sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

THE ROLE OF OPERATIONAL EXCELLENCE DIMENSIONS IN ENHANCING OIL AND GAS SUPPLY CHAIN EFFICIENCY- CASE STUDY IN NORTH OIL COMPANY

***Waleed Ali Hussein Al-Zaidi*[1]**

[1] *Dr. College of Oil and Gas Technologies Engineering, Northern Technical University, Iraq, E-mail address: dr.waleedah199@ntu.edu.iq*

Received 05 01 2025; Accepted 18 02 2025

Abstract
This study examines the role of operational excellence dimensions—namely Health and Safety, Assets and Process Reliability, Operational Efficiency, and Environmental Performance—in enhancing the efficiency of the oil and gas supply chain due to diagnosing a gap in existing research on the relationship between these dimensions. The study was conducted at the North Oil Company specifically the departments related to the current study, which included four departments, namely (Petroleum Engineering Department, Drilling Department, Lines Department, and Production Department). The study data was collected through personal interviews with the department managers, assistant department managers, division managers, and engineers working in the departments related to the study to gain insight into the company's operations. Additionally, 31 questionnaires were distributed across relevant departments. The data were analyzed using SPSS software to identify correlations, assess impact, and test the study's hypotheses.
The findings indicated significant correlations between all dimensions of operational excellence and supply chain efficiency, with the highest correlation (0.70**) observed between Assets and Process Reliability and supply chain efficiency. Significant impact relationships were also observed.
The study recommends enhancing the operational excellence dimensions to sustainably improve supply chain efficiency in the oil and gas sector, a fundamental pillar of the Iraqi economy.

Keywords: *operational excellence, oil, gas, supply chain.*
JEL Codes: *L11, L23, L95, M11.*

Introduction

The oil and gas sector is the cornerstone of the Iraqi economy, serving as a fundamental pillar that supports the country. As one of the world's largest oil producers, Iraq's economy relies heavily on revenues from the export of oil, gas, and related products to finance its budget and drive development across various sectors. This reliance enhances the government's ability to provide essential services to citizens, such as education, healthcare, and infrastructure.

Understanding operational excellence dimensions applied in the Iraqi oil and gas sector represents a fundamental focus for evaluating performance and identifying strengths and weaknesses for developing this vital sector and measuring its impact on supply chain efficiency in the oil and gas sector. Prior research has emphasized the significance of operational excellence by examining its essential aspects, and numerous previous studies have examined the effects of these aspects.

The study of (Muazu and Yahaya, 2022) focused on the Nigerian oil and gas sector to study the factors of risk management and operational excellence to determine the appropriateness of the method and instrument to be used to measure the effect of enterprise risk management determinants and its impact on operational excellence. The findings have shown that all risk management factors and implementation except staff capacity significantly impact operational excellence.

(Muazu and Gwangwazo, 2021) tried to determine the dimensions of operational excellence

in the oil and gas sector. Their research aimed to review the literature to clarify the dimensions of operational excellence. It was a continuation of previous reviews that distinguished between the dimensions of operational excellence in the manufacturing, services, and oil and gas sectors. The research found that operational efficiency, health and safety, asset and process reliability, and environmental performance are the dimensions of operational excellence in the oil and gas sector. Some factors that can influence the dimensions were suggested.

Using a qualitative methodology, (Ejiro et al., 2019) investigated how logistics performance was measured in Nigeria's oil and gas supply chain. The supply chain operations reference (SCOR) models and the balanced scorecard were found to be the main tools for measuring performance. It's interesting to note that not all upstream oil and gas firms use formal frameworks or models when choosing the metrics and key perfor-mance indicators needed to gauge supply chain logistics performance. Therefore, in order to stay competitive in the ever-changing business climate, logistics managers in the oil and gas industry are advised to incorporate flexibility and fast reaction into their logistical operations.

(Moro, 2023) reviewed optimising supply chain management in the oil and gas industry. Improving transportation can save costs and enhance environmental management and efficiency in the oil and gas indus-try. Effective supply chain management is critical to mitigating the impacts of oil operations and hazardous waste released into the environment. Increased regulations and awareness of emerging solutions in upstream, midstream and downstream logistics are essential to improving profitability and achieving environmental progress in reducing greenhouse gas emissions. The research findings revealed a shift in supply chain man-agement priorities from safety and reliability of asset management and increasing environmental concerns towards tighter integration of operations to increase revenue growth. Hence, it is desirable that integrating the operational framework with net zero GHG emissions will strengthen the relationship between oil and gas op-erators and their host governments.

The performance of oil and gas supply chain operations and logistics management were the main top-ics of the study by Akintokunbo and Ali (2021). A literature review served as the study's methodology and foundation for weighing the conclusions drawn on the theoretical relationship between the variables under investigation. While operational performance was assessed by looking at lead time and cost reduction, logis-tics management was examined in warehousing, inventory management, transportation, and logistics information systems. The study concluded that the operational performance of the oil and gas supply chain is great-ly impacted by logistics management. To improve operational effectiveness, the study urged firms to pursue in-depth knowledge of logistics management.

The study of (Al-Robaaiy et al., 2019) was conducted in a ready-made clothing production and gen-eral trade company in Baghdad. Through metrics such as (cost rationalization, quality improvement, delivery speed, high flexibility, profitability, continuity, and customer satisfaction) the study tries to quantify increas-ing efficiency in the supply chain.

According to the above studies and other several studies that studied efficiency, resilience, and readiness of supply chain such as the study of Ponomarov and Holcomb (2009) which discussed understanding the concept of supply chain resilience as well as the study of Adobor and McMullen (2018), which studied the resilience of supply chain in a dynamic and multidimensional approach, the lack of studies which discussed the relationship between the efficiency of supply chain and operational excellence dimensions especially in the oil and gas sector. Therefore, The current study tries to test the relationships between operational excellence dimensions and oil and gas supply chain efficiency to bridge this gap.

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Research Methodology

Research Problem

Operational excellence with its various dimensions is a critical issue that should be given priority in the advancement of the oil and gas sector, which plays a pivotal role in the Iraqi economy.

After reviewing the literature related to operational excellence and its dimensions, it became clear that there is a lack of studies that addressed the relationship between the operational excellence dimensions and the supply chain efficiency in the oil and gas sector. On the other hand, interviews were conducted with department heads and employees in the North Oil Company, and it became clear that they have poor knowledge of the dimensions of operational excellence and its importance to this sector.

Accordingly, the problem of the study can be clarified with the following questions:

1. What is the nature of correlation relationship between the dimensions of operational excellence and supply chain efficiency?
2. What is the nature of the impact of the dimensions of operational excellence on supply chain efficiency?

