

Strengthening firm sustenance through entrepreneurial innovation: Evidence from the Nigerian industrial goods sector

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Abstract

Purpose: The dearth of innovation not only limits operational efficiency, but also exposes firms to heightened risks of obsolescence and market displacement. Thus, this study ascertains the effect of entrepreneurial innovation on the sustainability of listed industrial goods firms in Nigeria.

Research Methodology: A sample size of eight out of 13 listed industrial goods firms was selected. Using the ex-post facto research strategy, secondary data were extracted from firms' annual reports over a ten-year period (2014-2023). Analyses were performed using descriptive test, linearity test, heteroskedasticity test, autocorrelation test, and ordinary least square regression.

Results: It was found that entrepreneurial innovation practice significantly enhances firm sustenance (proxy by operating cash flow ratio) among listed Nigerian industrial goods firms ($b = 0.352574$; $p\text{-value} = 0.004759$).

Conclusions: By fostering a culture of innovation, investing in research and development, and leveraging modern technologies, firms can position themselves for long-term success despite prevailing economic challenges.

Limitations: One limitation of this study is the small sample size, as only eight of the 13 listed industrial goods firms in Nigeria were included.

Contribution: This study contributes to the literature by addressing the gap in the existing literature on entrepreneurial innovation in industrial goods firms, particularly publicly listed firms in Nigeria, an area largely overlooked in prior research on SMEs and niche industries.

Recommendation: This study recommends that company executives establish dedicated innovation departments or strengthen existing ones to drive continuous improvement in the firm.

Keywords: *Entrepreneurial Innovation, Firm Sustenance, Nigerian Industrial Goods Sector*

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1. Introduction

In the modern global economy, firms are constantly under pressure to innovate and evolve to maintain their competitive advantage and ensure long-term survival. The increasing pace of technological change, growing market competition, shifting consumer preferences, and economic uncertainties have created an environment in which businesses that fail to innovate risk become obsolete (Chandratreya, 2025; Ebuka, Nzewi, Gerald, & Ezinne, 2020). This phenomenon is particularly pronounced in the industrial sector, where firms operate in a capital-intensive environment that demands efficiency,

adaptability, and continuous improvement. Thus, entrepreneurial innovation has emerged as a fundamental driver of firm survival, particularly in economies characterized by high levels of uncertainty, such as Nigeria (Asaolu, 2025; Fasanmi & Oyedele, 2025). Thus, in an era marked by globalization and rapid technological advancements, firms must develop innovative capabilities to remain competitive and relevant (Ikwo, Ukoha, & Nworie, 2025; Putra et al., 2024).

Alsafadi and Aljuhmani (2024) view entrepreneurial innovation as a firm's capacity to introduce novel ideas, products, processes, and business models that create value and enhance operational efficiency. It encompasses a broad range of activities, including research and development (R&D), technological advancements, process optimization, market expansion, and the creation of disruptive business models that challenge traditional industry norms (Oiku, 2024). Innovation is particularly crucial in the industrial goods sector, because firms must constantly improve production techniques, optimize supply chain logistics, and develop environmentally sustainable solutions to meet evolving regulatory and consumer demands. Moreover, firms that effectively leverage entrepreneurial innovation can enhance their market positioning, gain access to new customer segments, and mitigate the risks associated with economic downturns (Nwankwo & Ezeibe, 2021; Otache & Usang, 2022; Shuaib & He, 2024; Yahaya & Dutse, 2023), although the findings of Iyobhebhe, Majekodunmi, and Ogundele (2025) denied that innovation has a positive contribution to firm competitiveness. Innovation is a critical determinant of firm survival in Nigeria, where industrial firms face issues such as poor infrastructure, inconsistent energy supply, and regulatory bottlenecks.

Entrepreneurial innovation is not a new concept; it has been extensively studied in business strategy, economics, and management (Sodeinde, 2021). The classical Schumpeterian theory of innovation posits that economic progress is driven by waves of creative destruction in which innovations continuously replace outdated technologies and business models (Ebner, 2025). This perspective underscores the importance of continuous innovation for firms seeking to maintain market relevance. In the context of Nigerian industrial goods firms, the ability to innovate is even more critical because of the unique challenges that characterize the country's economic and business environment. Historically, the Nigerian industrial sector has been heavily reliant on imports for raw materials, machinery, and technology, making it susceptible to external shocks, such as currency fluctuations and global supply chain disruptions (Uma et al., 2019). Notably, many Nigerian industrial firms have begun to integrate automation, artificial intelligence, and digital manufacturing technologies to enhance efficiency and reduce costs. Furthermore, firms that prioritize and invest in product differentiation are likely to experience sustained growth, as they can create niche markets and establish strong brand loyalty among consumers.

