Role of Innovation in Enhancing Performance of selected Firms in Nigeria's Oil and Gas Downstream Subsector

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Abstract

This study examines the role of innovation in enhancing performance of firms within Nigeria's oil and gas downstream subsector. Specifically, it investigates the impact of three innovation approaches (marketing, supply chain, and technological innovation) on performance of firms. Using a descriptive research design, the study targeted 273 managerial employees across 18 selected firms, with a sample size of 162 respondents. Data were collected through structured questionnaires, and regression analysis was performed using SPSS. The results reveal that marketing innovation ($\beta = 0.449$), supply chain innovation ($\beta = 0.450$), and technological innovation ($\beta = 0.369$) all significantly contribute to firm performance, with supply chain innovation having the strongest impact. Additionally, the combined effects of the three innovations $(R^2 = 0.448)$ also significantly explain the variance in performance, although technological innovation's effect was less significant. The study suggests that firms in the downstream subsector should invest in innovative supply chain technologies, data-driven marketing strategies, and targeted technological solutions that align with business goals to enhance operational efficiency, customer engagement, and value creation. It also recommends that oil and gas companies develop a holistic innovation framework by establishing dedicated innovation units and cross-functional teams to integrate marketing, supply chain, and technological advancements across their operations.

Keywords: Innovation, Firm Performance, Marketing Innovation, Supply Chain Innovation, Technological Innovation, Oil and Gas Downstream Sector

Introduction

The oil and gas industry are a cornerstone of Nigeria's economy, contributing significantly to the country's revenue and economic development (Ifere, Nyuur, Amankwah-Amoah & Ochie, 2022). The downstream sector, which includes refining, distribution, and marketing of petroleum products, plays a crucial role in the nation's energy supply and overall economic stability. One of the most notable reforms undertaken by the Nigerian government in recent times has been the deregulation of the downstream sector, alongside the removal of fuel subsidies (Oni, 2025). This policy shift has fundamentally changed the operating environment for firms within the sector, introducing both new challenges and opportunities.

The deregulation of the downstream sector, which was initially designed to promote competition and reduce the financial burden of subsidies on government expenditure, has led to fluctuations in fuel prices. This shift towards market-driven pricing has intensified competition among firms, compelling them to adopt innovative strategies to maintain their market positions. Furthermore, the removal of subsidies has significantly impacted operational costs, leading firms to seek ways to optimize their performance and improve efficiency (Percy & Gloria, 2024).

In response to the evolving market dynamics, innovation has become a vital strategy for firms within Nigeria's oil and gas downstream sector. Innovation, in this context, refers to the introduction of new and improved practices, processes, products, and services that enable firms to

enhance their performance (Varadarajan, 2017). The adoption of these innovations is increasingly seen as essential for firms to stay competitive, manage risks, and navigate the complexities introduced by deregulation and the removal of fuel subsidies. As the sector becomes more market-driven, firms find innovative ways to differentiate themselves, improve customer satisfaction, and ensure operational sustainability. Innovation, therefore, plays a central role in shaping the future of Nigeria's oil and gas downstream sector (Trotter & Brophy, 2022).

The deregulation and removal of fuel subsidies have introduced a more competitive and marketdriven environment for firms operating in the sector (Percy & Gloria, 2024). This shift has heightened the need for firms to adopt strategies that not only address rising operational costs but also enable them to maintain competitiveness in an increasingly volatile market. While some studies have explored the general role of innovation in business performance (Rosario & Cruz, 2019; Liu & De Giovanni, 2019; Randhawa, Wilden & Gudergan, 2021), there is limited empirical research focused on the downstream oil and gas sector in Nigeria, particularly regarding how these distinct innovation approaches influence firms' operational and financial outcomes. This gap in the literature makes it challenging for firms and policymakers to fully grasp how the adoption of these innovation strategies improves efficiency, enhances customer engagement, and drives business success in a deregulated market. Thus, the problem lies in the insufficient exploration of how marketing, supply chain, and technological innovations directly impact the performance of firms within Nigeria's oil and gas downstream sector.

