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Effects of Risk Management Practices on the Success of Petroleum Products Distribution in Ondo State, Nigeria

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Abstract

The distribution of petroleum products are critical to the economic stability of Ondo State, Nigeria. However, challenges in risk management practices can hinder project success, affecting safety, operational efficiency, environmental sustainability, and financial viability. This study aims to assess the effect of risk management practices on the success of petroleum products distribution. A descriptive survey research design was adopted, involving a sample size of 181 participants drawn from a population of 330 senior staffs working in oil and gas firms and regulatory bodies in Ondo State, the selection of the participants was based on purposive sampling and random sampling technique. Data were collected using structured questionnaire and analysed using descriptive statistics and multiple regression analysis. The results revealed that Risk Identification and Risk Assessment have positive significant effects on success of success of petroleum products distribution, Risk Monitoring has negative insignificant effect on success of success of petroleum products distribution whereas Risk Mitigation has negative significant effect on success of success of petroleum products distribution. The study concludes that while risk identification and risk assessment positively affect the success of petroleum products distribution, challenges in risk

monitoring and risk mitigation must be addressed to maximize their effectiveness. Hence, this study recommends that organizations should invest in advanced technological tools and real-time data analytics to enhance the quality and timeliness of risk monitoring; and direct efforts towards addressing inefficiencies in the implementation of risk mitigation measures such as periodic reviews of strategies, enhanced resource allocation, and training programs to improve the execution of mitigation plans.

Keywords: Risk, management, practices, petroleum products, distribution, success

Introduction

The oil and gas sector serves as a major source of revenue, employment, and foreign exchange earnings for Nigeria (Edo et al., 2024). The distribution of petroleum products constitute vital components of Nigeria's economy (George et al., 2024; Olakada et al., 2024; Abu et al., 2023), particularly in states like Ondo where the oil and gas sector plays a significant role. Ondo State, located in the southwestern region of Nigeria, boasts considerable oil and gas reserves, making it a crucial hub for petroleum-related activities. However, despite its economic importance, the sector faces persistent challenges, notably in the context of risk management (Edo et al., 2024). A major challenge in the petroleum industry is the high level of uncertainty and risk across exploration, production, transportation, and supply; due to the industry's heavy reliance on automation and optimization, any disruption can quickly escalate into a widespread or national crisis (Enyinda et al., 2010). Therefore, any lapses in risk management within this domain will not only endanger lives and the environment but also have far-reaching implications for Nigeria's economic stability and development agenda.

According to Christopher & Adepoju (2012), petroleum distribution encompasses a range of complex infrastructures and processes, starting with crude oil exploration and ending with the delivery of petroleum products to consumers. The petroleum industry is divided into three main sectors: upstream, midstream, and downstream (Alaba, 2018). The supply chain starts with crude oil exploration and production, which is then transported to refineries for processing into various products, including jet fuel, petrol, diesel, and petrochemicals (Dawotola et al., 2011; Cheng & Duran, 2003). These refined

products are subsequently moved through pipelines to storage terminals before being distributed to end users. Oil refineries and depots play a crucial role in the downstream sector of the petroleum industry (Alaba & Agbalajobi, 2014).

The global oil and gas industry operates within a complex web of risks, ranging from safety hazards to environmental concerns and supply chain disruptions (Haouel & Nemeslaki, 2024; Tang et al., 2023). Studies indicated that the distribution of petroleum products in Ondo State grapple with inadequacies in risk management, leading to adverse outcomes (Odesa et al., 2024). Within this intricate landscape, effective risk management practices are essential for safeguarding operations, protecting stakeholders, and ensuring project success (Ambituuni, 2016).

Against this backdrop, it becomes imperative to explore deeper into the complexities of risk management practices within the distribution of petroleum products in Ondo State, Nigeria. By addressing these issues, stakeholders can mitigate risks, optimize project outcomes, and contribute to the overall growth and prosperity of Ondo State and Nigeria as a whole.