Research Objectives

The research seeks to determine the correlation and impact relationship between the operational excellence dimensions and; oil and gas supply chain efficiency, in addition to achieving the following objectives:

1. Proposing a model for the study that shows the nature of the relationship between operational excellence and its four dimensions represented by (Health and Safety, Assets and Process Reliability, Operational Efficiency and Environmental Performance) and the oil and gas supply chain efficiency, applied in the field to reach the results that reflect the research hypothesis, and the extent of its conformity with previous studies.
2. Testing the correlation and impact relationships between operational excellence and its four dimensions represented by (Health and Safety, Assets and Process Reliability, Operational Efficiency and Environmental Performance); and oil and gas supply chain efficiency.

The Study Model and Hypothesis

The systematic treatment of the study problem in light of the theoretical framework and its contents requires designing a hypothetical model that shows the logical relationships between the study variables as shown in Figure (1).

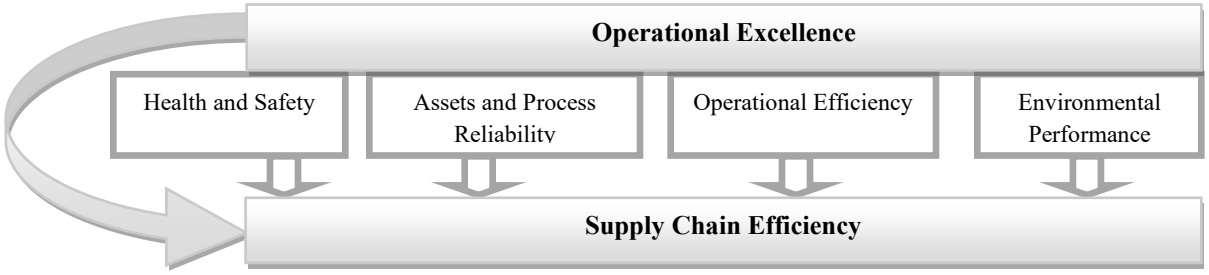

Figure 1. A conceptual framework of the relationship between Operational Excellence dimensions and supply chain efficiency

**Source: Author's own.*

The study model included two types of variables:

Independent variables: represented by operational excellence embodied in its four dimensions (Health and Safety, Assets and Process Reliability, Operational Efficiency and Environmental Performance).

Dependent variable: represented by the supply chain efficiency

The study model shows two main hypotheses, each of which has four main hypotheses, as follows:

H_1: There is a significant correlation between the combined dimensions of operational excellence and supply chain efficiency.

H_{1a}: There is a significant correlation between Health and Safety and supply chain efficiency.

H_{1b}: There is a significant correlation between Assets and Process Reliability and supply chain efficiency.

H_{1c}: There is a significant correlation between Operational Efficiency and supply chain efficiency.

H_{1d}: There is a significant correlation between Environmental Performance and supply chain efficiency.

H_2: The combined dimensions of operational excellence has a significant impact on supply chain efficiency.

H_{2a}: Health and Safety has a significant impact on supply chain efficiency.

H_{2b}: Assets and Process Reliability has a significant impact on supply chain efficiency.

H_{2c}: Operational Efficiency has a significant impact on supply chain efficiency.

H_{2d}: Environmental Performance has a significant impact on supply chain efficiency.

Data collection methods

The theoretical part of the current study relied on previous studies, books, theses, and websites. Whereas, The practical part is based on some research tools that were relied upon such as unstructured interviews and questionnaires. Unstructured interviews were conducted with the employees and managers who work at North Oil Company headquarters and departments related to the current study as in Table (1) using open-ended questions to obtain accurate information describing the company's work mechanism. An unstructured interview is the main data-collecting method that helps a researcher understand the study field's system nature deeply and collect a huge amount of data about the study field (Sekaran, 2003).

Table 1. The research sample: number of interviewers and institutions

Name of Dep.	Oil Engineering Dep.	Digging Dep.	Production Dep.
No. of interviewers	3	2	3

**Source: Author's own.*

The questionnaire was another main tool in collecting data, and its ability to measure the study variables was taken into consideration, as shown in Appendix (1). The questionnaire regarding operational excellence dimensions was based on the study of (Muazu and Gwangwazo, 2021) with the intervention for reformulating some variables to suit the current study.

As for measuring supply chain efficiency, the scale was developed by the researcher to measure related variables based on the study of (Ejiro et al., 2019), (Moro, 2023), (Akintokunbo and Ali, 2021).

The five-point Likert Scale was adopted, and the order ranged from the phrase "strongly agree," which received a weight (5), to the phrase "strongly disagree," which received a weight (1) as shown in the table (2).

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Table 2. Shows the dimensions of the study and its variables in the questionnaire form

Part of Questionnaire	Study Dimensions		Measurement indicators	Measurement indicators Symbol
First Part	General Questions		Demographic data	
Second Part	**Operational Excellence Dimensions**	Health and Safety	1-7	X1-X7
		Assets and Process Reliability	8-11	X8-X11
		Operational Efficiency	12-16	X12-X16
		Environmental Performance	17-19	X17-X19
	Supply Chain Efficiency		20-27	X20-X27

**Source: Author's own based on study results.*

The questionnaire form, as shown in the table above, consists of two parts:

First Part: Includes demographic data of the respondents (Age, Education Qualification, Experience years, Place of work.

Second Part: Includes paragraphs related to the operational excellence dimensions which include 19 variables distributed according to the dimensions as follows: 7 variables to measure Health and Safety, 4 variables to measure Assets and Process Reliability, 5 variables to measure Operational Efficiency, and 3 variables to measure Environmental Performance. The last paragraph of the questionnaire is specific to measuring supply chain efficiency which consists of 8 basic variables (Appendix 1).

The researcher conducted tests before and after distributing the questionnaire to the study sample to ensure its validity and reliability. The questionnaire was presented to four arbitrators specialized in administrative sciences to ensure the validity and clarity of the paragraphs and their ability to measure the study variables. Some paragraphs were added, deleted and corrected and were formulated in a way that meets the study objectives. While the stability of the scale was calculated using the Cronbach Alpha method, the researcher calculated the alpha coefficient for each dimension of the study in order to test the stability of the scales. The value of the alpha coefficient ranges between (0) and (1). The closer it is to (1), the higher the stability, and the closer it is to (0), the lower the stability. Table (3) shows the stability coefficients for the study scales.