This research assesses the relationship between various innovation approaches and performance in Nigeria's oil and gas downstream sub-sector in light of the following research objectives;

- i. To examine the impact of marketing innovation on performance of firms in Nigeria's oil and gas downstream subsector.
- ii. To determine the influence of supply chain innovation on performance of firms in Nigeria's oil and gas downstream subsector.
- iii. To examine how technological innovation affects performance of firms in Nigeria's oil and gas downstream subsector.
- iv. To assess the relationship between the three innovation approaches and performance of firms in Nigeria's oil and gas downstream subsector.

To guide the study, four hypotheses are formulated based on the stated objectives. These are:

- i. H₀₁: Marketing innovation has no significant effect on performance of firms in Nigeria's oil and gas downstream subsector.
- ii. H₀₂: Supply chain innovation has no significant impact on performance of firms in Nigeria's oil and gas downstream subsector.
- iii. H_{03} : Technological innovation has no significant effect on performance of firms in Nigeria's oil and gas downstream subsector.
- iv. H₀₄: The combined effects of the three innovation approaches have no significant effect on performance of firms in Nigeria's oil and gas downstream subsector.

Theoretical Framework

The study is underpinned by the Resource-Based View (RBV) model which posits that firms with access to superior resources and capabilities secure and sustain a competitive advantage (Barney, 1991). The Resource-Based View (RBV) was propagated by Birger Wernerfelt in 1984 through his paper titled "A Resource-Based View of the Firm" published in the journal Strategic Management Journal. Later, scholars like Jay Barney (especially with his influential 1991 paper

"Firm Resources and Sustained Competitive Advantage") further developed and popularized the RBV. These resources, whether tangible or intangible, are leveraged through organizational capabilities to enhance performance across various business functions (Barney, 1991; Peteraf, 1993). Semaan, Beydoun, and Mostapha (2020) highlight that valuable, rare, inimitable, and non-substitutable resources enable firms to outperform rivals and maintain a competitive edge. Moreover, organizational capabilities contribute to value creation and promote the adoption of new technologies, ideas, and business processes, facilitating innovation (García-Sánchez, García-Morales & Martín-Rojas, 2018).

Building on the RBV, firms attain superior performance and long-term competitive advantage by utilizing their distinct resources and capabilities (Barney, 1991). Innovativeness, defined as the ability to introduce new products, processes, and strategies, is a critical organizational capability that drives performance (Lukovszki, Rideg & Sipos, 2021). According to Gupta and Malhotra (2013), firms that innovate systematically not only gain competitive advantages but also boost profitability and growth prospects, ensuring long-term success.

Conceptual Clarification

Innovation Practices

Innovation is vital to organizational success, enabling firms to differentiate through unique offerings that better address customer needs (Varadarajan, 2017). In today's competitive environment, companies that fail to innovate risk obsolescence amid evolving technologies and shifting consumer demands (Lee & Trimi, 2018). It fosters resilience against geopolitical, market, and environmental uncertainties by enhancing adaptability (Lee & Trimi, 2018). Innovative technologies and business models drive operational efficiency by streamlining processes and optimizing resource use (Bouwman, Nikou & de Reuver, 2019). Firms benefit from cost reductions and improved profitability through automation and workflow improvements (Bouwman et al., 2019). Moreover, innovation supports agility, allowing companies to respond swiftly to market changes and capitalize on emerging trends (Randhawa, Wilden & Gudergan, 2021). It enhances customer experience, boosts loyalty, and opens avenues for new revenue through expanded product and service offerings (Randhawa, et al., 2021).

In the oil and gas industry, innovation has historically improved exploration, extraction, and production through advancements like seismic imaging and enhanced recovery methods (Hassani, Silva & Al Kaabi, 2017). With growing environmental concerns, current innovations focus on sustainability, including carbon capture and renewable energy integration (Al-Shetwi, 2022). Nigeria, heavily reliant on oil revenues, benefits significantly from innovations that enhance oil recovery and extend field life (Al-Shetwi, 2022). Innovative practices like modular refineries and indigenous services support local content development and reduce dependence on imports (Rosario & Cruz, 2019). Technological advancements in seismic surveys, drilling, and AI-driven monitoring improve safety, reduce risks, and enhance efficiency (Shawai Adadu & Usman, 2023). Innovations promote energy diversification through LNG and CNG adoption in transportation (Rosario & Cruz, 2019). As such, innovation supports Nigeria's economic growth, environmental goals, and industrial transformation (Trotter & Brophy, 2022).