Statement of the Problem

Despite the pivotal role the oil and gas sector plays, recent studies highlighted glaring deficiencies in risk management practices, which have far-reaching consequences (George et al., 2024; Waqar et al., 2024). Inadequate risk management practices does not only jeopardize the safety and well-being of workers and communities but also compromise infrastructure integrity and environmental sustainability, thereby hampering broader socioeconomic development initiatives within the state (Adedokun & Egbelakin, 2024; Rawat, et al., 2023). The consequences of unchecked deficiencies within the distribution of petroleum products often results to heightened accident rates, environmental degradation, supply chain disruptions, loss of life, and economic setbacks (Anigilaje et al., 2023; George et al., 2024).

Should these deficiencies persist unchecked, the consequences within the distribution of petroleum products in Ondo State could be severe. Such outcomes include heightened accident rates, environmental degradation, supply chain disruptions, loss of life, and economic setbacks (Anigilaje et al., 2023; George et al., 2024).

Numerous studies underscore the significance of effective risk management practices across diverse industries and geographical contexts (Didraga, 2013; Egieya et al. 2024; Kikwasi, 2018). However, the synthesis and application of this knowledge within the specific domain of petroleum products distribution in Ondo State remain underexplored, indicating a critical research gap that this study addressed.

Aims and Objectives

The general objective of the study is to investigate risk management practices with a view to enhancing the success of petroleum products distribution in Ondo State, Nigeria. However, the specific objective is to:

i. investigate the effect of risk management practices on the success of petroleum products distribution in Ondo State.

Literature Review

Concept of Risk Management

Risk management is a critical process aimed at identifying, quantifying, and mitigating potential risks that can impact the success of projects. According to the Project Management Body of Knowledge (PMBOK), this process involves a structured approach comprising six steps: risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, response planning, and risk monitoring and control (Dey, 2012). Effective risk management is essential to mitigate delays and cost overruns, which are often due to the incapability or inefficiency of project managers (Van Thuyet, 2007).

The risk management process begins with risk management planning, setting the framework and objectives for handling risk. Following this, risk identification involves determining the potential risks that might affect the project and understanding their potential impact. This step is iterative, as new risks can emerge throughout the project's lifecycle (Van Duijne et al., 2008). Early identification and assessment of risks at the planning stage enable better control and absorption of these risks (Tadayon et al., 2012). The subsequent step, qualitative risk analysis, prioritizes risks based on their likelihood and impact, informing the quantitative risk analysis, where numerical methods evaluate risk exposure. Response planning involves developing strategies to mitigate, transfer, accept, or avoid risks. Finally, risk monitoring and control ensure ongoing assessment and adaptation of risk management strategies as the project progresses (Dey, 2012).

Several challenges complicate risk management, particularly in large projects. Changes in the project environment can significantly impact timelines and budgets (Chapman, 2006). The complexity and uncertainty of a project increase with its size, making it essential to anticipate potential events and measure their impacts to achieve project objectives (Zayed & Pan, 2008; Rodney, 2015).

Risk mitigation is a technique for preparing for and reducing the impact of risks on a project or company. This is particularly crucial in energy projects involving multiple stakeholders, such as government agencies, residents, employees, contractors, and

non-governmental organizations (Rimšait, 2019). Implementing risk mitigation strategies requires substantial time, money, and resources (Royer, 2000). The oil and gas industry, characterized by its project-based nature, necessitates a comprehensive risk management framework to manage the numerous smaller projects that comprise a larger project (Suda et al., 2015).

Despite the capital-intensive nature of the oil and gas industry, risk management remains under-researched, particularly regarding projects outside the Middle East (Suda et al., 2015). Oil and gas projects are large and complex, involving state-of-the-art technology, multiple stakeholders, and the need for sustainable development analysis (Rodhi et al., 2017; Dey, 2012). These projects are exposed to various external risk factors, including economic, political, and government stability, necessitating a comprehensive analysis of how these factors affect projects across the oil and gas value chain (Kassem, 2022). It is critical to identify and mitigate these risks to ensure successful project completion.

