy is a secondary priority at the moment.*

Answer 6: *In the acquisition, the transfer of personnel and systems went smoothly without significant organizational changes. The process was well planned, resulting in a seamless handover. The personnel and systems remained the same, with the only change being the shift in roles and responsibilities.*

Question 4. During the merger and acquisition process, did your company face challenges in terms of culture change and getting people to adapt to the acquiring company's culture?

If yes, how did your company manage and address this challenge to ensure successful maintenance operations?

Answer 1: *During the merger and acquisition process company faced challenges in terms of culture change and getting people to adapt to the acquiring company's culture. To address this, we implemented a comprehensive plan for the project. One important aspect was ensuring the technical side of the transition, which involved preparing data to be moved to the new system and convincing employees to work with the new system.*

Competence development played a crucial role in managing the cultural differences. We designed courses tailored to the specific needs of employees based on their roles and frequency of system use. Clear communication about the project timeline, including the start of the new system and cut-off dates for using the old system, was essential. The project encompassed various aspects, such as competency assessment, course design, and addressing gaps between the old and new systems. Managing the merger required effective project management, resource allocation, and change management processes. We had dedicated project and technical managers, as well as individuals responsible for adjusting and transferring data to fit the new system. Bridging the gap between different technologies, such as adapting the maintenance program from the previous system (Workmate) to the new system (SAP), was a part of the process. It involved ensuring a controlled and well-managed transition throughout the project.

Answer 2: *In the long run, one of the significant issues we face is that employees still identify themselves with their former company rather than embracing the new organization. This leads to silos and separate groups working in their old ways, making collaboration challenging. People tend to be resistant to change, which creates friction within the company. The history of being separate entities contributes to this difficulty in aligning work practices and mindsets.*

To address this challenge, we recently undertook a large-scale organizational project aimed at creating a more unified company. As part of this effort, we are working on developing common management systems and defining a unified approach to work. We are actively involving employees from both companies and striving to reach a consensus on the best way forward, encouraging everyone to work together as one cohesive entity.

Answer 3: *We ensured close collaboration between the merger project team and representatives from the union and safety delegates. We recognized the importance of maintaining a continuous flow of information and keeping these individuals always informed. This involved various communication channels such as town hall meetings and electronic newsletters to supplement the information sharing process. It was crucial to have an ongoing dialogue and demonstrate respect for the existing culture and good practices from acquired company. We conveyed our ambition to preserve and adopt these practices, acknowledging the significant efforts made by employees over the years to build them.*

Answer 4: *Indeed, there have been noticeable shifts in culture since the merger. As a newly formed company, we had to establish our own unique culture. Initially, there were two distinct cultures, with one being more experienced in operations and the other having a different approach. One culture was more conservative, while the other was characterized by a more free-thinking and ad hoc style. It took time for everyone to align and adopt a unified mindset and way of working, especially in offshore operations. We swiftly formed a centralized department for maintenance management and engineering, eliminating regional differences to facilitate this alignment. The goal was to foster a cohesive team with a shared approach. However, it has taken time for individuals to fully embrace these changes, particularly in offshore operations. Our maintenance activities have been consolidated into a single department with a designated leader, which has brought greater unity compared to the previous fragmented structure.*

To promote consistency and prevent duplication, we initiated a comprehensive project to review and standardize the documentation specific to our assets. The aim was to establish a common framework that could be applied across all assets, providing offshore personnel with a unified system to work with. This endeavour has helped streamline operations and encourage a sense of cohesion and collaboration among team members.

Answer 5: *We implemented a personnel exchange program between different installations, allowing individuals from one company to work on assets belonging to the other company. This facilitated the transfer of experience and knowledge. To ensure successful work processes, it was crucial to involve the workforce in the development of these processes. By including representatives in the decision-making and establishing a sense of ownership, they felt heard and valued. The project involved subject matter experts who had weekly working*

sessions, even during the pandemic, utilizing online platforms like Teams. The leaders and managers of offshore installations actively participated in these workshops.