The impact of entrepreneurial innovation on a firm's sustainability manifests in several ways, ranging from improved financial performance to enhanced strategic positioning. First, firms that actively engage in innovation can develop new revenue streams by creating differentiated products that meet specific consumer needs (Oiku, 2024). This enhances profitability and reduces dependence on a single product line or market segment, thereby improving business resilience. Second, innovation enhances operational efficiency by enabling firms to adopt cost-effective production methods and optimize resource utilization (Triwahyono, Rahayu, & Kraugusteeliana, 2023). Third, entrepreneurial innovation fosters adaptability by equipping firms with the agility to respond to market disruptions, technological shifts, and regulatory changes. In an era where digital transformation is reshaping industries worldwide, Nigerian industrial firms that fail to embrace innovation risk are outperformed by competitors that leverage cutting-edge technologies and data-driven decision-making. Innovation is crucial for fostering sustainability by enabling firms to develop eco-friendly products, reduce carbon footprints, and comply with environmental regulations (Alinda, Tumwine, & Kaawaase, 2024).

Despite the recognized importance of entrepreneurial innovation, many firms struggle with its implementation due to various constraints, including inadequate financial resources, weak R&D capabilities, and poor infrastructure (Namaky, 2022; Pricopoaia, Busila, Cristache, Susanu, & Matis, 2024). The Nigerian business environment presents significant challenges, such as erratic power supply, foreign exchange volatility, high production costs, and limited access to technological advancements,

all of which hinder firms from effectively innovating. Additionally, many firms adopt a reactive rather than a proactive approach to innovation, leading to slow adaptation to technological trends and evolving market conditions. Unlike their global counterparts, several Nigerian industrial firms remain reliant on outdated production techniques, lack robust digital transformation strategies, and invest minimally in incremental product enhancements for innovation-driven competitiveness. This stagnation in innovation not only limits operational efficiency (Triwahyono et al., 2023) but also exposes these firms to heightened risks of obsolescence and market displacement.

The consequences of failure to integrate entrepreneurial innovation into business strategies are severe. Firms that lag in innovation often experience declining profitability, reduced market share, and heightened vulnerability to economic downturns. The inability to develop new products or optimize operational processes leads to inefficiencies, increased production costs, and reduced competitiveness, making it difficult for these firms to compete locally and internationally (Sodeinde, 2021). Additionally, industrial firms struggle to attract investors, strategic partners, and financial support without sustained innovation, further limiting their growth potential. In the long run, a lack of entrepreneurial innovation leads to business closures, job losses, and a weakened industrial sector, negatively impacting Nigeria's economic development and industrialization agenda. If Nigerian industrial firms fail to embrace innovation as a fundamental driver of sustainability, their survival in an increasingly competitive and technology-driven global economy remains uncertain.

Despite extensive research on entrepreneurial innovation and firm performance, significant gaps remain in understanding how innovation specifically influences the sustenance of listed industrial goods firms in Nigeria. Existing studies, such as those by Alsafadi and Aljuhmani (2024) and Yahaya and Dutse (2023), primarily focus on the impact of innovation on competitive advantage and firm competitiveness rather than on long-term business survival. Similarly, Oiku (2024) and Shuaib and He (2024) examined the role of innovation in organizational resilience and SME performance. However, they did not address how these findings translate into the sustainability of larger, listed firms within the industrial goods sector. Moreover, studies such as those by Okpalaoka et al. (2022) and Otache and Usang (2022) emphasize technological innovation and innovation capability during economic crises. However, there is a lack of empirical evidence linking these factors to Nigeria's continued existence and growth of publicly traded industrial goods firms.