The study focused on marketing innovation, supply chain innovation, and technological innovation;

• Marketing Innovation

Marketing innovation refers to implementing new strategies and technologies to improve how firms connect with customers and promote offerings (Ungerman, Dedkova & Gurinova, 2018). It includes creative advertising, digital platforms, personalized pricing, and targeted customer value propositions (Hinterhuber & Liozu, 2017). By innovating, firms respond to market shifts and strengthen customer relationships, enhancing brand visibility and loyalty (Aripin, Pynatih & Aristanto, 2024). Creative campaigns and influencer partnerships help firms build recognition and reach wider audiences (Leung, Gu & Palmatier, 2022). Personalized marketing using analytics and AI increases engagement, retention, and customer lifetime value (Kumar, Ashraf & Nadeem, 2024). Firms also expand market share by identifying unmet needs and launching new offerings (Purchase & Volery, 2020).

Marketing innovation drives the adoption of products through digital channels and cultivates a culture of creativity and collaboration (Kohli & Melville, 2019). This culture encourages novel thinking, cross-functional idea-sharing, and continuous improvement (Bömelburg & Gassmann, 2024). Oil and gas firms use marketing to highlight sustainable practices and CSR efforts, boosting trust and reputation (George et al., 2016). Social media and influencer strategies enhance transparency and stakeholder engagement (Yang, Basile & Letourneau, 2020). Content marketing and integrated campaigns help firms build thought leadership and reach diverse audiences (Yang et al., 2020). A customer-centric approach informed by research enables firms to deliver tailored experiences and value, improving loyalty and satisfaction (Sheth, Jain & Ambika, 2023).

• Supply Chain Innovation

Supply chain innovation involves adopting new technologies, practices, and processes to improve efficiency, reduce costs, and mitigate risks (Afraz et al., 2021). Innovations such as automation and digitalization enhance supply chain operations, enabling quicker decision-making and resource optimization (Chauhan et al., 2022). This innovation also boosts resilience by diversifying supply sources and improving collaboration to withstand external disruptions (Haddud & Khare, 2020). Process automation, for instance, reduces manual labour and errors, leading to lower operational costs (Afraz et al., 2021). Additionally, lean manufacturing practices, like value stream mapping, help identify inefficiencies and optimize production processes (Munksgaard, Stentoft & Paulraj, 2014).

Supply chain innovation is crucial in optimizing logistics and improving visibility across supply chains (Wang *et al.*, 2016). By using technologies such as route optimization algorithms and real-time tracking, companies minimize transportation costs and improve service delivery (Perboli et al., 2018). Furthermore, innovation fosters agility in responding to market changes, enhancing companies' competitiveness and customer satisfaction (Ahmed & Rashdi, 2021). In industries like oil and gas, these innovations lead to operational cost reductions, improved procurement processes, and stronger supplier relationships (Yusuf, 2023). Embracing innovation helps firms differentiate themselves, attract customers, and build a strong market presence (Munksgaard *et al.*, 2014).

• Technological Innovations

Technology plays a critical role in shaping industries, particularly in automation, digitization, renewable energy, and alternative fuels, driving improvements in processes and products (Krishnan, 2021). Technological innovation in the oil and gas industry includes advanced refining, asset management, predictive maintenance, and renewable energy solutions (Hayat, Shahare,

Sharma & Arora, 2023). Innovations such as automation, robotics, and digitalization streamline operations, boosting efficiency, product quality, and customer satisfaction (Kokina & Blanchette, 2019). Technologies like 3D printing further accelerate innovation cycles, enabling firms to develop and introduce new products quickly (Aversa, Haefliger, Hueller & Reza, 2021). These innovations offer firms competitive advantages, enhance market reach, and unlock new revenue opportunities, especially in e-commerce and mobile platforms (Teece, 2018).

In Nigeria, deregulation and technological advancements have transformed the downstream oil sector, fostering efficiency and process optimization (Olujobi, 2021; Wang et al., 2022). Technological solutions like digital payment systems and self-service fuel stations have redefined the consumer experience in the retail sector (Shawai Adadu & Usman, 2023). The focus on renewable energy and alternative fuels aligns with global sustainability goals, supported by investments in biofuels (Joshua, Michael & Ufua, 2020). However, challenges remain, including the need for regulatory adaptation to support technology adoption and the infrastructure barriers in Nigeria, such as unreliable electricity and limited digital access (Joshua et al., 2020). Additionally, cybersecurity risks and data privacy concerns highlight the importance of safeguarding technology-driven systems (Gupta & Sharma, 2019).