The company has a process-based management system in place, and it is important to involve the relevant individuals in decision-making. When implementing a new work permit system during the pandemic, they took it seriously and involved the workforce representatives, treating them as instructors rather than solely relying on a small group of individuals to develop the system. Involving people in the process development is not only common sense but also a requirement from regulatory authorities. As they prepare to implement a new version of SAP (SAP S/4HANA), they emphasize the need to engage offshore personnel and gain their full agreement. The work processes within the management system must align with SAP, serving as a roadmap for finding information. The goal is to have user-friendly, web-based systems where employees can easily access the information they need, thereby promoting effective utilization of the management system.

Answer 6: *The challenge of culture change and people adapting to a new culture is always present in these projects. Despite the uncertainty surrounding how to address this challenge, we strive to adhere to the project's scope of work as closely as possible. When confusion arises regarding reporting, maintenance programs, or concepts, we maintain close communication with the operating company and conduct workshops with our designated contact points. Ultimately, decisions are made by these contact points, even if internal conflicts arise. We prioritize documentation during projects, especially when there are uncertainties or information regarding setups. Clear and systematic documentation ensures traceability, allowing us to provide answers to clients based on the decisions made in meetings and workshops.*

Answer 7: *To address the challenge of integrating different company cultures and ensuring successful maintenance operations, effective communication has been a key focus. The Norwegian model, which emphasizes collaboration between companies and cooperation with authorities under the Working Environment Act, serves as a framework for building a shared understanding. It helps guide how the organization should be structured, whether it should be more flat or hierarchical. In the case of our merger, there is a recognition that Norwegian work culture tends to be more direct and flatter in structure, while other country cultures may have a more hierarchical approach. Efforts are being made to bridge these cultural differences and*

create a harmonious working environment. For example, there are initiatives such as HSE management visits to installations where personnel from different backgrounds can observe and learn from each other's practices. These experiences aim to facilitate a transfer of knowledge and understanding between personnel from different merged companies.

It is worth noting that the integration process is ongoing, and adapting to the acquiring company's culture takes time. Although some assets acquired several years ago, there are still instances where people inadvertently refer to the previous company. This indicates that complete assimilation into the new culture may take time and continuous effort.

***Answer 8:** The cultural differences between the contractor-oriented and the operator-oriented culture have posed challenges in the acquisition. Acquired side personnel are accustomed to working as contractors for operators and find it difficult to shift their mindset to operating as an operator themselves. The cultural disparities between two country norms add an additional layer of complexity. Efforts are being made to address these challenges through cultural integration programs, leadership training, and discussions to merge the cultures. The average age of the personnel working in acquired asset is relatively high, which further adds to the time required for cultural adaptation.*

Question 5. How does effective communication among stakeholder's impact asset management during merger and acquisition projects? How can you improve communication in your organisation?

***Answer 1:** Effective communication among stakeholders has a significant impact on asset management during merger and acquisition projects. It plays a crucial role in ensuring that all parties involved have a clear understanding of the project goals, expectations, and processes. Improved communication facilitates smooth coordination, reduces misunderstandings, and enhances collaboration among stakeholders.*

In our organization, we have recognized the challenges of communication and have taken steps to improve it. We sought external assistance to make communication more understandable, especially during times of significant change. This involved using illustrations and concise language to convey information effectively. Additionally, we have a dedicated communication department that works closely with offshore and onshore leaders. Through workshops and training sessions, we have empowered these leaders to communicate

important information to their teams. We also understand that individuals within the organization have varying levels of skill and knowledge. To address this, we have incorporated work processes and tools into classroom trainings. This approach allows us to not only teach how to use specific tools like SAP but also educate on how these tools align with our work processes.

Despite our efforts, we acknowledge that communication remains a challenging aspect. It requires continuous attention and adaptation to meet the diverse information needs of stakeholders. We are committed to finding innovative ways to improve communication within our organization to enhance asset management outcomes.