The petroleum supply chain (PSC) is inherently risky due to its nature, involving large capital investments and numerous stakeholders (Hussain & Khorramshahgol, 2016; Modarress et al., 2016; Lima et al., 2016; Shah et al., 2011; Varma et al., 2007). The key risk factors in the PSC include significant upfront investments and the involvement of heterogeneous stakeholders from various countries, which complicates the risk landscape. Geopolitical relations, international taxation, exchange rates, and crude price volatility introduce complexities and uncertainties.

Concept of Project Success

The concept of project success is multifaceted and has evolved significantly over time. While it remains challenging to provide a universally accepted definition, the identification of success factors and their relationship to project success has garnered increasing interest. According to Amjad et al. (2020), the perception of project success can vary widely among different stakeholders, making it a subjective and individualized determination. As Montes-Guerra et al. (2015) noted, what is deemed successful for some may be considered a failure by others.

In the past, project success was traditionally measured by adherence to the "iron triangle" of schedule, cost, and quality (Ika, 2009). Shenhar et al. (2001) suggested that success should be assessed using a broader scale that includes project efficiency, customer impact, business and direct success, and future preparedness. The British Association for Project Management (2006) emphasized that success should be measured by stakeholder satisfaction and predefined criteria agreed upon before project implementation. Ika (2009) proposed a hexagonal framework for project

success, incorporating time, cost, quality, strategic objectives, end-user satisfaction, and stakeholder satisfaction.

Over time, definitions of project success have evolved from focusing solely on the implementation phase to considering the entire project and product life cycle (Jugdev & Müller, 2005). According to the American Project Management Institute (2013), project success encompasses achieving project objectives within scope, time, budget, quality, resource, and risk constraints. However, this view has expanded to include additional factors such as managerial soft skills and effective communication channels, which are now recognized as critical contributors to success (Olawumi & Chan, 2019).

Empirical Review

Anigilaje et al. (2023) conducted a comprehensive review on the exposure to benzene, toluene, ethylbenzene, and xylene (BTEX) at petrol stations in Nigeria. Their objective was to evaluate the current status, challenges, and future directions in managing BTEX exposure. The study considered variables such as environmental contamination, health impacts, and regulatory frameworks. Methodologically, the researchers employed a literature review approach to gather data from various sources. Their findings revealed significant health risks associated with BTEX exposure, highlighting the inadequacy of current risk management practices. The study concluded that enhancing risk management protocols is crucial for mitigating health risks and ensuring the success of petroleum distribution projects by protecting both workers and the environment.

Odesa et al. (2024) reviewed three decades of oil spillage in the Niger Delta, focusing on its impact on soil and water. Their objective was to understand the environmental consequences of oil spills and the effectiveness of existing risk management strategies. The study analyzed variables such as spill frequency, response measures, and environmental restoration efforts using historical data and case studies. The findings indicated that inadequate risk management practices have led to severe environmental degradation. The authors concluded that improving risk management strategies is essential for preventing spills and ensuring the sustainability of petroleum distribution projects.

Tang et al. (2023) assessed the investment environment risks for oil and gas in countries along the Belt and Road Initiative. The objective was to evaluate how risk factors impact investment decisions and project outcomes. The study considered variables including political stability, regulatory environment, and economic risks. Utilizing a risk assessment framework, they found that countries with robust risk management practices attract more investment and achieve better project outcomes.

The study concluded that effective risk management is integral to the success of petroleum projects, reinforcing the need for comprehensive risk strategies in the Nigerian context.

Haouel & Nemeslaki (2024) explored the opportunities and challenges of digital transformation in the oil and gas industry. Their objective was to understand how digital technologies can enhance risk management and project success. The study examined variables such as technology adoption, operational efficiency, and risk mitigation. Through a mixed-methods approach, including case studies and surveys, they found that digital tools significantly improve risk management by providing real-time data and predictive analytics. The study concluded that integrating digital technologies into risk management practices can enhance the success of petroleum transportation projects by reducing uncertainties and improving decision-making processes.