Firm Performance

Firm performance is a key indicator for investors and stakeholders (Selmi, Bouoiyour & Miftah, 2020). Bravo and Hernández (2021) emphasized that employee performance quality significantly impacts firm performance. It is also defined as the effectiveness in achieving strategic goals and delivering value to stakeholders (Wang & Sengupta, 2016). Investors assess firm performance to determine investment worth (Wang & Sengupta, 2016). In the oil and gas industry, firm performance depends on various interconnected factors for long-term success (Fracarolli Nunes, Lee Park & Paiva, 2020). Financial stability is crucial, providing resilience to market volatility (Bravo & Hernández, 2021). Key financial metrics such as revenue, profitability, and cash flow gauge the firm's ability to handle market fluctuations (Bravo & Hernández, 2021). A strong financial position allows for growth and maintains investor confidence (Beliaeva et al., 2020).

Fig 1 shows the diagrammatical representation between the independent variables (marketing innovation, supply chain innovation, and technological innovation) and dependent variable (firm's performance).



Fig 1: Conceptual Model Source: Anyaogu, Ifere and Abiola (2025)

Methodology

This study adopted a descriptive research design to investigate innovation practices and firms' performance in the Nigerian oil and gas downstream sector. The target population comprised 273 employees occupying managerial positions across eighteen selected firms with offices in Lagos State and possessing over 2% market share, as reported by Citac (2024). These criteria ensure the study focuses on influential firms with substantial market presence and experienced managerial staff, providing relevant and reliable insights into industry practices in Lagos State. Using Yamane's (1967) formula, a sample size of 162 respondents was determined. A multi-stage sampling technique was employed: the first stage utilized stratified sampling to select firms based on location and market share to control for environmental variance; the second stage involved purposive sampling to identify managerial staff within these firms; and the third stage used convenient sampling to collect cross-sectional data from the identified participants. Primary data were collected through structured questionnaires scored on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 20.0, and regression analysis was employed to test the relationships between innovation practices and firm performance.

Result of the Findings

Hypothesis One:

 H_{01} : Marketing innovation has no significant effect on performance of firms in Nigeria's oil and gas downstream subsector.

			Mode	l Summary	7						
Model	R	R Square		Adju	sted R Squ	Std. I	Std. Error of the				
		-									
1	.573ª	.3	29			.32	25	.32695			
	ANOVA ^a										
Model		Sum of	df	Mean	Square	F		Sig.			
		Squares									
1	Regression	8.905	1		8.905)7	.000 ^b			
	Residual	18.172	17()	.107						
	Total	27.077	171								
			Coe	fficients ^a							
Model		Unstandard	lized Coe	fficients	Standardized		t	Sig.			
				Coeffi	cients		_				
		В	St	d. Error	Be	Beta					
1	(Constant)	2.23	6	.188			11.880	.000			
	Marketing	.44	9	.049		.573	9.127	.000			
	innovation										
a. Depend	lent Variable: Firn	ns' performanc	e								
b. Predict	ors: (Constant), M	arketing innov	ation								

Table	1: Regre	ession a	analysis	between	marketing	innova	ation a	nd f	ïrms'ı	performance
1 4010	1. Itegie		anar y 515	000000000	maincenne	, 11110	atton a	110 1	mmb	

From the model summary, R-value is 0.573 which indicates a moderate positive correlation between marketing innovation and performance of firms. Also, R^2 is 0.329 which notes that approximately 32.9% of the variance in firms' performance is explained by marketing innovation. This suggests that while marketing innovation has a notable impact, there are other factors affecting firms' performance not included in this model. The regression table indicates that the Fvalue is 83.307 at a 0.000 significant level (p < 0.05) which notes that the model significantly explains the variance in the dependent variable. The high F-value suggests that marketing innovation is a statistically significant predictor of firms' performance in Nigeria's oil and gas downstream subsector. This indicates that the null hypothesis is rejected and the alternative hypothesis is accepted as indicated above.