***Answer 2:** Effective communication is vital in merger and acquisition projects as it ensures consistency and alignment among stakeholders. Without proper communication, tasks may be carried out differently, leading to a lack of cohesion. Therefore, it is crucial for all individuals involved to engage in continuous dialogue throughout the project, managed within the project's processes.*

Regarding our situation, merger process is still ongoing, with the entire organization being transferred to our company. During our own experience, which took place before the COVID-19 pandemic, we held numerous meetings to facilitate communication. As the project consisted of multiple initiatives, it was important for stakeholders to collaborate, assign tasks, and designate leaders to facilitate effective communication. This communication primarily took place through physical meetings and workshops. In certain instances, it was necessary to involve individuals with relevant expertise to assess the potential impacts of proposed changes. For example, discussions with mechanical and instrument department representatives or inventory specialists were crucial to understanding the potential ramifications. Competence played a significant role in identifying and defining the areas of impact.

While most of our meetings were conducted online, we also utilized physical meetings and email communication. Being in the same building provided an advantage as teams working on specific tasks were able to sit together and maintain regular communication. In the post-merger phase, it is anticipated that acquired company will receive support, including online assistance and designated super users, who can provide guidance and help address any

challenges that may arise. This support system will be instrumental in ensuring effective communication and facilitating a smooth transition.

Answer 3: *One of the major challenges in the organization is the lack of collaboration and awareness among employees. There is a tendency for individuals to work on similar tasks without knowledge of others, resulting in duplication of work and working in isolated silos. Insufficient reporting and information sharing contribute to this issue. To address this, it is crucial to improve the availability and accessibility of information, ensuring that employees have access to the necessary data and insights to work more collaboratively.*

Answer 4: *Incorporating a bottom-up approach and involving employees in decision-making is essential for effective communication during merger and acquisition projects. Understanding the strengths, areas of excellence, and specific needs of the merged organization is crucial. It is important to conduct a thorough risk assessment and continuously address any identified risks through collaborative actions with employee representatives. By actively involving employees and valuing their input, they feel heard, taken seriously, and engaged in finding solutions.*

Answer 5: *To ensure successful maintenance operations and address the challenges of integrating different working cultures, the company focuses on communication, team-building, and personal interaction. They organize team-building activities and handover meetings to foster connections and clarify expectations. Personal communication is prioritized for important information and changes to ensure understanding and engagement. The company acknowledges the time needed for team cohesion and recognizes the benefits of in-person communication to build a shared purpose and bridge the gap between offshore and onshore teams.*

Question 6. During the process of merging assets, one common challenge is integrating different Computerized Maintenance Management System (CMMS) software, such as SAP, Maximo, or other specific software, into one unified system. Has your company faced similar challenges during mergers, and if so, what approach was taken to address this issue?

Answer 1: *Companies in the industry adhere to common maintenance standards such as NORSOK and Z-008, which provide a basis for standardization and commonality. By starting with these standards, organizations can identify similarities and differences in maintenance*

practices and evaluate their effectiveness. The goal is to find a balance between standardization and accommodating unique requirements.

Answer 2: *During merger projects, one of the challenges encountered is the differences in BMS and work processes across the companies involved. This leads to variations in CMMS requirements and functionality, as well as discrepancies in data. Standardization plays a crucial role in addressing these challenges. Companies often follow ISO standards such as ISO 14224 for maintenance concepts and tasks.*

In the context of CMMS, the organization in question utilizes a software called Workmate. Workmate serves as their CMMS and plays a significant role in managing maintenance processes, including work order identification, validation, and execution. SAP, on the other hand, is an enterprise resource planning (ERP) system that is commonly used in various business functions, including asset management. During the merger process, efforts are made to align the CMMS (Workmate) and SAP functionalities to ensure seamless integration. This involves defining common BMS requirements that encompass ISO standards and work processes. A blueprint is developed to adapt the CMMS (Workmate) to align with the defined BMS and SAP functionalities.

Data enrichment and cleaning are carried out to consolidate and harmonize information, ensuring accurate and reliable data for the integration process. Mock executions and test runs are conducted to validate the migration of data from Workmate to SAP, ensuring a smooth transition. Effective communication and a holistic approach are essential in successfully addressing the challenges related to CMMS integration, ISO standards, and SAP implementation.