Table 3. The stability coefficients for the study scales

Study dimensions	Values
Operational Excellence	0.91
Health and Safety	0.74
Assets and Process Reliability	0.83
Operational Efficiency	0.89
Environmental Performance	0.70
Supply Chain Efficiency	0.90
Total	0.94

**Source: Author's own based on study results.*

The table above shows that the alpha coefficient values for the scales used in the study were all more than 0.60, which is the minimum acceptable alpha coefficient. Therefore, it can be said that the scales used have internal consistency. The researcher was careful not to interfere with the answers of individuals in the study sample to achieve objectivity and neutrality and allow the expression of the true opinion of each individual in the sample.

Statistical analysis methods: The SPSS program was used to conduct the required statistical analysis. These tools are as follows:

1.Frequencies, percentages, arithmetic means, and standard deviations to be used in describing and diagnosing the study variables.

2. Correlation coefficient, which is used to determine the nature of the relationship between variables in terms of strength and direction.

3. Regression is a method used to determine the type of relationship between two or more variables.

4. F test to verify the significance of the effect for the entire sample.

5. T-test to determine whether the dependent variable plays an important role in the independent variable.

6. R2 test to determine the variance in the dependent variable that can be predicted through the independent variable.

Description of the study sample community and its members

Study community

The North Oil Company was chosen to implement the field aspect of the study, which was established in 1929 under the name of Iraq Petroleum Company Limited, then transformed into North Oil Corporation in 1972 and then into North Oil Company in 1987. The geographical area of the company extends to include (4) Iraqi governorates (Kirkuk, Nineveh, Salah al-Din, Anbar). The first well No. (1) was drilled on 30/6/1927 at a depth of 400 m, and on 14/10/1927, oil flowed from the well within the Kirkuk field at a rate of (60-70) thousand barrels per day. The company includes more than fifty facilities of pumping stations, concentration complexes, tank fields, gas isolation, and compression stations, and a large number of oil wells, all of which are connected to multiple networks of pipelines distributed across the company's area. The company supplies various types of crude oil to Iraqi refineries, associated gas, and dome gas to the North Gas Company, power generation stations, and industrial facilities, and exports crude oil via export lines to the north, south, and west.

Study Sample Description:

The researcher distributed 31 questionnaires to the research sample individuals as follows: (10) in the Petroleum Engineering Department, (5) in the Drilling Department, (6) in the Lines Department, and (10) in the Production Department, as shown in Table (4).

Table 4. Describe study sample characters

Age									
Less than 25		26-35		36-45		46-55		More than 56	
No.	%	No.	%	No.	%	No.	%	No.	%
0	0	4	12.9	17	54.8	9	29	1	3.2
Education qualification									
Technical Diploma		Bachelor		Higher Diploma		Master		PhD	
No.	%	No.	%	No.	%	No.	%	No.	%
0	0	25	80.6	3	9.7	3	9.7	0	0
Experience years									
Less than 2		3-5		6-8		9-11		More than 12	

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

No.	%	No.	%	No.	%	No.	%	No.	%
1	3.2	2	6.5	2	6.5	3	9.7	23	74.2
Place of work									
Oil Engineering Dep.		Digging Dep.		Lines Dep.		Production Dep.			
No.	%	No.	%	No.	%	No.	%		
10	32.3	5	16.1	6	19.4	10	32.3		

**Source: Author's own based on study results.*

The table above also shows the characteristics of the surveyed individuals as follows:

Age: The age indicator gives important indications of maturity and knowledge of the work, as it is clear that the majority of the surveyed individuals are between the ages of (36-55) years, as their percentage reached 83.8%, which indicates the accumulation of experience and knowledge of work matters.

Academic qualification: It is one of the most important indicators that is greatly reflected in the method of dealing with the questionnaire form, as it is clear from the table that the percentage of those who hold a bachelor's degree is ahead of the rest of the other percentages in the company, as it reached (80%), while the percentage of those who hold a diploma and a master's degree reached 9.7%, respectively.

Experience years: Long years of experience play an important role in consolidating the experience and knowledge of the individuals in the study sample, which has a positive impact on dealing with the questionnaire form, as the table above shows that the majority of the individuals surveyed have more than 12 years of experience, and their percentage reached (74.2%), which constitutes the highest percentage.

Place of work: The table shows the distribution of employees according to the company's departments under study. The highest percentage of employees was in the Petroleum Engineering and Oil Production departments, where they each amounted to 32.3%. The Drilling Department came in at 16.1%, while the percentage of employees in the Lines Department was 19.4%. These percentages show the importance of Engineering and Production departments to the current study.

Theoretical Background

Operational Excellence

"Excellence" refers to achieving and sustaining a goal to remain distinct, while "operational" refers to assembling and distributing the product to accomplish specific tasks (Mitchell, 2015). Operational excellence is associated with improved performance and efficiency across all industry scops as well as it is linked to both operational performance (e.g., expense metrics, quality, and flexibility) and sustainable performance (e.g., handling people and resources effectively to support business expansion) (Zhu, Johnson, Varisco, & Schiraldi, 2018). Operational excellence is equally concerned with manufacturing processes such as reducing waste and generating interactions between employees and customers to increase customer value (Chakraborty, Sharma, & Vaidya, 2020; Dev, Shankar, & Qaiser, 2020). Operational Excellence Management works to increase operating profits by achieving stable operational excellence in the production system, which supports customers by providing the right value for products and services.

Operational excellence is defined as the continuous monitoring of industry best practices in operational performance, health and safety, process reliability, and environmental behavior (Bag, Wood, Mangla, & Luthra, 2020).

Operational excellence is the use of valuable, rare, expensive to imitate, and non-substitutable resources and capabilities to implement operations strategy consistently and reliably. An organization can achieve continuous improvement of sustainable operational performance and sustainable competitive advantages while maintaining the satisfaction of employees, customers,

suppliers, and other important stakeholders (Kovilage et al., 2022).

Operational Excellence is a comprehensive approach to enhancing day-to-day operations in organizations that integrates elements such as leadership and accountability, risk assessment and management, communications, competency and training, asset safety, safe operations, contractors and suppliers, emergency preparedness, incident reporting and analysis, community awareness and outreach, and continuous improvement as well as the written commitments should be matched with procedures and implement it by organizations effectively if they are to form the basis of the entire organization's decisions and actions and prove truly useful. (Applied Operational Excellence for the Oil, Gas, and Process Industries, 2015: 35)

Based on the information provided above, the researcher sees that operational excellence is a strategic approach that aims to achieve outstanding performance in all aspects of the organization's work through the application of principles and practices. This approach includes the use of the best available processes, technologies and tools to improve performance and increase the efficiency of products and services, by focusing on achieving quality, safety, efficiency and flexibility.