The constant value (intercept) of 2.236 in the coefficient table above shows that even without any marketing innovation, the baseline performance of firms in Nigeria's oil and gas downstream subsector is expected to be approximately 2.236. Also, the marketing innovation coefficient (B) is 0.449 which indicates that for every one-unit increase in marketing innovation, firms' performance increases by 0.449 units. From the coefficients, the regression model for predicting firms' performance (Y) based on marketing innovation (X₁):

$$Y_1 = 2.236 + 0.449 X_1$$

Hypothesis Two:

 H_{02} : Supply chain innovation has no significant impact on performance of firms in Nigeria's oil and gas downstream subsector.

Model Summary												
Model R		R Square	R Square		Adjusted R Square					Std. Error of the		
		_								Estimate		
1	.600ª		360				.35	57	.31915			
	ANOVA ^a											
Model		Sum of		df	Mean	Square	F		Sig.			
		Squares				-			Ū			
1	Regression	9.761		1		9.761	95.83	30	.000 ^b			
	Residual	17.316	5 170			.102						
	Total	27.077		171								
				Coeffi	cients ^a							
Model		U	nstan	dardize	d	Standa	rdized		t	Sig.		
			Coefficients			Coefficients				-		
		В	В		Std. Error		Beta					
1	(Constant)	2.28	2.283		.171			1	3.351	.000		
	Supply chain	.45	50	.046		.600			9.789	.000		
	innovation											
a. Depend	ent Variable: Firm	s' performan	ce									
b. Predicte	ors: (Constant), M	arketing innov	vatio	n								

Table 2: Regression analysis between supply chain innovation and firms' performance

From the model summary, R-value is 0.600 which indicates a moderate to strong positive correlation between supply chain innovation and performance of firms. Also, R^2 is 0.360 which notes that approximately 36.0% of the variance in firms' performance is explained by supply chain innovation. This shows a slightly stronger explanatory power compared to the previous model with marketing innovation. The regression table indicates that the F-value is 95.830 at a 0.000 significant level (p < 0.05) which notes that the model significantly explains the variance in the dependent variable. The high F-value suggests that supply chain innovation is a significant predictor of performance of firms in Nigeria's oil and gas downstream subsector. This indicates that the null hypothesis is rejected and the alternative hypothesis is accepted as indicated above.

The constant value (intercept) of 2.283 in the coefficient table above shows that even without any supply chain innovation, the baseline performance of firms in Nigeria's oil and gas downstream subsector is expected to be approximately 2.283. Also, the supply chain innovation coefficient (B) is 0.450 which indicates that for every one-unit increase in supply chain innovation, firms' performance increases by 0.450 units. From the coefficients, the regression model for predicting firm performance (Y₂) based on supply chain innovation (X₂):

$$Y_2 = 2.283 + 0.450 X_2$$

Hypothesis Three:

 H_{03} : Technological innovation has no significant impact on performance of firms in Nigeria's oil and gas downstream subsector.

Model Summary												
Model	del R			R Square		Adju	sted R Squ	Sto	Std. Error of the			
			_								Estimate	
1	.535ª			286				.28	32	.33712		
	ANOVA ^a											
Model		Sı	ım of		df	Mean	Mean Square			Sig.		
		Sq	uares									
1	Regression		7.757		1		7.757	68.25	50	.000 ^t		
	Residual		19.321		170		.114					
	Total	· · · ·	27.077		171							
					Coeffi	cients ^a						
Model			U	Insta	ndardize	ed	Standa	rdized	t		Sig.	
			Coefficients				Coeffi	cients				
			В		Std.	Std. Error		Beta				
1	(Constant)		2.666			.156			17.062		.000	
	Technological		.36	.369		.045		.535	8.261		.000	
a. Depend	ent Variable: Firm	ıs' pe	rforman	ce								
b. Predicto	b. Predictors: (Constant), Technological innovation											

Table	3: F	Regression	analysis	between	technol	ogical	innovation	and firms	s' performance	ce
		0	1			0				

From the model summary, R-value is 0.535 which indicates a moderate positive correlation between technological innovation and firms' performance. Also, R^2 is 0.286 which notes that approximately 28.6% of the variance in firm performance is explained by technological innovation. This suggests a weaker explanatory power compared to the previous models with marketing and supply chain innovations. The regression table indicates that the F-value is 68.250 at a 0.000 significant level (p < 0.05) which notes that the model significantly explains the variance in the dependent variable. The F-value suggests that technological innovation is a significant predictor of performance of firms in Nigeria's oil and gas downstream subsector. This indicates that the null hypothesis is rejected and the alternative hypothesis is accepted as indicated above.