Note: *The BMS serves as a central system that incorporates strategies, work processes, policies, and company strategies, providing a framework for efficient asset management during mergers and acquisitions.*

Answer 3: *In previous projects, there have been experiences with implementing and transitioning between different CMMS systems. One such project involved a global implementation of Maximo, which later required a change to SAP due to compatibility issues. The transition from one system to another involved data cleansing and preparation for the transfer. These transitions between CMMS systems are complex and go beyond configuring*

the software itself. They also involve reorganizing the maintenance process, including the roles and responsibilities of individuals within the organization. Logistics, material management, and other aspects are considered during the transition. It is a substantial project that involves both the software system, such as Maximo or SAP, and the people involved in the maintenance process.

***Answer 4:** One of the major challenges is the different coding and usage of systems across various assets within the organization. It becomes difficult to navigate and manage these differences, especially for those working across multiple assets. To address this, the organization is transitioning to a new system, SAP Hana, and has initiated a project to ensure uniformity in processes before the transition. They are currently working on combining maintenance procedures to align them across assets and achieve consistency. The goal is to unify operations through the new system.*

***Answer 5:** It is not necessary to have only one CMMS system within a company, but it is generally considered an objective to strive for. In the case of the organization, the merging of CMMS systems was not initially included as part of the organizational merger project. Instead, the assets continued to use their existing CMMS systems throughout the process. A separate project was later established to harmonize the CMMS systems, which was a major and comprehensive task with high complexity. The advice given is to avoid conducting the CMMS system merger in parallel with the organizational and legal mergers, as it is a significant and complex undertaking that may require individual approach, time and dedicated resources.*

***Answer 6:** During our acquisition, both companies used SAP. One company's SAP was a standardized soft version, while the other company had a modified and fine-tuned SAP that had been optimized for 25 years. The decision was made to select one SAP system, specifically the standardized version, to be used across both companies. However, this posed a challenge for one part of the organization, as they had to adapt to the new SAP and let go of their finely tuned solutions. Training and common procedures were implemented to ensure a standardized maintenance approach within SAP. It's important to note that the selected SAP was considered a temporary solution, with plans to eventually implement a newer version called SAP S/4HANA, which offers improved user-friendliness and features. The goal is to have one common system that is shared across the organization.*

Answer 7: *The focus is always on the end system that will be used. In my experience, there haven't been significant challenges because both companies typically use the same systems, such as SAP. The main task is migrating from the old system to the new one. The challenge lies in ensuring that the inputs for the new system are simpler compared to the old SAP. This requires close collaboration with the IT department to receive guidance on the required data and metadata. Essentially, we follow the IT guidelines and documentation to ensure a smooth transition.*

Answer 8: *The headquarters of the company has decided to use SAP, while acquired company previously used a different software. This has resulted in a significant amount of work in transferring and finding information between the two systems. The transition project, has multiple streams of focus, including maintenance and information management. Coexisting with different software has posed a challenge, as there is confusion about which software to use and where to find information. The situation is still a work in progress, with ongoing efforts to streamline and unify the systems.*

Answer 9: *After the acquisition, there was a transition period where the opposite side personnel continued to use the IFS system instead of transitioning to our SAP system until recent times. This allowed for a smoother transition as it gave time for training and familiarization with the new system. However, challenges arose during the transfer from IFS to SAP, especially due to the differences in setup between two companies. The transition involved transferring data and adjusting maintenance processes, which required extra capacity and ongoing training sessions. Despite the challenges, the situation has improved, and efforts are being made to provide support both offshore and onshore.*

Question 7. During the M&A process, have you encountered the issue of lost or unidentified asset information after integrating all assets into a single CMMS. If so, how did you address this challenge of potentially lost data and ensure proper data capture for these assets at a later date?

Answer 1: *In the current digitalized era, data loss is unlikely to be a significant problem due to the ability to store and recover information. Older systems may pose challenges, but with digitalization, data can be easily retrieved through ticketing systems or archives. The method of digitalization plays a crucial role in ensuring information accessibility and searchability. By*

using methods that allow for tagging and references, data can be efficiently retrieved and utilized. Simply scanning documents as plain images may limit search capabilities. However, implementing algorithms and Python codes enables advanced searching options. Overall, the approach to digitalization and data management significantly impacts the ability to avoid data loss and facilitate efficient information retrieval.