Dimensions of operational excellence in the oil and gas sector

According to (Bag, Wood, Mangla, & Luthra, 2020) and (Muazu & Gwangwazo, 2021), the dimensions of operational excellence in the oil and gas sector have been explained by four main dimensions that include health and safety, Assets and Process Reliability, operational efficiency, and environmental performance.

Health and safety

Studies indicate that most industrial companies operate in a relatively risky environment. Oil and gas companies stand out as one of the industries facing the greatest risks, especially in terms of health and safety (Osabutey et al., 2013).

According to the National Institute for Occupational Safety and Health (NIOSH) (2010), the oil and gas health and safety program aims to identify potential exposure to hazardous chemicals to prevent physical injuries and maintain the health of the workforce.

Safety is defined as the absence of unexpected and unwanted negative events that may negatively impact employees, assets, or operations (Alkhaldi et al., 2017).

In general, health and safety policies are essential for organizations because they contribute to all aspects of business performance as they adhere to corporate continuous improvement ideologies (McCracken, 2008; Mitchell, 2015).

Safety and health require strategic management attention because they can directly impact a company's operational performance. According to British Petroleum (BP, 2016), functional safety leads to reliable operations of its assets, better efficiency, and ultimately, higher financial performance (Kolios & Luengo, 2016).

Effective safety and health management is achieved with strong leadership that identifies risks, responds promptly to incidents, and involves employees in safety and health management within the organization, leading to improved operational performance, and thus operational excellence and changing their perception towards risks (Bornstein & Hart, 2010).

Felemban and Sheikh (2013) emphasize the use of information technology, specifically radio frequency (RFID) which helps oil and gas companies in several ways such as search and rescue on oil rigs for cases of falling overboard or missing persons by using RFID badges and other sensors such as (GPS) which help to track victims. A mandatory equipment checklist helps detect and verify whether employees are wearing necessary safety equipment, such as tracking workers in all facilities to record and diagnose employee movements which helps in reporting unauthorized movements, falls from stairs, health conditions, headcount, and accident audits. Although the use of information technology in health and safety management in the oil and gas sector requires large investments, it is better to invest in prevention rather than paying employees' health or life costs and the costs of disruption to work due to accidents.

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Assets and Process Reliability

The reliability and dependability of assets and operations is another dimension that explains operational excellence in the oil and gas sector after health and safety.

It means the ability of machines or devices to perform the relevant function and continue to do it without failure (Business Dictionary, 2017).

In oil and gas sector operations, assets are considered essential in oil sector operations and their capital foundation, especially in drilling rigs, offshore operations, dry oil wells, oil and liquefied natural gas pipelines, and refineries (midstream and downstream activities) (Ossai, 2012).

According to Nolan and Anderson (2015), reliability is the assurance that companies have regarding their assets, performance of production employees, and the availability of products or services. Reliability is the ability of companies to identify, eliminate, track, and investigate the potential failures of assets, for improvement taking into account the life of the assets from design to obsolescence (Ernst & Young, 2015).

According to the study of Felemban & Sheikh (2013), Radio Frequency Identification technology (RFID) provides a solution to many challenges in asset management, such as identifying equipment located in difficult-to-reach areas such as underwater or buried equipment, and monitoring equipment located in harsh environments that are exposed to corrosion, rust, and another environmental factors. It also facilitates monitoring and maintains underwater equipment, drilling, exploration, and transportation.

Moreover, RFID technology aids in monitoring the workflow across all stages of production processes, recording and alerting potential accidents, and enabling workers to access instructions even without an Internet connection by storing them on the cloud infrastructure of RFID technology (Felemban and Sheikh, 2013).

Several factors play a critical role in enhancing the reliability of assets and work processes within the oil and gas sector, integral to achieving operational excellence. These factors encompass senior management involvement, utilization of information technology tools, comprehensive employee training, company size, and adherence to legislation governing operations in the oil and gas industry (Muazu & Gwangwazo, 2021).

Operational Efficiency

Operational efficiency is the relationship between inputs and outputs. Inputs include available resources (raw materials, labor, time), while outputs include revenues and related products. Common scenarios in efficiency improvement are the same output for less input, more output for the same input, and much more output compared with increased input (Krajewski et al., 2016). This efficiency is accelerating with advances in digital technology that provide innovative tools and systems that leverage information to modernize processes to increase oil production (Ernst & Young, 2015). On the other hand, Mitchell (2015) saw that operational efficiency is the ability to provide a product or service at the lowest costs and minimize waste in both operation and energy usage.

Additionally, Companies aim to cut costs by considering human resource activities that include hiring and training suitable employees, to enhance their ability in improving efficiency (Namu et al., 2014).

According to Hartley and Medlock (2008), the significant difference in efficiency between National Oil Companies (NOCs) and shareholder-owned oil companies cannot be ignored because the management of NOCs faces political pressures, such as overstaffing and granting discounted resource rents to operating companies, which affects their operations and revenues.

The critical factors for enhancing the operational efficiency of the oil and gas sector as an operational dimension are senior leadership commitment, qualified employees, using modern technology and information technology, and company ownership (Muazu & Gwangwazo, 2021).

Environmental Performance

Given that operations in the oil and gas sector have the potential to worsen climate change and cause environmental degradation, the environment is an essential component of business operations. The entire supply chain, from production to distribution, is therefore faced with an additional difficulty as a result of efforts to prevent climate change and the extreme weather events that occur from it. This issue has a major effect on the oil industry, endangering its dependability, operations, and the oil and gas sector as a whole (Katopodis, 2019).

According to the US Environmental Protection Agency (2008), waste releases due to oil and gas exploration activities such as fluid leakage from drilling, air emissions and storage waste have made it difficult for the industry to eliminate impacts on the environment. Efforts by oil companies to reduce these harmful effects are evident in their environmental performance such as oil spills, accidents, fires, land damage, and air and water pollution. These efforts and practices to reduce environmental impact can be implemented internally or in a company's broader chain-level operations (Graham & McAdam, 2016).

The disclosure of environmental practices in the internal operations of oil companies affects their performance and market share. (Hart & Doyle, 2011).

In a study conducted by Kassinis and Vafeas (2006) on the impact of pressure from stakeholders (government and community) on environmental performance, the results showed that community pressure significantly improved the performance of oil and gas companies. Consequently, community interaction with oil and gas companies can help reduce some environmental challenges. Additionally, a robust pollution prevention strategy minimizes the potential and actual negative impacts on the environment that arise during production activities (Schoenherr, 2012).

The factors such as committed leadership, employee capabilities, IT tools, company ownership and size and regulations guiding oil and gas industry operations are some of the factors that contribute to improve the environmental performance of oil and gas sector (Muazu & Gwangwazo, 2021).