Furthermore, while scholars such as Enyinna, Ihuoma, and Ikenna (2023), Nwankwo and Ezeibe (2021), and Sodeinde (2021) have explored innovation's impact on firm growth and financial performance, their focus has been mainly on SMEs, informal sectors, or specific industries like brewing and furniture manufacturing. The studies by Ikpe, Ikechukwu, Okri, Oko, and Tabi (2021) and Nakato, Ngigi, and Andemariam (2021) analyzed innovation strategies and product innovation in niche industries, leaving a gap in the literature concerning broader industrial goods firms. Additionally, Onogwu and Sule (2020), Aminu and Aliyu (2020), and Kiveu, Namusonge, and Muathe (2019) assessed innovation's role in MSMEs and manufacturing SMEs in Kenya and Nigeria. However, they did not examine its effect on sustaining larger firms operating in the industrial sector. Kimathi, Mukulu, and Odhiambo (2019) and Asad, Rizwan, Shah, and Munir (2018) also investigated innovation's relationship with SME performance and sustainable business practices, but did not contextualize their findings to publicly listed industrial firms. This study addresses these gaps by examining how entrepreneurial innovation enhances the sustenance of listed industrial goods firms in Nigeria, providing empirical-based perspectives on a sector overlooked in prior research.

2. Literature Review

2.1 Conceptual Issues

Entrepreneurial innovation has become a central theme in contemporary business discourse, with firms increasingly leveraging innovative strategies to achieve competitive advantage and sustainability (Alsafadi & Aljuhmani, 2024). Entrepreneurial innovation refers to the introduction of new ideas, products, services, or business models within an entrepreneurial venture to enhance performance and competitiveness. It is a dynamic process that involves identifying market gaps, leveraging technology, and implementing creative solutions to improve business efficiency (Sodeinde 2021). According to

Schumpeter and Swedberg (2021), the Schumpeterian Theory of Innovation postulates that entrepreneurs drive economic development by introducing new combinations of resources, including new products, production methods, markets, and organizational structures. This perspective highlights the disruptive nature of innovation, suggesting that firms that successfully innovate can redefine their industries and gain substantial market advantages.

Entrepreneurial innovation is categorized into three main types.

1. **Product Innovation:** The development of new or significantly improved goods and services to meet consumer demands (Yahaya & Dutse, 2023).
2. **Process Innovation:** Introducing new production techniques, automation, or digital transformation to enhance efficiency (Onogwu and Sule, 2020).
3. **Business Model Innovation:** The restructuring of business processes, revenue models, or customer engagement strategies to create value (Björkdahl & Holmén, 2013).

Conversely, firm sustenance refers to a company's ability to survive and thrive in a competitive business environment over an extended period (Kowo, Akinrinola, & Akinbola, 2021). It involves financial stability, operational efficiency, customer loyalty, and the capacity to adapt to market changes. Sustainable firms demonstrate resilience to economic downturns, industry disruptions, and technological shifts. Porter (1985) identified competitive advantage as a key determinant of firm sustenance, arguing that businesses must either differentiate their products or achieve cost leadership to maintain market relevance.

Firm sustainability is often linked to strategic planning, resource management, and corporate governance. Companies that effectively balance short-term profitability with long-term growth strategies are more likely to sustain their operations (Oiku 2024). Although firm sustenance is a critical goal for businesses, the role of entrepreneurial innovation in ensuring long-term success remains contested. Some scholars argue that innovation is necessary for firm sustenance (Sodeinde, 2021), whereas others caution against excessive reliance on untested innovations, which could lead to business failures. Hence, academic and business circles have widely debated the relationship between entrepreneurial innovation and firm sustainability. One perspective asserts that innovation is indispensable for firm longevity, as it drives growth, enhances efficiency, and fosters adaptability (Alsafadi & Aljuhmani, 2024; Ichdan & Maryani, 2024; Naab & Bans-Akutey, 2021; Oiku, 2024; Shuaib & He, 2024). For instance, firms such as Apple and Tesla have consistently leveraged innovation to sustain their market leadership. Their ability to introduce cutting-edge technologies and redefine industry standards underscores the positive impact of entrepreneurial innovation on firm sustainability.