The constant value (intercept) of 2.666 in the coefficient table above shows that even without any technological innovation, the baseline performance of firms in Nigeria's oil and gas downstream subsector is expected to be approximately 2.666. Also, the technological innovation coefficient (B) is 0.369 which indicates that for every one-unit increase in technology innovation, firms' performance increases by 0.369 units. From the coefficients, the regression model for predicting firm performance (Y₃) based on technology innovation (X₃):

$$Y_3 = 2.666 + 0.369 X_3$$

Hypothesis Four

 H_{04} : The combined effects of the three innovation approaches have no significant effect on performance of firms in Nigeria's oil and gas downstream subsector.

				Model S	Summary	7			
Model	Model R				Adju	Std. I	Std. Error of the		
							E	Estimate	
1	.669ª		.4	48			.43	8	.29829
				AN	OVAª				
Model		Su	ım of	df	Mean	Square	F		Sig.
		Sq	uares						
1	Regression	1	2.130	3		4.043	45.44	2	.000 ^b
	Residual	1	4.948	168		.089			
	Total	2	27.077	171					
				Coeff	icients ^a				
Model			U	nstandardiz	ndardized		Standardized		Sig.
			Coefficie		ts Co		cients		C
		ĺ	В	Std.	Std. Error		ta		
1	(Constant)		1.789 .241		.187			9.551	.000
	Marketing				.057		.308	4.242	.000
	innovation Supply chain innovation Technological								
			.245		.063	.327		3.912	.000
			.09	7	.056		.141	1.717	.088
	innovation								
a. Depend	lent Variable: Firn	ns' pe	rformanc	e		•	•		•
b. Predict	ors: (Constant), Te	echnol	logical in	novation, N	Aarketing	innovation	, Supply ch	ain innovat	ion

Table 4: Regression analysis between the combined innovation practices and firms' performance

From the model summary, R-value is 0.669 which indicates a strong positive correlation between the combined predictors (technological innovation, marketing innovation, and supply chain innovation) and firm performance. Also, R^2 is 0.448 which notes that approximately 44.8% of the variance in firms' performance is explained by these three types of innovation. This is a notable improvement in explanatory power compared to the individual models for each innovation type. The regression table indicates that the F-value is 45.442 at a 0.000 significant level (p < 0.05) which notes that the model significantly explains the variance in the dependent variable. The high F-value suggests that the predictors collectively have a significant effect on performance of firms in Nigeria's oil and gas downstream subsector. This indicates that the null hypothesis is rejected and the alternative hypothesis is accepted as indicated above.

The constant value (intercept) of 2.666 in the coefficient table above shows that the baseline performance of firms in Nigeria's oil and gas downstream subsector when all types of innovation are zero is expected to be approximately 1.789. For the marketing innovation coefficient (0.241), a one-unit increase in marketing innovation is associated with a 0.241-unit increase in firm performance. Also, for the supply chain innovation coefficient (0.245), a one-unit increase in supply chain innovation is associated with a 0.245-unit increase in firms' performance. More so, for the technological innovation coefficient (0.097), a one-unit increase in technological innovation is associated with a 0.097-unit increase in firms' performance, but this effect is not statistically significant. From the coefficients, the regression model for predicting firms' performance (Y_{1-3}) based on the three types of innovation (X_1, X_2, X_3):

$$Y_{1-3} = 1.789 + 0.241X_1 + 0.245X_2 + 0.097X_3$$

Discussion of the Findings

The study discovered that marketing innovation has a positive and significant effect on performance of firms in Nigeria's oil and gas downstream subsector. This indicates that marketing strategies focusing on new approaches to product promotion, customer engagement, and market reach play a crucial role in enhancing competitive advantage and improving financial outcomes for firms operating in this subsector. This is in line with Olomu, Binuyo and Oyebisi (2023) study which found that innovative marketing practices, such as digital marketing and customer relationship management, positively influence firms' growth and competitive positioning, especially in high-demand sectors like oil and gas. Also, Grubb, McDowall and Drummond (2017) have explored how marketing innovation helps firms in the oil and gas sector navigate market challenges, maintain relevance, and increase profitability, emphasizing that those who invest in market-driven innovations are better equipped to handle sector-specific volatility.