Supply Chain Efficiency Concept

The supply chain management system is the coordination of all chain activities, starting from raw materials and ending with the customer. Therefore, the supply chain includes suppliers; Manufacturers and/or service providers; and distributors, wholesalers and/or retailers who deliver the product and/or service to the end customer (Heizer et al., 2017: 444).

Oil and gas firms' supply chains are under a lot of strain due to globalization and rising energy demand. Additionally, the oil and gas sector's earnings have decreased as a result of the ongoing, consistent swings in oil prices. Companies in the oil and gas industry must reassess their logistics operations and those of their partners in order to reduce the impact of low oil prices and get rid of supply chain inefficiencies (Ejiro et al., 2019).

The Current Reality of The Study Variables, Their Description And Diagnosis

This part clarify the initial awareness of respondents about operational excellence dimensions. The researcher relied on measuring the dimensions of the research by relying on the independent dimension represented by operational excellence, which was measured by four sub-dimensions consisting of 19 variables, while the dependent dimension represented by supply chain efficiency was measured by 8 variables from (X20-X27) by using a five-point Likert scale.

Health and Safety

Table (5) indicates that the respondents' perception was positive towards the paragraphs related to the health and safety dimension (X1-X7), as the general agreement rate reached 94.02, with 60.37 agreeing and 33.65 strongly agreeing. In contrast, the percentage of neutral answers reached 1.8. The general rate of disagreement reached 4.14. The average of arithmetic mean of the respondents' answers is 4.2 with a standard deviation of 0.41, which means that the respondents' percep-

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

tion of the health and safety dimension is positive, which is supported by the significance level of the (t) test, which reached 0.00 - less than the threshold of 0.05 - indicating that the respondents' answers are statistically significant and positively oriented.

Table 5. The frequencies, percentage of agreeing, mean and standard deviation of Health and Safety

Health and Safety												
Study variables	**Totally agree**		**Agree**		**Neutral**		**Disagree**		**Totally disagree**		**Mean**	**Std. deviation**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
X1	11	35.5	20	64.5	0	0	0	0	0	0	4.35	0.48
X2	12	38.7	19	61.3	0	0	0	0	0	0	4.39	0.49
X3	15	48.4	15	48.4	1	3.2	0	0	0	0	4.45	0.56
X4	10	32.3	20	64.5	0	0	1	3.2	0	0	4.26	0.63
X5	6	19.4	20	64.5	1	3.2	4	12.9	0	0	3.9	0.87
X6	9	29	18	58.1	1	3.2	3	9.7	0	0	4.06	0.85
X7	10	32.3	19	61.3	1	3.2	1	3.2	0	0	4.23	0.67
Total index		**33.65**		**60.37**		**1.82**		**4.14**		**0**	**4.2**	**0.41**

**Source: Author's own based on study results.*

Assets and Process Reliability

It is noted from Table (6) that the perception of the study sample was positive towards the paragraphs of this dimension (X8-X11) the agreement rate reached (90.3%) distributed as (20.15%) strongly agreed and (70.15%) agreed. The general rate of disagreement is about (5.6%), the percentage of neutral answers is about (4.02%), and the average of the arithmetic means is (4.04%) with a standard deviation of (0.58%). This indicates that the respondents' perception of the dimension of reliability of assets and operations is positive.

Table 6. The frequencies, percentage of agreeing, mean and standard deviation of Assets and Process Reliability

Assets and Process Reliability												
Study variables	**Totally agree**		**Agree**		**Neutral**		**Disagree**		**Totally disagree**		**Mean**	**Std. deviation**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
X8	4	12.9	25	80.6	1	3.2	1	3.2	0	0	4.03	0.54
X9	5	16.1	23	74.2	2	6.5	1	3.2	0	0	4.03	0.6
X10	8	25.8	20	64.5	1	3.2	2	6.5	0	0	4.1	0.74
X11	8	25.8	19	61.3	1	3.2	2	6.5	1	3.2	4	0.93
Total index		**20.15**		**70.15**		**4.02**		**4.85**		**0.8**	**4.04**	**0.58**

**Source: Author's own based on study results.*

Operational Efficiency

The data in Table (7) indicate that there is a high agreement rate which is (86.44%) regarding the variables of this dimension (X12-X16) with a response rate of 16.14% strongly agree and 70.3% agree. The general disagreement rate reaches 9.68% and the percentage of neutral responses is 3.86%. The average of the arithmetic means is 3.9% with a standard deviation of 0.71%. This points that the respondents' perception of the operational efficiency dimension is positive which is enhanced by the significance level from the T-test, which is 0.00—less than the threshold of 0.05—indicating that the respondents' answers are statistically significant and positively directed.

Table 7. The frequencies, percentage of agreeing, mean and standard deviation of Operational Efficiency

Operational Efficiency												
Study variables	**Totally agree**		**Agree**		**Neutral**		**Disagree**		**Totally disagree**		**Mean**	**Std. deviation**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
X12	8	25.8	17	54.8	1	3.2	4	12.9	1	3.2	3.87	1.05
X13	6	19.4	20	64.5	3	9.7	2	6.5	0	0	3.97	0.75
X14	3	9.7	24	77.4	1	3.2	2	6.5	1	3.2	3.84	0.82
X15	5	16.1	24	77.4	0	0	1	3.2	1	3.2	4	0.77
X16	3	9.7	24	77.4	1	3.2	2	6.5	1	3.2	3.84	0.82
Total index		**16.14**		**70.3**		**3.86**		**7.12**		**2.56**	**3.9**	**0.71**

**Source: Author's own based on study results.*

Environmental Performance

According to Table 8, there is a high agreement rate of 82.8% regarding the variables in this dimension (X17-X19), with 20.43% of respondents strongly agreeing and 62.36% agreeing. The overall disagreement rate is 10.7%, while the percentage of neutral responses is 6.46%. The arithmetic mean is 3.91, with a standard deviation of 0.68. This points that the respondents' perception of the environmental performance dimension is positive. This conclusion is further enhanced by the significance level from the T-test, which is 0.00—less than the threshold of 0.05—indicating that the respondents' answers are statistically significant and positively directed.