Answer 2: *Throughout the data migration process, the focus was on minimizing data loss and ensuring a successful transition. Mock sessions were conducted as test runs to migrate data, with adjustments made along the way to address any missing information. By the final session involving end users, data integrity was expected to be ensured. Conscious decisions were made not to move historical data, as the potential risks and challenges associated with adapting them to the new system outweighed their value. To assist users during the transition period, a lookup table was created to easily find corresponding values in the new system. Although there were individual support cases, overall, no significant data loss or missed information occurred during the process. The support organization was prepared to address any issues that arose, ensuring a smooth transition for users.*

Answer 3: *During the migration process, the focus was on data maturity and ensuring the quality of information transferred to the new system. While there may have been concerns about the data quality of older assets with limited documentation, no significant data loss occurred. The use of tracking systems and robust storage ensured that information was retained and accessible. Losing information is not an appropriate description as the data was archived in the old system, and the goal was to maintain data integrity and usability in the new CMMS. The emphasis was on ensuring the data's suitability for the new technology and system rather than experiencing data loss.*

Answer 4: *Data migration carries inherent risks, including the potential for data loss and changes in data quality. However, it is a common practice, and industry methodologies and data standards exist to guide the planning and execution of such migrations. While achieving a seamless data transfer is highly attainable, it requires meticulous planning, sufficient time, and competent individuals to carry out the process effectively. Recognizing the complexities involved and dedicating resources to ensure a detailed and well-executed plan is crucial for successful data migration.*

Answer 5: *There have been no specific instances of data loss during the transition. By maintaining a single version of SAP and not experiencing any notable data loss, it can be inferred that all data has been successfully preserved. Additionally, backups have been implemented to ensure that in the event of any missing information, the data can be recovered from the backup systems. This approach provides confidence that the company's data remains intact and accessible.*

Answer 6: *During one of the projects, a strategy was implemented to preserve the original data by keeping the old database intact. To identify any missing data between the old and new systems, a Python program was used for automatic comparison and highlighting of discrepancies. This approach aimed to minimize the risk of data loss during the transition. While manual work may be necessary in some cases, utilizing automated programs like Python proved to be efficient for screening large volumes of data. Collaboration with data analysts facilitated the process and ensured accurate data preservation.*

Answer 7: *It seems that there are challenges related to data management and documentation after the acquisition. While there is a contract in place with other company to address any missing information, there is a higher requirement for data and documentation from our perspective. The existing data may not have been logged or validated properly by other company, leading to difficulties in extracting specific information based on tags or categories. As a result, ongoing efforts are being made to clean up the data, filter it, and organize it within their system for better management and accessibility.*

Question 8. Were there any significant differences in the maintenance and operations philosophies or strategies between the two assets, and if so, how did you address them?

Answer 1: *There were some significant differences in the maintenance and operations philosophies or strategies between the two assets. This is common when integrating companies or departments with different approaches. To address these differences, a collaborative process was followed. The maintenance management loop was analyzed stage by stage to understand the executional work of each company. By comparing strategies and work processes, a common requirements database and strategy were developed.*

During our merging with other company, there was a recognition that they had certain areas of excellence and a better strategy in some aspects compared to us. The approach taken was

to identify these "Golden Nuggets" or pockets of excellence and incorporate them into the existing governance and strategy. This allowed for the adoption of their best practices while maintaining consistency with the overall approach of our company.

Answer 2: *There were significant differences in the maintenance and operations strategies between the two assets. It is common for companies to have their own unique strategies in these areas. Before integrating the systems and technologies, it was necessary to align and combine the strategies. This involved fitting the old strategy into the new one and addressing any gaps that may exist. The focus was on integrating the management processes and creating a standardized approach. It was important to establish harmony between the existing strategies and the new ones in order to achieve standardization.*

For instance, if one company had a practice of fixing a pump every second year, while the other company did it every five years, there was a clear difference. In such cases, changes needed to be made to find an optimal solution and bring the strategies together. The goal was to ensure that all aspects were combined into a unified strategy for the integrated operations.