The study discovered that supply chain innovation has a positive and significant effect on firms' performance in Nigeria's oil and gas downstream subsector. This indicates that innovative approaches to logistics, procurement, inventory management, and supplier collaboration enhance operational efficiency, reduce costs, and improve overall financial outcomes. This finding is in line with Musa and Dabo (2016) who explored supply chain innovation in the oil and gas sector, demonstrating that process optimization and the use of advanced technologies like ERP systems and RFID lead to increased efficiency and profitability. Also, Unhelkar, Joshi, Sharma, Prakash, Mani and Prasad (2022) found that innovations such as technology-enabled logistics solutions enhance supply chain coordination, leading to improved performance and cost savings.

The study discovered that technology innovation has a positive and significant effect on firms' performance in Nigeria's oil and gas downstream subsector. This indicates that advancements in digital technologies, automation, and data analytics contribute to better financial and operational outcomes. This is in line with Afful-Dadzie, Kolog, Effah, Omwenga and Egala (2023) study which explored the role of technology innovation in improving performance and found that firms adopting digital oilfield technologies, such as automation and real-time data monitoring, enhanced productivity and cost efficiency. Porter and Heppelmann (2015) also argued that the adoption of smart, connected technologies allows firms to gain real-time insights, optimize processes, and enhance operational efficiency.

The study discovered that the combined effects of the three innovation approaches (marketing, supply chain, and technology) have a positive and significant effect on performance of firms in Nigeria's oil and gas downstream subsector. This indicates that integrating these innovation strategies leads to enhanced operational efficiency, improved customer engagement, and increased profitability, fostering a sustainable competitive advantage in a rapidly evolving market. This finding is consistent with Sok and O'Cass (2011) study which emphasized that firms that adopt a comprehensive innovation strategy, combining product, process, and marketing innovations, experience superior performance outcomes due to increased market responsiveness and operational flexibility. Also, a study by Al-Qubaisi and Ajmal (2018) identified that firms leveraging a combination of technological and marketing innovations not only improve operational efficiency but also enhance customer satisfaction and loyalty, leading to sustained growth in the oil and gas industry.

Conclusion

The study concludes that innovation plays a significant role in enhancing firms' performance in Nigeria's oil and gas downstream subsector. Individually, marketing innovation, supply chain innovation, and technological innovation each demonstrated statistically significant positive effects on firms' performance, with supply chain innovation showing the strongest individual influence, followed by marketing and then technological innovation. When combined, the three innovation types explained a greater proportion of variance in firms' performance, indicating a synergistic effect. However, while marketing and supply chain innovations remained significant predictors in the combined model, technological innovation did not show a statistically significant impact in the presence of the other variables. This suggests that while all three innovation types contribute to performance, their relative influence varies, with supply chain and marketing innovations emerging as more impactful drivers of firm performance in the subsector.

Recommendations

Based on the findings of the study, the following recommendations are made:

- i. Firms in the downstream subsector should invest more in innovative logistics, real-time inventory tracking systems, digital supply chain platforms, and strategic supplier partnerships. Adopting integrated supply chain technologies like blockchain for traceability and AI for demand forecasting significantly enhances operational efficiency and responsiveness.
- ii. Companies should revamp their marketing strategies through data-driven customer engagement, personalized service delivery, and digital advertising tools. Innovations such as omnichannel communication, customer loyalty programs, and brand storytelling should be scaled to capture and retain market share in an increasingly competitive and deregulated subsector.
- iii. Firms should conduct a comprehensive audit of their technological investments to ensure alignment with specific business goals. Rather than blanket adoption of new tech, focus should be placed on relevant technologies, such as process automation, IoT for pipeline monitoring, and AI for predictive maintenance, that directly drive efficiency and value creation.
- iv. Oil and gas firms should design a holistic innovation framework that simultaneously leverages marketing, supply chain, and technological advancements. This be achieved through the creation of innovation units, cross-functional teams, and collaborative platforms that encourage integrated ideation, testing, and implementation of innovations across the business value chain.

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