Table 8. The frequencies, percentage of agreeing, mean and standard deviation of Environmental Performance

Environmental Performance												
Study variables	**Totally agree**		**Agree**		**Neutral**		**Disagree**		**Totally disagree**		**Mean**	**Std. deviation**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
X17	7	22.6	22	71	1	3.2	1	3.2	0	0	4.13	0.619
X18	5	16.1	20	64.5	2	6.5	3	9.7	1	3.2	3.81	0.94
X19	7	22.6	16	51.6	3	9.7	5	16.1	0	0	3.81	0.98
Total index		**20.43**		**62.36**		**6.46**		**9.66**		**1.06**	**3.91**	**0.68**

**Source: Author's own based on study results.*

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Supply Chain Efficiency

The study sample's perception was positive as shown in Table 9, with an agreement rate of 96.37% for the variables (X20-X25). Of these, 27.82% strongly agreed and 68.55% agreed. The overall disagreement rate was 0.8%, and the percentage of neutral responses was 2.81%. The average arithmetic mean was 4.23, with a standard deviation of 0.41. This indicates that the respondents' perception of this dimension was positive.

Table 9. The frequencies, percentage of agreeing, mean and standard deviation of Supply Chain Efficiency

Supply Chain Efficiency												
Study variables	**Totally agree**		**Agree**		**Neutral**		**Disagree**		**Totally disagree**		**Mean**	**Std. deviation**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
X20	5	16.1	26	83.9	0	0	0	0	0	0	4.16	0.37
X21	7	22.6	24	77.4	0	0	0	0	0	0	4.23	0.42
X22	6	19.4	23	74.2	1	3.2	1	3.2	0	0	4.1	0.59
X23	6	19.4	23	74.2	1	3.2	1	3.2	0	0	4.1	0.59
X24	11	35.5	19	61.3	1	3.2	0	0	0	0	4.32	0.54
X25	12	38.7	19	61.3	0	0	0	0	0	0	4.39	0.49
X26	9	29	19	61.3	3	9.7	0	0	0	0	4.19	0.6
X27	13	41.9	17	54.8	1	3.2	0	0	0	0	4.39	0.55
Total index		**27.82**		**68.55**		**2.81**		**0.8**		**0**	**4.23**	**0.41**

**Source: Author's own based on study results.*

Test of Hypothesis

This part focusing on testing correlation and effect relationships between operational excellence dimensions and oil and gas supply chain efficiency to accept or reject the study hypothesis.

Testing and analyzing the correlations between study dimensions

Testing the first main hypothesis and its related sub-hypotheses: This hypothesis suggests that there is a significant correlation between the combined dimensions of operational excellence and the dependent variable, represented by supply chain efficiency, as shown in Table 10. The table also indicates a significant correlation between each operational excellence dimension and supply chain efficiency.

Table 10. The Correlation relationships

Dependent variable / **Independent variables**	**Supply Chain Efficiency**	**Sig.**
Operational Excellence	0.74**	0.00
Health and Safety	0.54**	0.00
Assets and Process Reliability	0.70**	0.00

Operational Efficiency	0.60**	0.00
Environmental Performance	0.69**	0.00
N= 31		

**Source: Author's own based on study results.*

The table above shows a positive significant correlation of 0.74 between the combined dimensions of operational excellence and the supply chain efficiency dimension, indicating a strong relationship between them .

Regarding the relationship between each dimension of operational excellence and the dependent variable, represented by supply chain efficiency, the results are as follows:

1. The relationship between the health and safety dimension and the supply chain efficiency dimension: Table 10 shows a positive significant correlation between the health and safety dimension and supply chain efficiency, with a correlation value of 0.54** at a significance level of 0.00. This result suggests that increased attention to the health and safety dimension leads to greater supply chain efficiency which approves the first hypothesis *(H1a: There is a significant correlation between Health and Safety and supply chain efficiency).*

2. The relationship between asset and process reliability and supply chain efficiency as highlighted in Table 10. It shows a positive significant correlation, with a value of 0.70** at a significance level of 0.00. This result indicates that an increased focus on asset and process reliability leads to improved supply chain efficiency. H1b: There is a significant correlation between Assets and Process Reliability and supply chain efficiency which approves the second hypothesis *(H1b: There is a significant correlation between Assets and Process Reliability and supply chain efficiency).*

3. Table 10 highlights the relationship between operational efficiency and supply chain efficiency. It shows a positive significant correlation, with a value of 0.60** at a significance level of 0.00. This result indicates that an increased focus on operational efficiency enhances supply chain efficiency which approves the third hypothesis *(H1c: There is a significant correlation between Operational Efficiency and supply chain efficiency).*

4. The relationship between Environmental Performance and Supply Chain Efficiency indicates a positive significant correlation with a value of 0.69** at a significance level of 0.00, as clarified in Table 10 above. This result shows that an increased focus on environmental performance enhances supply chain efficiency, supporting the related hypothesis *(H1d: There is a significant correlation between Environmental Performance and supply chain efficiency).*

Testing and Analyzing Effect Relationships of Study Dimensions

This section will examine the second main hypothesis and its related sub-hypotheses. The second main hypothesis is formulated as follows:
H2: The combined dimensions of operational excellence has a significant impact on supply chain efficiency.

The analysis of regression analysis is conducted as shown in Table (11) to select the effect relationship between dimensions. The significance value for the F-test is found to be 0.00, which is below the threshold of 0.05, indicating a statistically significant impact of the combined dimensions of operational excellence on supply chain efficiency. The coefficient of determination (R^2) was 0.55, suggesting that the independent variables, represented by the dimensions of operational excellence, account for 55% of the variation in the dependent variable, i.e., the oil and gas supply chain efficiency. The remaining variance is attributed to random factors not captured or included in the regression model. Additionally, the T-test confirmed the significance of the regression coefficient, also at 0.00, which is less than the 0.05 significance level. Based on these findings, the second main hypothesis is supported and can be accepted.

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Table 11. The Effect Relationships of Study Dimensions

Dependent variable / Independent variables	Supply Chain Efficiency			Sig.
	F- test	R2	T- test	
Operational Excellence	35.66	0.55	5.97	0.00
Health and Safety	12.32	0.29	3.51	0.00
Assets and Process Reliability	28.43	0.49	5.33	0.00
Operational Efficiency	16.97	0.36	4.12	0.00
Environmental Performance	26.65	0.47	5.16	0.00
N= 31				

**Source: Author's own based on study results.*

To clarify the affecting relationship between each dimension of operational excellence and the dimension of oil and gas supply chain efficiency, each dimension was analyzed as follows:

1. The effect of the health and safety dimension on the efficiency of the oil and gas supply chain is illustrated by the regression analysis results in Table (11). The F-test yielded a significance value of 0.00, which is below the 0.05 threshold, indicating a statistically significant influence of the health and safety dimension on supply chain efficiency. The coefficient of determination (R^2) was 0.29, suggesting that the health and safety dimension accounts for 29% of the variance in the dependent variable, represented by the efficiency of the oil and gas supply chain, while the remaining variance is attributed to uncontrolled or unaccounted-for random factors not included in the regression model. The T-test further confirmed the significance of the regression coefficient, with a value of 0.00, which is also below the 0.05 significance level. Based on these findings, the first sub-hypothesis (H2a) — that health and safety dimension has a significant impact on supply chain efficiency — is supported and can be accepted.

