(Jabss) Journal of Accounting, Business and Social Sciences
Volume 10 Number 3,October 2026; ISSN 2672-4235

MANAGEMENT EFFICIENCY AND ECONOMIC SUSTAINABILITY: MODERATING EFFECT OF FIRM SIZE OF LISTED MANUFACTURING FIRMS IN NIGERIA

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Abstract

This study examined the moderating role of firm size on the effect of management efficiency on the economic sustainability of listed manufacturing firms in Nigeria, with specific emphasis on investment, inventory, liquidity, labour, and overhead management efficiency. Five research questions and hypotheses were formulated for this study. An ex post facto research design was adopted, and the study covered a population of 39 listed manufacturing firms on the Nigerian Exchange Group, from which 30 firms were purposively selected, for the period 2015 to 2025. Secondary data were collected from the published annual reports and financial statements of the sampled firms. The study was analysed using descriptive statistics, spearman rank order correlation, and the hypotheses were tested using Panel Estimated Generalised Least Squares after conducting Hausman specification test. The findings revealed that, at 5% significance level, Investment management efficiency had a positive and significant effect on economic sustainability of listed manufacturing firms in Nigeria (β = 1.793049; p = 0.0000), Firm size had a positive and significant moderating effect on the effect of investment management efficiency on economic sustainability (β = 0.354206; p = 0.0000). Inventory management efficiency had a negative and significant effect on economic sustainability of listed manufacturing firms in Nigeria (β = -0.038886; p = 0.0000). Firm size had a negative and significant moderating effect on the effect of inventory management efficiency on economic sustainability (β = -0.007178; p = 0.0000). Liquidity management efficiency had a positive but non-significant effect on economic sustainability of listed manufacturing firms in Nigeria (β = 0.007127; p = 0.6923). Firm size had a positive but non-significant moderating effect on the effect of liquidity management efficiency on economic sustainability (β = 0.006171; p = 0.2079). The study concluded that management efficiency significantly affected the economic sustainability of listed manufacturing firms and that firm size strengthened or weakened the effects of most management efficiency dimensions on economic sustainability. The study recommended that management of listed manufacturing firms should improve investment and labour management practices, strengthen inventory and overhead cost control measures, and

consider firm size when formulating strategies aimed at enhancing long term economic sustainability.

Keywords: Management Efficiency, Economic Sustainability, Economic Value Added, Firm Size

1.0 Introduction

In recent years, many manufacturing firms struggle with cost control, asset utilization, and liquidity constraints, which affect their ability to sustain value creation. Management efficiency has therefore become a central concern for both practitioners and researchers who are interested in understanding how firms can better deploy their resources to achieve stronger economic outcomes. Empirical evidence suggests that firms with stronger managerial systems and structured performance frameworks tend to achieve better operational outcomes, including improved resource utilization and service quality (Ohanyere et al., 2026). The argument in literature remains how internal efficiency translates into sustained economic outcomes which is a critical concern for both managers and policy makers in the manufacturing sector over time, particularly as prior studies have linked management efficiency to broader economic sustainability and firm-level performance (Obizue et al., 2025; Sunday & Agubata, 2023).

Economic sustainability has become an important measure of organizational performance because it reflects the ability of firms to generate value over time without eroding their resource base (Kyaw et al., 2022). It goes beyond short term profit and focuses on the long term capacity of firms to remain financially viable while contributing to economic development. In the manufacturing sector, economic sustainability is often assessed through indicators such as economic value added, which captures the true economic profit after accounting for the cost of capital, and has been shown to significantly influence shareholder wealth (Yusuf, 2011). Management efficiency, on the other hand, reflects how well firms utilize their resources such as assets, labour and working capital to generate output and returns (Olusola, 2025).

In a competitive business environment, firms that manage resources efficiently are more likely to survive market shocks, attract investors and maintain steady growth. This position is supported by studies which find that managerial efficiency contributes significantly to profitability and return on assets across different sectors (Owualah & Adaise, 2022; Adegbie et al., 2019). However, some contrasting evidence suggests that efficiency alone may not always guarantee improved performance, especially in sectors where other structural factors dominate (Sani & Salihu, 2022; Olusola, 2025). This is particularly relevant in emerging economies where resource constraints and market

instability can easily erode firm performance. Consequently firms are under pressure to adopt more disciplined management practices that enhance efficiency across key operational areas while supporting long term economic performance. Such practices help firms respond effectively to financial challenges and improve resource allocation decisions in highly competitive markets like Nigeria.