Answer 3: *There were notable disparities in maintenance and operations philosophies and strategies between the two assets. These variations were influenced by factors such as asset age, productivity, and maintenance planning approaches. One asset focused on high-level performance with newer equipment, while the other had older equipment and a different approach due to limited production life expectancy. These differences posed challenges when trying to provide assistance or resources between assets, as individuals needed to adapt to unfamiliar practices. As a result, it was difficult to fully utilize shared resources due to the need for alignment and collaboration between the differing philosophies and practices.*

Answer 4: *The assets involved in the merger had their own unique maintenance and operations philosophies shaped by their respective company cultures. Differences existed between the strategies and approaches of the two assets. The central corporate organization provided common practices and requirements, but each asset had its own specific methods. To ensure alignment, a thorough examination of the strategies was conducted, leading to a consensus on a harmonized approach for the combined entity. Implementation efforts focused on adopting this unified strategy across the assets, taking into account the differences and finding common ground.*

Answer 5: *There were not significant differences in the maintenance and operations philosophies between the assets. Both were built upon a common PSA activity Regulation 45. However, there were some variances. To address this, a common steering system was developed within the management system for maintenance. A maintenance task force was formed across the assets to ensure a unified approach, both onshore and offshore. Additionally, a centralized maintenance organization was established, aiming to align the maintenance and operations philosophies. Despite these efforts, there has been some resistance to change, as people generally dislike changes in their work routines. Over the course of five years, ongoing efforts have been made to overcome this resistance and foster a smooth transition to the new maintenance and operations philosophy.*

Answer 6: *The significant difference in maintenance and operations philosophies between the assets lies in the age and condition of the assets. While one asset has older equipment and outdated practices, the other asset has newer equipment and modern maintenance strategies. To address this, cooperation between the maintenance engineering team, a small department within the organization, and the technical department is crucial. The challenge lies in merging these different philosophies and implementing a new CMMS while considering time constraints. It is important to have good strategies and long-term vision for maintenance, as the benefits may not be immediately apparent. Active participation from internal team members is necessary for successful implementation.*

Answer 7: *The maintenance and operations philosophies between the assets are communicated and aligned closely with the client. Regular communication and routine meetings with the client are important to understand their future strategies and determine the proposed solutions. Decisions regarding priorities and solutions may take time, and low-priority items may be deferred to later phases. One example is the lifeboat function test, where the PSA did not clearly state the requirement to follow IMO standards. Through investigation and reference to NORSOK, it was determined that the test should be conducted according to IMO standards. However, considering environmental concerns and practicality, a compromise was reached by performing a modified start battery test instead of a full engine start. Balancing compliance with practicality is essential when offering solutions that align with regulations and standards.*

Answer 8: *Before acquiring the asset, the operation philosophy involved opposite side of personnel handling all aspects of the legacy equipment, including the drilling rig and general engine operation. With the addition of a new process module, a different operation philosophy was implemented for that component. However, after the acquisition, all personnel working on the rig are now transferred to buyer company. One approach being implemented is cross-training, where mechanical operators from both sides are trained to handle both the process plant and the rest of the rig. This allows for more efficient utilization of personnel and helps bridge the knowledge gap between the two operational setups.*

The transition to being solely owned brings the positive aspect of increased control, leading to potential gains in operational efficiency and personnel management.

Answer 9: *It appears that the maintenance and operation philosophy and strategy decided during the project and lease and operate agreement with acquired company have been continued without significant changes. However, there have been recent updates to the maintenance strategy, particularly focusing on safety, environment, and equity improvements. Rather than rushing to implement all changes at once, a gradual approach has been adopted, allowing for successful implementation over time.*

Question 9. In your experience, what role does digitalization play in facilitating asset management during merger and acquisition projects? Have you implemented any new technologies or digital tools in your asset management processes during merger and acquisition projects? If so, can you discuss the impact of those tools on your operations?