2. The impact of the assets and process reliability dimension on the efficiency of the oil and gas supply chain is highlighted by the regression analysis results in Table (11). The F-test value of 0.00, which is below the 0.05 significance threshold, indicates a significant effect of the assets and process reliability dimension on supply chain efficiency. The coefficient of determination (R^2) is 0.49, meaning that the assets and process reliability dimension explains 49% of the variance in the dependent variable, represented by the efficiency of the oil and gas supply chain. The remaining variance is attributed to random factors outside the control of the model or not included in the regression analysis. The T-test further confirms the significance of the regression coefficient, also yielding a value of 0.00, below the 0.05 level of significance. Consequently, the second sub-hypothesis (H2b) — that the assets and process reliability dimension has a significant impact on supply chain efficiency — is supported and can be accepted.

3. The impact of the operational efficiency dimension on oil and gas supply chain efficiency is shown in Table (11) through the regression analysis. The F-test value of 0.00, below the 0.05 significance level, confirms a significant effect of operational efficiency on supply chain performance. The coefficient of determination (R^2) is 0.36, indicating that operational efficiency interprets 36% of the variation in supply chain efficiency, with the remainder due to uncontrolled factors not included in the model. The T-test further reinforces the significance, with a value of 0.00. Consequently, the sub-hypothesis H2c, stating that operational efficiency significantly impacts supply chain efficiency, is accepted.

4. The impact of the environmental performance dimension on oil and gas supply chain efficiency is highlighted in Table (11) through regres-

sion analysis. The F-test significance level of 0.00, below the 0.05 threshold, confirms a significant effect of environmental performance on supply chain efficiency. The coefficient of determination (R^2) is 0.47, indicating that environmental performance explains 47% of the variation in supply chain efficiency, with the remainder attributed to uncontrolled factors. The T-test further supports the significance with a value of 0.00. Therefore, the sub-hypothesis H2d, which states that environmental performance has a significant impact on supply chain efficiency, is accepted.

Conclusions

The operational excellence concept, with its four dimensions represented by (Health and Safety, Assets and Process Reliability, Operational Efficiency, and Environmental Performance) is a crucial factor in enhancing supply chain efficiency, especially in the oil and gas sector.

The study results showed a strong relationship between the oil and gas supply chain's efficiency and the operational excellence dimensions. With a value of 0.70**, the highest correlation is found between supply chain efficiency and assets and process reliability, which is corroborated by statistically significant effect relationships confirmed by T-tests and F-tests. As a result, every main and sub-hypothesis of the current study are accepted. The researchers are recommended to try and detect the more specific operational excellence dimensions related to oil and gas sector.

References

Adobor, H., & McMullen, R. S. (2018). Supply chain resilience: a dynamic and multidimensional approach. The International Journal of Logistics Management, 29(4), 1451-1471.

Akintokunbo, O. O., & Ali, F. O. Logistics Management and Operations Performance of Oil and Gas Supply Chain: A Review of Literature. Asian Journal of Social Science and Management Technology ISSN: 2313-7410 Volume 3, Issue 6, November-December, 2021

Alkhaldi, M., Pathirage, C. & Kulatunga, U. (2017). The Role of Human Error in Accidents within the Oil and Gas Industry in Bahrain. School of Built Environment Workshop Paper ID 044, University of Salford, UK.

Al-Robaaiy, Mohammed Sameer; Kuba, Ali Karim Mohammed; Dakheel, Aqeel Karim, 2019, The Importance of Using Supply Chain Performance Measuring Indicators to Achieve Cost Efficiency, Quality, Flexibility, and Delivery: An Applied Study in Production of Ready-Made Garments and General Trade/ Baghdad, Journal of Administration and Economics, Volume 8, Issue 30, Pages 211-181

Bag, S., Wood, L. C., Mangla, S. K., & Luthra, S. (2020). Procurement 4.0 and its implications on business process performance in a circular economy. Resources, Conservation and Recycling, 152, 104502.

Bornstein S. & Hart, S. (2010). Evaluating Occupational Safety and Health Management Systems. Policy and Practice in Health and Safety, 8 (1), 61–76.

Business Dictionary. Retrieved November 23, 2017, from BusinessDictionary.com website: http://www.businessdictionary.com/definition/reliability.html

Chakraborty, S., Sharma, A., & Vaidya, O. S. (2020). Achieving sustainable operational excellence through IT implementation in Indian logistics sector: An analysis of barriers. Resources, Conservation and Recycling, 152, 104506. https://doi.org/10.1016/j.resconrec.2019.104506

Chevron Corporation, (2010). Operational Excellence Management System; an Overview of the OEMS. Chevron U.S.A. Inc.

Dev, N. K., Shankar, R., & Qaiser, F. H. (2020). Industry 4.0 and circular economy: Operational excellence for sustainable reverse supply chain performance. Resources. Conservation and Recycling, 153, 104583.

Ejiro O.M., Francis, S.A. & Okeke, A. (2019). Logistics Performance Measurement in the Upstream Oil and Gas Supply Chain in Nigeria. International Journal of Scientific Research in Social Sciences and Management Studies. 4(1)81-88.

Ernst & Young (2015). Driving Operational Performance in the Oil and Gas. EY global limited business Report.

Felemban, E. & Sheikh, A., A. (2013). RFID for Oil and Gas Industry: A lications and Challenges. International Journal of Engineering and Innovative Technology (IJEIT), 3(5), 80-85

Graham, S., & McAdam, R. (2016). The effects of pollution prevention on performance. International Journal of Operations and Production Management, 36(10), 1333-1358. DOI: 10.1108/IJOPM-05-2015-0289.

Gwangwazo, S. B., & Muazu, M. H. (2021). Operational Excellence Dimensions in the Oil and Gas Sector: A Literature Review. Advances in Accounting, Management, Business and Economics Journal, 1(1), 78-98.

sciendo

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

Hartley, P., R. & Medlock III, K., B. (2008). A Model of the Operation and Development of a National Oil Company. Energy Economics, 30(5), 2459-2485.

HEIZER, J., RENDER, B., MUNSON, C. (2017). Operations Management: Sustainability and Supply Chain Management, 12th ed., Harlow, UK: Pearson Education Limited.