Another school of thought argues that excessive innovation may lead to resource misallocation, financial strain, and strategic instability. Namaky (2022) contends that innovation should be purpose-driven rather than pursued for its own sake. His argument highlights cases in which companies invest heavily in experimental innovations that fail to yield commercial success, jeopardizing their financial health. For example, Nokia's excessive investment in smartphone innovation without a clear strategic direction has contributed to its market decline. This perspective aligns with Christensen's (1997) theory of disruptive innovation, which suggests that innovation can create new opportunities and render established firms obsolete if they fail to effectively manage transitions (Markides, 2006). Moreover, the sustainability of innovation is a concern. Firms that rely excessively on continuous innovation may face diminishing returns, because consumers may not always be receptive to constant changes (Ryan, 2015). This is evident in industries in which incremental improvements in products do not necessarily translate into increased customer demand. Thus, balancing innovation and stability is essential for firm sustainability.

2.2 Theoretical Framework and Development of Research Hypothesis

Joseph Schumpeter propounded the Schumpeterian Theory of Innovation in 1934 in his seminal work *The Theory of Economic Development* (Lazzarotti, Samir Dalfovo, & Emil Hoffmann, 2011). Schumpeter, an Austrian economist, introduced innovation as a fundamental driver of economic growth and industrial transformation. His theory emphasizes the role of entrepreneurs in introducing new

combinations of resources, thereby disrupting existing market structures and creating competitive advantages. Schumpeter argued that innovation occurs through “creative destruction,” where old technologies, products, and business models are continuously replaced by new and more efficient ones (Langroodi, 2021).

The Schumpeterian Theory of Innovation is based on several key postulations. First, it identifies five types of innovation: (1) the introduction of new products, (2) the adoption of new production methods, (3) the discovery of new markets, (4) the acquisition of new sources of raw materials, and (5) the implementation of new forms of business organization (Catalline, 2010). Second, Schumpeter asserted that entrepreneurs are the primary agents of innovation, as they identify opportunities and take risks to introduce novel ideas into the market. Third, the theory suggests that innovation leads to business cycles characterized by periods of economic expansion and contraction, as successful innovations drive growth, while outdated businesses decline. Finally, Schumpeter and Swedberg (2021) highlight that financial institutions play a critical role in innovation by providing the necessary capital for entrepreneurial activities (Langroodi, 2021).

The Schumpeterian Theory of Innovation is highly relevant to this study on the effect of entrepreneurial innovation on the sustenance of listed industrial goods firms in Nigeria. Industrial goods firms operate in a competitive and dynamic environment, where continuous innovation is necessary for long-term survival. Moreover, given the economic challenges in Nigeria, such as infrastructural deficiencies and policy uncertainties, innovation has become a critical factor in ensuring firm resilience and sustainability. By applying Schumpeter’s theory, this study hypothesizes the following:

H_a: Entrepreneurial innovation practice will significantly enhance firm sustenance (proxy by operating cash flow ratio) among listed Nigerian industrial goods firms.

2.3 Synthetic Review of Related Empirical Findings

The role of entrepreneurial innovation in enhancing firm performance and competitive advantage has been extensively explored across various studies, particularly in SMEs and industrial sectors. Alsafadi and Aljuhani (2024) found that entrepreneurial innovation and thinking positively influence competitive advantage, supporting the idea that innovation is a core driver of firms' strategic positioning. Similarly, Shuaib and He (2024) demonstrated that innovation has a significant and positive relationship with manufacturing SME performance in Nigeria, suggesting that innovation is essential for sustaining competitiveness in dynamic market conditions. Okpalaoka et al. (2022) found that technological innovation capabilities positively affect SME performance, emphasizing that a firm’s ability to innovate technologically is a critical factor in achieving sustainable performance, especially in the face of market challenges. These findings underscore the crucial role of entrepreneurial innovation in ensuring firms' continued growth and competitiveness.

Several studies have highlighted the significant positive impact of product and process innovations on firm growth and performance. However, Iyobhebhe et al. (2025) denied that innovation positively contributes to firm competitiveness. Enyinna et al. (2023) and Aminu and Aliyu (2020) confirmed that product and process innovation strategies are crucial for enhancing growth and profitability, particularly in the brewing and wood furniture sectors. Similarly, Sodeinde (2021) found that product and process innovations contribute significantly to sales growth, although marketing innovation has less impact. Yahaya and Dutse (2023) also confirmed that product innovation substantially contributes to organizational goals and objectives, demonstrating the strategic value of product-focused innovation. Conversely, studies such as Onogwu and Sule (2020) identified a more nuanced relationship, noting that product and process innovations may not always lead to positive outcomes, such as sales growth, in specific contexts. This finding highlights the importance of context-specific factors in assessing the impact of innovation on firm performance.