Answer 1: *Digitalization plays a key role in asset management during merger and acquisition projects. While we haven't implemented new technologies specifically for the merger, our existing digital tools have had a positive impact. Our user-friendly CMMS and custom apps enhance accessibility and usability for end users. Additionally, we have a broader digitalization agenda, including implementing a digital twin and utilizing advanced tools for condition-based maintenance. While these efforts aren't directly linked to the merger, we benefit from incorporating expertise from the acquired company. However, it's not a major digitalization shift specifically tied to the merger. Although 3D models aren't extensively used in the merger process, they are part of our asset management with varying quality across assets.*

Answer 2: *Digitalization plays a crucial role in facilitating asset management during merger and acquisition projects, particularly in the context of operation and maintenance. The core application portfolio, including the CMMS system, controller work, and lifecycle information, forms the foundation for effective asset management. It is essential to have robust functionality and reliable data integrity in these core systems. While additional digital tools such as 3D models and digital twins can enhance asset management, it is vital to prioritize the quality of basic data sources and application portfolio. Without a strong foundation, attempts to implement advanced digital solutions may not be successful. Therefore, it is advisable to focus on getting the fundamentals right before pursuing more elaborate digital initiatives following a merger.*

Answer 3: *We have implemented some new digital tools, specifically a barrier panel and a dashboard to monitor digital barriers and extract information from SAP. Additionally, we are currently undertaking a significant project focused on digital field work. This project involves equipping field workers with tablets, allowing them to perform tasks without the need to be constantly present in the office. The goal is to enhance productivity by enabling workers to access the necessary information, such as drawings, P&IDs, and work management systems, directly from their tablets. This project is particularly important offshore, where strict safety protocols govern work organization. While we have made progress with tablet-based inspections on the acquired field, we are also working on developing the necessary infrastructure, including Wi-Fi and fiber, for digital operations on other assets.*

Answer 4: *Digitalization plays a significant role in asset management during merger and acquisition projects. While I haven't personally implemented new technologies, our company has a strategy to digitize assets. This includes automating reporting systems and transitioning from paper-based work orders to mobile work orders. We also utilize Python programs developed by our data colleagues to facilitate data population and ensure consistency in our maintenance programs and asset hierarchy. Additionally, the use of Power BI for reporting allows us to track project progress and provide management with timely updates. However, digital twins and 3D models are primarily used for operational purposes rather than maintenance at this point. Overall, digitalization improves efficiency and streamlines asset management processes during merger and acquisition projects.*

Answer 5: *During the acquisition and startup phase of the new field, there were several new tools from the portfolio that were implemented, including planning tools, maintenance scheduling tools, production operations tools, and communication tools such as offshore helmets with cameras. However, the implementation of multiple tools simultaneously posed a challenge due to limited capacity. While the tools themselves were not affected by the merger, the timing of their implementation alongside the acquisition and field startup created capacity constraints.*

Question 10. After asset acquisition have you used that standardization of maintenance programs in any scale? If so, what was the outcome?

Answer 1: *After the asset acquisition, we have implemented standardization of maintenance programs to a certain extent. We conducted maintenance strategy assessments and developed maintenance and test concepts for specific equipment groups, focusing primarily on safety-critical equipment. These concepts outline the required tests and measurement points for each equipment group. While we have made progress in standardizing maintenance, we still face challenges in asset-specific resistance and variations due to different vendors' maintenance manuals suggesting different approaches. However, despite the challenges, I believe the standardization efforts have been beneficial. We now have a large portfolio of new build installations that can benefit from the standardized maintenance program outlines. These newer installations can adopt a more proactive, condition-based maintenance approach, while our older assets continue to follow the standardized program.*

Answer 2: *After the asset acquisition, we have made efforts to standardize maintenance programs. It is essential to align the maintenance practices across the acquired assets. However, there are challenges involved in this process. Different technologies, equipment, philosophies, and organizational structures may exist, which require careful consideration and justification for standardization. For example, if one asset performs a function test yearly while another does it every second year, we need to evaluate and determine the appropriate frequency. Standardization is a goal for all operators when integrating new assets, but it takes time to fully implement. Typically, a standardization project is initiated to merge the acquired assets into a new system. Once the systems are in place, additional projects can be launched to further standardize processes.*

To facilitate standardization, roles and responsibilities are established, with a designated person overseeing the work and sharing lessons learned across different assets. While achieving full standardization may not happen immediately, it remains a crucial objective in the maintenance field.