Katopodis, T., & Sfetsos, A. (2019). A review of climate change impacts to oil sector critical services and suggested recommendations for industry uptake. Infrastructures, 4(4), 74.

Kolios, A., J. & Luengo, M., M. (2016). Operational Management of Offshore Energy Assets. Journal of Physics: Conference Series 687, 1-7. 012001, doi:10.1088/1742-6596/687/1/012001.

Kovilage, Manori P., Saman TWS Yapa, and Champa Hewagamage. "A Comprehensive Definition for 'Operational Excellence'." Vidyodaya Journal of Management 8.II (2022)

Krajewski, Lee J., Malhotra, Manoj & Ritzman, Larry P. (2016). "Operations Management", Processes And Supply Chains, 11thed., Pearson Education Inc., USA.

McCracken, J. (2008). Successful Health and Safety Management. file:///C:/Users/admin/Downloads/HSE%20guide4.pdf

Mitchell, J. S. (2015). Operational excellence: Journey to creating sustainable value. John Wiley & Sons. ISBN: 978-1-118-61801-1.

MORO, O. P. (2023). OPTIMISING SUPPLY CHAIN MANAGEMENT IN THE OIL AND GAS INDUSTRY: A REVIEW. Journal of Management Science and Career Development.

Namu, N., N. Kaimba, G., K. Muriithi, D. K. & Nkari, I. M. (2014). Impact of Cost Reduction Strategies on Performance of Tea Factories in Embu County, Kenya. European Journal of Business and Social Sciences, 3(9), 26-48.

NIOSH (2010). Field Effort to Assess Chemical Exposure Risks to Gas and Oil Workers. NOISH Fact Sheet. DHHS (NIOSH) Publication No. 2010–130.

Nolan, D., P., & Anderson, E., T. (2015). A lied Operational Excellence for the Oil, Gas, and Process Industries. Gulf Professional, an imprint of Elsevier, Waltham: USA ISBN 978-0-12-802788-2.

Osabutey, D., Obro-Adibo, G., Agbodohu, W. & Kumi, P. (2013). Analysis of Risk Management Practices in the Oil and Gas Industry in Ghana. Case Study of Tema Oil Refinery (Tor). European Journal of Business and Management, 5(29), 139-149.

Ossai, C., I. (2012). Advances in Asset Management Techniques: An Overview of Corrosion Mechanisms and Mitigation Strategies for Oil and Gas Pipelines. International Scholarly Research Network. ISRN Corrosion Volume 2012, Article ID 570143, 1-10 doi:10.5402/2012/570143.

Ponomarov, S.Y. and Holcomb, M.C. (2009), "Understanding the concept of supply chain resilience", The International Journal of Logistic Management, Vol. 20 No. 1, pp. 124-143.

Schoenherr, T. (2012). The role of environmental managemen in sustainable business development: A multicountry investigation. International Journal of Production Economics, 140, 116-128.

Sekaran, U., 2003. Research Methods for Business: A Skill-Building Approach, 4th ed. John Wiley & Sons, Inc.

Shaw, F., and Donovan, C. (2019). Assessing the Preparedness of Major Oil and Gas Companies for a Low-Carbon Energy Transition. Available at SSRN 3339853. https://ssrn.com/abstract=3339853.

Zhu, L., Johnsson, C., Varisco, M., & Schiraldi, M. M. (2018). Key performance indicators for manufacturing operations management—Gap analysis between process industrial needs and ISO 22400 standard. Procedia Manufacturing, 25, 82–88.

APPENDIXES

QUESTIONNAIRE FORM

Section One: General data for respondents

Below is a set of paragraphs. Please put a check mark (√) in front of the appropriate option please.

Age				
Less than 25	26-35	36-45	46-55	More than 56
Education qualification				

Technical Diploma	Bachelor	Higher Diploma	Master	PhD
Experience years				
Less than 2	3-5	6-8	9-11	More than 12
Place of work				
Oil Engineering Dep.	Digging Dep.	Lines Dep.	Production Dep.	

Section Two: Questionnaire questions on research dimensions

Below is a set of paragraphs. Please put a check mark (√) in front of the appropriate option... please.

Operational Excellence dimensions						
Items	**Health and Safety**	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1	Facilities and machines are designed to prevent injuries to workers					
2	Each work site has a comprehensive safety program related to safe work practices					
3	The health and safety risk management process is reviewed periodically to assess health and safety risks					
4	There is a decrease in worker injuries, deaths and operational accidents					
5	Our employees enjoy work confidence and health insurance due to available medical services					
6	The aspects of operations related to safety and integrity are properly designed and constructed, tested, and inspected before starting operation					
7	Emergency response teams are always on high alert to deal with incidents					
Assets and Process Reliability		**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
8	Pre-startup reviews for new or inactive facilities are conducted before operation begins and after shutdown to ensure compliance					
9	Failure analysis is performed to identify the causes and develop measures to mitigate its impact					
10	Unplanned plant shutdowns have been significantly reduced as a result of proactive maintenance and ongoing condition monitoring of our assets' mechanical integrity					
11	Ageing assets are regularly maintained and replaced frequently before they reach the point of decommissioning					
Operational Efficiency		**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
12	Costs related to production and maintenance are being reduced					
13	Expenses related to lawsuits and hazard incidents are being reduced					
14	Some processes and procedures are being integrated into production operations for fast and efficient production					
15	The operational process is optimized, and profitability is enhanced by efficient utilization of people, time, and assets					
16	Quality has been improved through interaction and coordination across design, marketing and production units					
Environmental Performance		**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
17	The company works to identify and assess potential risks to the environment and reduce their impacts (including those affecting living organisms)					
18	The company works to inventory all emissions, waste and potential pollution resulting from operations					
19	The company periodically evaluates contractors on environmental performance to renew and award contracts					

Items	**Supply Chain Efficiency Variables**	**Strongly**	**Agree**	**Neutral**	**Disagree**	**Strongly**

Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2025. Vol. 47. No. 1: 124-142
Article DOI: https://doi.org/10.15544/mts.2025.10

		Agree				**Disagree**
20	The company seeks to reduce the costs of extracting oil and gas					
21	The company seeks to reduce the costs of transporting oil and gas					
22	The company seeks to reduce the costs of storing oil and gas					
23	The company seeks to reduce the costs related to production operations					
24	The company is committed to supplying the relevant parties with oil and gas in the agreed quantities accurately					
25	The company is committed to supplying the relevant parties with oil and gas on time without delay					
26	The company adopts an organized approach to reduce interruptions in the oil and gas flow					
27	The company works to supply the relevant parties with oil and gas according to the agreed specifications					