Edo et al. (2024) provided a comprehensive literature review on petroleum discovery, utilization, and processing in Nigeria and globally. Their objective was to examine the historical context and current practices in the petroleum industry, focusing on risk management. The study reviewed variables such as technological advancements, regulatory changes, and environmental impacts. They found that evolving risk management practices have played a crucial role in mitigating risks associated with petroleum operations. The study concluded that continuous improvement in risk management practices is necessary for ensuring the success and sustainability of petroleum projects.

George et al. (2024) critically reviewed the environmental effects of petroleum product transportation spillage in Nigeria. The objective was to assess the impact of spills on the environment and evaluate the effectiveness of risk management practices. Variables considered included spill frequency, environmental impact, and mitigation measures. Using a review methodology, they found that poor risk management has led to frequent spills and severe environmental damage. The study concluded that enhancing risk management practices is vital for minimizing environmental risks and ensuring the success of petroleum transportation projects.

Methodology

This study adopted a survey research design which involves the use of structured questionnaire for data collection. The study obtained a sample size of 181 participants from a population of 330 senior staffs working in oil and gas firms and regulatory bodies in Ondo State. The questionnaire was made up of three parts which contain questions relating to demography of the respondents, risk management practices, and

success of petroleum products distribution. The indicators for each of the construct employed a 5-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = moderately agree, 4 = agree, 5 = strongly agree. The data collected were analysed using descriptive statistics and multiple linear regression analysis on Statistical Package for Social Sciences (SPSS) software. The equation for the multiple regression analysis is presented below:

$$SP = \beta 0 + \beta 1RI + \beta 2\ RA + \beta 3RM + \beta 4RMC + \varepsilon \quad (1)$$

Where,

SP = Success of petroleum products distribution

RI, RA, RM, RMM = Risk management practices

RI = Risk identification

RA = Risk assessment

RM = Risk mitigation

RMC = Risk monitoring and control

$\beta 0$= Regression constant

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$= Coefficients of independent variables

ε = Error term

Results and Discussion

Response Rate

A total of 181 copies of questionnaire were randomly administered among the respondents. 159 copies were properly completed and returned representing 88.0%.

Multiple Regression Model Summary of the Effect of Risk Management Practices on the Success of Petroleum Products in Ondo State, Nigeria

Table 1 shows an overview of the regression model's explanatory power. The R-value of 0.561 indicates a moderate positive correlation between the predictors (risk management practices) and the dependent variable (success of petroleum products distribution). The R-Square value of 0.314 implies that approximately 31.4% of the variation in success of petroleum products distribution can be explained by the combined influence of Risk Identification, Risk Assessment, Risk Mitigation, and Risk Monitoring. The Adjusted R-Square value of 0.296 confirms that the model remains robust when adjusted for the number of predictors, indicating that other unmeasured factors account for the remaining 68.6% of the variation in success of petroleum products distribution.

Table 1: Model Summary of the Effect of Risk Management Practices on the Success of Petroleum Products Distribution

Model	R	R Square	Adjusted R square	Std. Error of the Estimate
1	0.561[a]	0.314	0.296	0.36074

a. Predictors: (Constant), Risk Monitoring, Risk Mitigation, Risk Identification, Risk Assessment

Source: Researcher's field survey (2024)

Multiple Regression Coefficients of the Effect of Risk Management Practices on the Success of Petroleum Products in Ondo State, Nigeria

Table 2 shows the coefficients for each predictor, offering insights into their individual contributions to success of petroleum products distribution. Risk Identification emerges as the most significant predictor, with a standardised beta coefficient of 0.628, a t-value of 6.433, and a p-value of 0.000. This suggests that systematic identification of risks strongly enhances success of petroleum products distribution, highlighting the importance of proactively recognizing potential threats and opportunities in the distribution processes.