It is worth noting that in the future, we anticipate more merging projects and larger companies absorbing smaller ones, which will continue to drive the need for standardization in maintenance practices.

***Answer 3:** In terms of outcomes, we have seen some benefits from our standardization efforts. For example, we have been able to create a set of maintenance and test concepts for specific equipment groups, such as active firefighting, which outline the required tests and measurement points. This has helped to ensure that preventative maintenance is done consistently across our assets, which is important for safety and reliability.*

However, we have also faced challenges with standardization, particularly when it comes to equipment that has different vendors or maintenance manuals that suggest different approaches. In some cases, asset-specific fights have also arisen, with some assets claiming that standardization increases costs.

***Answer 4:** The outcome of our standardization efforts has been the development of a common document that contains all maintenance procedures and long texts in SAP. This document ensures that regardless of the asset, the maintenance procedures are consistent and recognized by all. This project is still ongoing and is a significant undertaking.*

We have also reviewed asset-specific documentation systems, including system descriptions, operational procedures, and maintenance concepts. As part of this process, we are implementing FMECA to establish a common maintenance approach for all assets. The goal is to have a unified maintenance concept and FMECA process across all our assets.

While these standardization initiatives take time, our objective is to ensure that everything is standardized and consistent across all assets. It is a continuous effort, but it is an important step toward improving efficiency and effectiveness in maintenance operations.

***Answer 5:** The standardization of maintenance programs is a common goal for companies, including Aker BP. The aim is to have a generic maintenance concept that can be applied to*

each asset. However, for complex equipment like gas turbines or compressors, specific instructions and technical specifications may be required alongside the standardization. The standardization process involves defining failure modes, causes, effects, and impacts for each object type, and then determining the appropriate maintenance activities to mitigate those failures. After implementing the standard maintenance activities, a review is conducted to identify any assets that may need additional specific requirements. This iterative process ensures that the maintenance programs are as standardized as possible while accounting for asset-specific considerations.

Question 11. Any other challenges you faced during merging?

Answer 1: *During the merger activities, blending different stocks and minimum/maximum values into a unified CMMS system posed significant challenges. This required a data enrichment project and resulted in the devaluation of many spare parts. Managing spare parts remains a challenge due to the ownership structure across different fields and the need for internal purchases rather than simple transfers. Industry cooperation on spare parts could be beneficial, as maintaining large stock levels incurs costs.*

Despite the successful execution of the merger, the introduction of a new CMMS, specifically SAP, initially led to a peak in KPIs followed by a subsequent drop. Backlog increased, and plan attainment decreased during this period. However, overall, the company has become experienced in managing mergers and considers them a familiar process.

Answer 2: *The daily challenges faced during operations and maintenance are seen as manageable and even positive, as they provide opportunities for growth and learning. The merger between the two companies was perceived as a good solution, as they complemented each other's strengths and weaknesses. One company brought modern thinking and new technologies, while the other had experienced and competent personnel. This combination proved beneficial, particularly in the areas of maintenance and operation, where the organizations found a good match.*

Answer 3: *The biggest challenge in maintenance projects is often underestimated timelines and lack of understanding regarding the complexity of the work involved. Clients may initially think that automation and IT programs can handle everything easily, but in reality, manual work and detailed analysis are often required, especially for data cleaning and developing*

maintenance programs. The involvement of relevant personnel and subject matter experts is crucial for comprehensive project planning. Additionally, the efficiency-driven culture in many companies can lead to higher workloads and limited time for decision-making and approval processes, which can impact project timelines. Close coordination with operational teams is important, but their busy schedules can also pose a challenge. These factors contribute to the difficulty in meeting project timelines and achieving comprehensive project outcomes.

Answer 4: *One positive aspect of the acquisition was that acquired company had well-defined systems for training, competency, and procedures, which acquiring company didn't have initially. This provided a solid foundation to work with. Efforts have been made to "localize" the procedures and implement stronger information management and documentation systems. The focus has been on taking the time to ensure thoroughness rather than rushing through the process. The positive vibes and progress in training, competency, and management systems have been encouraging.*