Interestingly, Obizue et al. (2025) argued that management efficiency appears to play a central role in determining the economic sustainability of manufacturing firms because it reflects how well resources are transformed into value creating outputs. Investment management efficiency influences how effectively firms allocate capital to productive projects that generate returns above the cost of funds, a relationship that has been linked to improved financial outcomes in prior studies (Oyedele, 2025). Inventory management efficiency affects the ability of firms to balance stock levels in a way that minimizes holding costs while avoiding stock outs that could disrupt production, with evidence showing its significant contribution to firm profitability (Oyewobi & Adesoye, 2024). Liquidity management efficiency ensures that firms maintain adequate cash flow to meet short term obligations without compromising investment opportunities. Labour management efficiency contributes to productivity levels by ensuring that human resources are effectively utilized to achieve operational targets, while overhead management efficiency reflects how well firms control indirect costs that do not directly contribute to production but affect overall profitability. These dimensions of efficiency have been widely associated with improved organizational productivity and competitiveness (Nwoka & Thom-Otuya, 2013; Rasak, 2024).

Beyond direct effects, firm size plays a significant moderating role in shaping how management efficiency translates into economic sustainability. Larger firms may have more diversified resources, stronger access to capital markets and more advanced managerial systems that enable them to benefit more fully from efficient management practices. Empirical studies support this view by showing that firm size positively influences performance and enhances the effectiveness of managerial practices (Olusola, 2025; Oyewobi & Adesoye, 2024). In contrast smaller firms may face constraints such as limited access to finance, weaker organizational structures and lower capacity to absorb operational shocks, which can reduce the extent to which efficiency improvements translate into sustained economic gains.

In many cases large manufacturing firms in Nigeria are better positioned to invest in modern technologies, improve monitoring systems and strengthen internal controls that enhance management efficiency across different functional areas. These advantages may translate into stronger economic sustainability outcomes when compared with smaller firms that operate under tighter financial and operational constraints, a position consistent with findings that managerial ability interacts with organizational and environmental factors to shape firm performance (Johnson et al., 2024; Sinha et al., 2024). Similarly

well managed smaller firms can achieve strong sustainability results when resources are carefully allocated and operational processes are effectively controlled.

Manufacturing firms are expected to operate in a manner that ensures efficient use of resources, consistent profitability, and sustained value creation over time. In such a setting, management is able to allocate financial, human, and material resources in ways that maximize output while minimizing waste. Effective investment decisions, proper inventory control, sound liquidity management, and disciplined cost control contribute to stable operations and improved financial performance. When these practices are properly implemented, firms are better positioned to generate economic value added, remain competitive, and contribute meaningfully to economic development (Fijabi et al., 2022). Large and small firms alike are able to translate their internal capabilities into long term economic sustainability through structured management practices and strategic decision making.

In reality, many listed manufacturing firms in Nigeria struggle to achieve this level of performance due to persistent inefficiencies in resource management and operational processes (Boluwaji et al., 2024). Issues such as poor inventory control, weak cost management, suboptimal investment decisions, and liquidity challenges continue to affect firm performance. Fluctuating macroeconomic conditions, infrastructure gaps, and policy inconsistencies further complicate managerial efforts (Onodje & Onodje, 2022). Although some firms show improvement, the overall performance pattern remains uneven, with several firms unable to consistently generate sufficient returns above their cost of capital.

The persistence of these challenges has significant implications for both firms and the broader economy. Inefficient management practices can lead to declining profitability, poor asset utilization, and weakened investor confidence (Olusola, 2025). Over time, this may reduce the ability of firms to sustain operations, expand production, and create employment opportunities. It can also limit their contribution to industrial growth and national economic development. In addition, variations in firm size may widen the performance gap between large and small firms, making it more difficult for smaller firms to remain competitive. These issues highlight the need for a deeper understanding of how management efficiency influences economic sustainability, particularly within the context of listed manufacturing firms in Nigeria.

Existing studies have examined management efficiency and firm performance using indicators such as return on assets, earnings per share, and market value, as seen in Ohanyere et al. (2026), Olusola (2025), Obizue et al. (2025), Oyewobi and Adesoye (2024), Sunday and Agubata (2023), Owualah and Adaise (2022), and Adegbie et al. (2019). However, only Yusuf (2011) linked managerial performance with economic value added, and the study focused on conglomerates rather than manufacturing firms,

leaving a sector-specific gap. In addition, prior studies relied on limited efficiency measures, whereas this study combined investment, inventory, liquidity, labour, and overhead efficiency for a broader assessment. Furthermore, while firm size has been treated as a control variable in studies such as Sani and Salihu (2022) and Olusola (2025), its moderating role remains largely unexplored, which this study addresses; hence, the need for this study that investigated the effect of firm size on the relationship between management efficiency and economic sustainability of firms in Nigeria.

The specific objectives are as follows to:

Determine the moderating role of firm size on the effect of investment management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

Examine the moderating role of firm size on the effect of inventory management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

Evaluate the moderating role of firm size on the influence of liquidity management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

Review of Related Literature

2.1 Conceptual Review

2.1.1 Management Efficiency

Management efficiency refers to the extent to which a firm is able to utilize its available resources in a way that produces maximum output with minimal waste (Sunday & Agubata, 2023). It reflects how well different resources within an organization are coordinated and applied toward achieving organizational goals (Olusola, 2025). It is concerned with how inputs such as capital, labour, and operational assets are converted into outputs that generate value for the firm. It also relates to the ability of a firm to organize its internal activities in a structured manner that supports productivity and cost effectiveness over time (Nwoka & Thom-Otuya, 2013).