The relationship between innovation and firm performance during economic challenges has also been explored, with promising results for innovation capabilities. Otache and Usang (2022) found that innovation capability positively influences SME performance during economic crises, suggesting that firms that prioritize innovation are better positioned to adapt and thrive during difficult times.

Furthermore, Kiveu et al. (2019) and Kimathi et al. (2019) emphasize the importance of process and marketing innovations, noting their significant positive impact on firm competitiveness. Asad et al. (2018) broadened this perspective by highlighting the positive influence of various types of innovation (product, process, marketing, and organizational) on multiple aspects of firm performance, including financial and customer outcomes. These findings collectively illustrate that, when effectively implemented, entrepreneurial innovation can serve as a robust mechanism for sustaining firm performance, particularly in challenging market environments.

3. Methodology

This study adopts an ex post facto research design to examine the nexus between entrepreneurial innovation and the sustenance of listed industrial goods firms in Nigeria. The ex-post facto design is appropriate, as it involves the analysis of existing financial records over a specified period (2014–2023) to determine how past innovation strategies have influenced firm sustainability. Given that the study variables cannot be manipulated but only observed retrospectively, this research design provides a robust framework for assessing the nexus between entrepreneurial innovation and firm sustenance (Aggreh, Abiahu, & Nworie, 2023; Ukoh, Nduokafor, & Nworie, 2024).

The study population comprises thirteen (13) publicly listed industrial goods firms on the NGX as of 2023. These firms operate across various subsectors, including manufacturing, construction materials, and industrial chemicals. The complete list of industrial goods firms is presented below.

Table 1. Population of the Study

1. Austin Laz & Company Plc.
2. Berger Paints Plc.
3. Beta Glass Plc.
4. BUA Cement Plc.
5. CAP Plc.
6. Cutix Plc.
7. Dangote Cement Plc.
8. Greif Nigeria Plc.
9. Lafarge Africa Plc.
10. Meyer Plc.
11. Notore Chemical Industries Plc.
12. Premier Paints Plc.
13. Tripple Gee And Company Plc.

Source: NGX Factsheet (2023)

The study employs a judgmental sampling technique to select eight (8) firms from the population based on the availability of complete financial reports covering the period 2014–2023. To ensure diversity in the sample, the selected firms represent a mix of large, medium, and small industrial goods companies. The sampled firms are:

Table 2. Selected Sample

1. Berger Paints Plc.
2. Beta Glass Plc.
3. CAP Plc.
4. Cutix Plc.
5. Dangote Cement Plc.
6. Lafarge Africa Plc.
7. Meyer Plc.
8. Tripple Gee And Company Plc.

Source: Researcher's Compilation (2025)

This study relies on secondary data from selected firms' annual financial reports obtained from the NGX database and company websites. The data spans the ten years from 2014 to 2023 and include relevant financial metrics required to measure firm sustenance and entrepreneurial innovation. As financial reports undergo external audits, they provide reliable and standardized data for analysis.

Firm sustainability is measured using the Net Operating Cash Flow to Current Liabilities Ratio. This ratio assesses a firm's ability to generate cash from operations relative to its short-term obligations, indicating financial sustainability.

Entrepreneurial Innovation is quantified using a weighted index method adapted from Anthony (2013). The innovation strategy is assessed based on the disclosure of key themes in annual reports:

Table 3. Operationalization of Entrepreneurial Innovation

Entrepreneurial Innovation Theme	Value Assigned During Coding
Innovation Magnitude	"1" if disclosed, otherwise "0"
Innovation Success Rate	"1" if disclosed, otherwise "0"
Investment Efficiency	"1" if disclosed, otherwise "0"
Total	Number of disclosed innovation theme/3

Source: Adapted from Anthony (2013)

To examine the effect of entrepreneurial innovation on firm sustenance, this study employs a regression model specified as follows:

$$SUS_{it} = \alpha_0 + \beta_1 INNOV_{it} + \varepsilon_{it} \quad eqi$$

Where:

SUS_{it} = Firm Sustenance (Net Operating Cash Flow/Current Liabilities) for firm i in year t .

$INNOV_{it}$ = Entrepreneurial Innovation Index for firm i in year t

α_0 = Constant term.

β_1 = Coefficient of Entrepreneurial Innovation.