Risk Assessment also shows a positive and statistically significant contribution to success of petroleum products distribution, with a beta coefficient of 0.245, a t-value of 1.996, and a p-value of 0.048. This indicates that thorough evaluation and prioritization of risks contribute to improved outcomes, enabling organizations to allocate resources effectively and prepare for potential challenges.

In contrast, Risk Mitigation and Risk Monitoring exhibit negative relationships with success of petroleum products distribution, though their effects differ in magnitude and significance. Risk Mitigation has a beta coefficient of -0.083 and a t-value of -1.219, with a p-value of 0.225, indicating that its effect is not statistically significant. This unexpected result may suggest inefficiencies or inconsistencies in the implementation of mitigation strategies within the study context.

Risk Monitoring, on the other hand, has a beta coefficient of -0.351, a t-value of -2.711, and a p-value of 0.007, making its negative effect statistically significant. This finding suggests that while monitoring is critical for risk management, its current application in the study area may face challenges, such as inadequate tools, insufficient integration, or delayed communication of results, which could inadvertently hinder the success of petroleum products distribution. This is in agreement with George et al. (2024) and Haouel & Nemeslaki (2024) who revealed that risk identification and risk assessment significantly enhance project outcomes while inadequate risk mitigation

and risk monitoring frameworks often lead to delayed responses and reduced project efficiency.

The implications of these findings are multifaceted. Firstly, the strong positive effects of Risk Identification and Risk Assessment underscore the importance of a proactive and systematic approach to recognizing and evaluating risks. Organizations should prioritize these practices to optimize project outcomes. Secondly, the negative and significant impact of Risk Monitoring suggests a need to re-evaluate its implementation. Efforts should focus on improving the quality, timeliness, and integration of monitoring activities to ensure they support, rather than hinder success of petroleum products distribution. Lastly, the insignificant effect of Risk Mitigation highlights potential gaps in strategy execution that must be addressed to enhance its effectiveness.

In summary, the regression analysis demonstrates that risk management practices significantly affect success of petroleum products distribution, with Risk Identification and Risk Assessment playing pivotal roles. However, challenges in the implementation of Risk Monitoring and Risk Mitigation highlight areas for improvement. Addressing these gaps will enable organizations to leverage risk management practices more effectively, ensuring safer, efficient, and sustainable distribution of petroleum products in Ondo State.

Table 2: Regression Coefficients of the Effect of Risk Management Practices on the Success of Petroleum Products Distribution

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
(Constant)	0-.171	0.613		-0.279	0.781
Risk Identification	1.151	0.179	0.628	6.433	0.000
Risk Assessment	0.351	0.176	0.245	1.996	0.048
Risk Mitigation	-0.025	0.020	-0.083	-1.219	0.225
Risk Monitoring	-0.441	0.163	-0.351	-2.711	0.007

Dependent Variable: Success of petroleum products distribution

SP = -0.171 + 1.151RI + 0.351RA+ -0.025RM + -0.441RMC + 0.613

Source: Researcher's field survey (2024)

Conclusion and Recommendations

This study concludes that risk management practices play a critical role in determining the success of petroleum products distribution in Ondo State. Despite the overall robustness of risk management practices, challenges in Risk Monitoring and Risk

Mitigation were identified. The negative effects of Risk Monitoring and Risk Mitigation suggest inefficiencies in its current application, potentially stemming from inadequate tools, delayed communication, or insufficient integration. Similarly, the non-significant effect of Risk Mitigation highlights the need for improvements in strategy execution. Hence, this study recommends that organizations should invest in advanced technological tools and real-time data analytics to enhance the quality and timeliness of risk monitoring; and direct efforts towards addressing inefficiencies in the implementation of risk mitigation measures such as periodic reviews of strategies, enhanced resource allocation, and training programs to improve the execution of mitigation plans.

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