ε_{it} = Error term.

The collected data were analyzed using Eviews 10 software. The analysis included:

1. Descriptive Statistics: Mean, standard deviation, and minimum and maximum values of all variables.
2. Inferential Statistics: Ordinary Least Squares (OLS) regression examines the relationship between entrepreneurial innovation and firm sustenance.
3. Diagnostic Tests: Tests for linearity, heteroskedasticity, and autocorrelation were conducted to ensure the robustness of the regression model.

The study adopted a 1% significance level ($\alpha=0.01$). If the p-value for the regression coefficient is less than 0.01, the null hypothesis is rejected, indicating that entrepreneurial innovation significantly affects firm sustainability. The null hypothesis was accepted if the p-value exceeded 0.01, suggesting no statistically significant effect.

3.1 Ethical Considerations

The data utilized in this study were sourced exclusively from publicly accessible annual reports. There was no direct engagement or communication with the firms involved and, as such, no formal consent was necessary. Given that the information was available in the public domain and that the study did not involve human participants, ethical approval was not required. The use of financial data adheres to the access policies provided by the Nigerian Exchange (NGX) and firms' official websites.

4. Result and discussions

4.1 Descriptive Analysis

Table 4. Descriptive Analysis

	SUSTENANCE	INNOVATION
Mean	0.373374	0.462500
Median	0.375286	0.333333
Maximum	1.772829	1.000000
Minimum	-1.840163	0.000000
Std. Dev.	0.445648	0.395096
Observations	80	80

Source: Computations with the aid of Eviews 10 (2025)

Table 4.1 shows the output of the descriptive analysis. For **sustainability**, the mean value of 0.373374 suggests that, on average, the listed industrial goods firms in the sample generate sufficient operating cash flow relative to their current liabilities. The maximum value of 1.772829 reveals that some firms can generate cash from their operations relative to short-term liabilities, thus showcasing financial resilience. In contrast, the minimum value of -1.840163 indicates that a few firms in the sample are experiencing negative cash flow relative to their current liabilities, signalling potential liquidity or operational efficiency challenges. The standard deviation of 0.445648 points to considerable variability in the firm's financial ability to sustain its operations, with some firms significantly outperforming others in cash flow generation.

For **Innovation**, the mean value of 0.462500 (as shown in Table 4.1) reflects a moderate level of entrepreneurial innovation among the listed industrial goods firms. This suggests that, on average, approximately 46% of the firms in the sample disclose key innovation themes in their annual reports, indicating a relatively active but not overly aggressive approach to innovation. The maximum value of 1.000000 shows that some firms fully disclose all three innovation themes (Innovation Magnitude, Innovation Success Rate, and Investment Efficiency), demonstrating a comprehensive approach to entrepreneurial innovation. On the other hand, the minimum value of 0.000000 indicates that firms in the sample disclose no innovation themes, which may reflect a lack of focus on innovation or insufficient transparency in their reporting. The standard deviation of 0.395096 suggests moderate variability in innovation disclosure among firms, with some firms exhibiting more advanced innovation strategies, while others show little to no emphasis on innovation. This variability highlights the different levels of entrepreneurial innovation across firms in the sample.

4.2 Model Diagnostics

Three model diagnostic tests were carried out: linearity test, heteroskedasticity test, and autocorrelation test. Table 4.2 shows the output of the tests.

Table 5. Model Diagnostics

Type of Test	Tool Used	Test Statistics	p-value
Linearity Test	Ramsey RESET	0.183447	0.8549
Heteroskedasticity Test	Glejser	0.753457	0.3880
Autocorrelation Test	Breusch-Godfrey LM Test	1.406231	0.2514

Source: Computations with the aid of Eviews 10 (2025)

The **linearity test** in Table 4.2, using the Ramsey RESET tool assesses whether there is a linear relationship between the dependent and independent variables in the model (Nwoye, Udunwoke, & Nworie, 2023; Prabowo, Suhartono, & Prastyo, 2020). A p-value of 0.8549 indicates no evidence of rejection of the null hypothesis of linearity, meaning that the model does not suffer from any misspecification related to the functional form. This suggests that the assumption of linearity holds and that the model appropriately represents the relationship between the variables in a linear fashion, which is crucial for the validity of the regression analysis.

The **heteroskedasticity test**, conducted using the Glejser test, examines whether the variance of the errors is constant across all levels of the independent variables (Ilori & Tanimowo, 2022). A p-value of 0.3880 suggests no significant evidence of heteroscedasticity, meaning that the assumption of constant variance (homoscedasticity) is not violated. This is essential because heteroskedasticity can lead to inefficient estimates and affect the reliability of statistical inferences, such as confidence intervals and hypothesis tests, thereby validating the model's assumptions.

The **autocorrelation test**, performed using the Breusch-Godfrey LM test, evaluates whether the residuals from the regression model are correlated across time or observations (Gujarati & Porter, 2012). A p-value of 0.2514 indicates that there is no significant autocorrelation in the residuals, meaning that the errors are not correlated with each other. This is important because autocorrelation can suggest that the model has missing key variables or temporal patterns, and its absence ensures that the estimated standard errors are consistent, thus providing valid hypothesis tests and confidence intervals for the model parameters.

4.3 Test of Hypothesis and Discussion of Finding

Ha: Entrepreneurial innovation practice will significantly enhance firm sustenance (proxy by operating cash flow ratio) among listed Nigerian industrial goods firms.

Table 6. Test of Hypothesis

Dependent Variable: SUSTENANCE				
Method: Least Squares				
Date: 02/10/25 Time: 05:16				
Sample: 1 80				
Included observations: 80				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INNOVATION	0.352574	0.121315	2.906254	0.0048
C	0.210309	0.073599	2.857492	0.0055
R-squared	0.097706	Mean dependent var		0.373374
Adjusted R-squared	0.086138	S.D. dependent var		0.445648
S.E. of regression	0.426022	Akaike info criterion		1.156031
Sum squared resid	14.15659	Schwarz criterion		1.215581
Log-likelihood	-44.24123	Hannan-Quinn critter.		1.179906
F-statistic	8.446312	Durbin-Watson stat		1.573450
Prob(F-statistic)	0.004759			

Source: Computations with the aid of Eviews 10 (2025)

The regression analysis in Table 4.3 tests the hypothesis that entrepreneurial innovation practice will significantly enhance firm sustenance, measured by the operating cash flow ratio, among listed Nigerian industrial goods firms. The coefficient for innovation is 0.352574, with a p-value of 0.0048, which is statistically significant at the 1% level. This indicates that a one-unit increase in entrepreneurial innovation is associated with a 0.352574 increase in the operating cash flow ratio, suggesting that higher innovation practices positively influence firm sustainability. This result supports the alternative hypothesis, demonstrating that entrepreneurial innovation has a meaningful and positive influence on the financial sustainability of firms in this context.

The constant (C) term has a coefficient of 0.210309 with a p-value of 0.0055, which is also significant at the 1% level. This means that even in the absence of entrepreneurial innovation (i.e., when innovation is zero), the firms' baseline operating cash flow ratio is expected to be 0.210309. This suggests that other factors beyond entrepreneurial innovation contribute to these firms' sustenance, although the effect of innovation remains more pronounced in enhancing financial sustainability.

An R-squared value of 0.097706 indicates that the entrepreneurial innovation variable in the model explains approximately 9.77% of the variation in firm sustenance (operating cash flow ratio). Although

entrepreneurial innovation plays a notable role in predicting a firm's sustainability, it accounts for less than 10% of the observed variation. This indicates that additional factors, such as capital structure, market fluctuations, and leadership approach, may also contribute to a firm's financial stability. While 9.77% is a relatively low percentage, it still suggests that entrepreneurial innovation accounts for a significant portion of the variation in firm sustainability, especially considering that the model could be enhanced by other factors not included in the analysis. The Durbin-Watson stat of 1.573450 falls within the range of 1.5 to 2.5, suggesting no serious issue with autocorrelation in the residuals. The Prob(F-statistic) of 0.004759 is highly significant, indicating that the overall regression model is statistically significant and that the relationship between innovation and sustainability is not due to random chance.

4.4 Decision and Discussion

It was found that entrepreneurial innovation practice significantly enhanced firm sustenance (proxy by operating cash flow ratio) among listed Nigerian industrial goods firms ($b = 0.352574$; $p\text{-value} = 0.004759$). This could be because innovation fosters adaptability, competitiveness, and long-term growth. Industrial goods firms often operate in dynamic environments in which technological advancements, regulatory changes, and shifting consumer demands necessitate continuous improvement. Firms can improve operational efficiency, reduce costs, and enhance value by embracing entrepreneurial innovation, whether in products, processes, or business models. Additionally, innovation enables firms to differentiate themselves from competitors, build substantial brand equity, and respond proactively to market challenges. This sustained competitive advantage ultimately enhances longevity, ensuring that listed industrial goods firms remain profitable and relevant in the evolving economic domain.

The finding that entrepreneurial innovation enhances firm sustainability aligns with the findings of multiple empirical studies. Alsafadi and Aljuhmani (2024) found that entrepreneurial innovation significantly improves competitive advantage, reinforcing that firms leveraging innovation can sustain themselves by maintaining a strong market position. Similarly, Oiku (2024) highlighted the positive correlation between entrepreneurial innovativeness and organizational resilience in SMEs, suggesting that innovation fosters business survival, even in challenging conditions. Shuaib and He (2024) also support this conclusion, demonstrating that innovation positively influences firm performance, which is crucial for long-term sustainability. Furthermore, Enyinna et al. (2023) established a positive and significant relationship between product innovation and firm growth, indicating that continuous innovation drives expansion and financial stability, contributing to firm longevity. However, Iyobhebhe et al. (2025) find that innovation makes no significant contribution to firm competitiveness.

5. Conclusion

5.1 Conclusion

As expected, industrial goods firms are anticipated to sustain their operations through continuous innovation, strategic adaptability, and efficient resource utilization. Entrepreneurial innovation is a key driver of business growth, fostering product differentiation, process efficiency, and market expansion. Firms that consistently invest in research and development (R&D), technological advancements, and innovative business models are expected to maintain a competitive edge, improve financial performance, and enhance their long-term sustainability. Sustainable industrial goods firms leverage innovation to develop high-quality, cost-effective products, optimize production processes, and respond effectively to changing consumer demands and regulatory requirements. With the right combination of innovation and strategic foresight, these firms can withstand economic uncertainties, scale their operations, and contribute significantly to national industrialization and economic growth.

In conclusion, entrepreneurial innovation is a critical determinant of firm sustenance in the industrial goods sector, as it enhances competitiveness, promotes efficiency, and ensures adaptability in an ever-changing business environment. Nigerian industrial firms must recognize the necessity of innovation as a means of survival and a tool for sustainable expansion and value creation. Thus, firms can position themselves for long-term success despite prevailing economic challenges by fostering a culture of innovation, investing in R&D, and leveraging modern technology.

5.2 Recommendations

1. Since entrepreneurial innovation practice significantly enhances firm sustenance, company executives should establish dedicated innovation departments or strengthen existing ones to drive continuous improvement in products, services, and operational processes. This should be supported by structured R&D investments, partnerships with research institutions, and employee training in innovative thinking.
2. The government should implement a structured industrial innovation policy that includes financial incentives, regulatory support, and research funding for firms that adopt entrepreneurial innovation practices. Specifically, tax breaks, low-interest innovation loans, and grants should be provided to firms that demonstrate sustained improvements in their operating cash flow ratios through innovation.

5.3 Limitations to the Study and Suggestions for Further Studies

One limitation of this study is the small sample size, as only eight of the 13 listed industrial goods firms in Nigeria were included. Although this covers most firms, it may not fully represent the entire sector. Another limitation is secondary data from annual reports, which only provides historical information and does not capture real-time innovation or qualitative hints within firms. The study did not account for external factors such as economic changes, policy shifts, or industry-specific events between 2014 and 2023, which might have impacted the results. Although several strong statistical tests were used, such as descriptive analysis, regression, and tests for linearity, heteroskedasticity, and autocorrelation, these methods cannot completely rule out other factors that may influence innovation and firm performance.

Future studies should expand the sample size to include all listed industrial goods firms in Nigeria to improve the representativeness and generalizability of the findings. Additionally, incorporating primary data through interviews or surveys could provide valuable qualitative perspectives on innovation practices within firms, offering a deeper understanding of innovation dynamics. Future research should also consider external factors such as economic fluctuations, government policies, and industry-specific shocks to better capture the real-world context. Moreover, exploring the potential impact of other variables, such as managerial capabilities, firm culture, and financial strategies, could provide a more comprehensive view of the factors influencing firm sustainability.

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