Management efficiency also relates to how effectively decision making processes within a firm contribute to the best possible use of resources (Johnson et al., 2024). It reflects how managers are able to align operational activities with financial and strategic objectives in a way that avoids unnecessary costs and delays (Adegbie et al., 2019). In firms where management efficiency is high, resources tend to be allocated to productive areas in a balanced and controlled manner, reducing wastage and improving overall performance outcomes (Sani & Salihu, 2022). It also reflects the ability of a firm to

maintain stability in its operations while responding to changes in the business environment.

In addition, management efficiency captures how smoothly various functional areas within a firm operate together (Aissa & Goaied, 2016). This includes coordination between production, finance, human resources, and other departments in a way that ensures that resources are not duplicated or misused (Owualah & Adaise, 2022). When these areas operate in alignment, firms are able to maintain consistency in output and reduce operational disruptions. It also reflects the level of discipline in the use of organizational resources, especially in environments where cost pressures are high (Olusola, 2025).

2.1.1.1 Investment Management Efficiency

Investment management efficiency refers to the ability of a firm to allocate financial resources into investment opportunities in a way that yields optimal returns relative to the funds committed (Gerio et al., 2020). It reflects how carefully investment decisions are made and how effectively such decisions contribute to the overall performance of the firm. It is concerned with the allocation of funds into projects, assets, or business activities that have the potential to generate future income and enhance financial stability (Bao & Motlagh, 2024).

Investment management efficiency also relates to the quality of judgment applied in selecting investment opportunities (Al-Radaideh & Ibrahim, 2023). It captures how well a firm is able to identify productive ventures and avoid commitments that may not contribute positively to financial performance. In firms with strong investment management efficiency, financial resources are directed toward areas that support growth and long term stability rather than being tied up in unproductive or low yielding activities. It further reflects the ability of a firm to maintain balance between risk and return in its investment decisions. This involves ensuring that funds are not concentrated in areas that expose the firm to unnecessary financial pressure (Al-Radaideh & Ibrahim, 2023). Instead, resources are distributed in a manner that supports steady returns while maintaining financial stability. This balance is important for sustaining continuous business operations.

2.1.1.2 Inventory Management Efficiency

Inventory management efficiency refers to the ability of a firm to maintain and control its stock levels in a way that supports continuous production while minimizing unnecessary holding costs (Islam et al., 2019). It reflects how well materials, goods, and supplies are managed within the operational cycle of a firm. It is concerned with ensuring that inventory is neither excessive nor insufficient, but maintained at a level that supports

smooth production and sales activities (Elsayed, 2015). Inventory management efficiency also relates to how effectively a firm is able to balance availability of materials with the cost of storing them. It captures the ability to avoid situations where excess stock leads to increased storage costs, spoilage, or obsolescence. At the same time, it ensures that shortages do not disrupt production or delay delivery of goods to customers (Yousaf, 2026). This balance contributes to smooth operational flow within the firm.

Inventory management efficiency also reflects how well a firm organizes its procurement and storage systems (Oraegbunam & Okeke, 2026). It shows how efficiently materials are received, stored, and issued for production or sale. Firms with strong inventory management efficiency are able to maintain order in their stock systems, reducing confusion and delays in accessing required materials (Onwubiko et al., 2025). This contributes to improved productivity and operational discipline.

2.1.1.3 Liquidity Management Efficiency

Liquidity management efficiency refers to the ability of a firm to maintain adequate short term financial resources in a way that ensures smooth settlement of obligations as they become due while still supporting ongoing operations (Bhunia & Khan, 2011). It reflects how effectively cash and other liquid resources are organized within the firm to maintain continuous business activity without interruption. It also relates to the balance between available liquid funds and short term financial commitments, ensuring that neither excess idle cash nor cash shortages disrupt operations (Odum & Ovwighose, 2025).

Liquidity management efficiency also captures how well a firm maintains stability in its day to day financial position (Almakura et al., 2024). It shows the extent to which a firm can meet payment obligations such as supplier settlements, wages, and operational expenses without experiencing financial strain. A firm that demonstrates strong liquidity management efficiency is able to maintain confidence among stakeholders because it consistently meets financial responsibilities in a timely manner (Ofulue et al., 2025).

It further reflects how financial resources are positioned within the firm in relation to timing of inflows and outflows (Tasie et al., 2024). This involves the alignment between cash inflows from operations and cash outflows required for daily activities. When this alignment is properly maintained, the firm avoids unnecessary borrowing and reduces exposure to financial distress. It also supports continuous production and service delivery without disruption.

2.1.2 Economic Sustainability

Economic sustainability refers to the ability of a firm to maintain continuous financial viability over an extended period while consistently generating value without exhausting its economic resources (Kyaw et al., 2022). It reflects a condition where an organization is able to remain operationally stable and financially sound across different business cycles. It is closely linked to the capacity of a firm to persist in its activities while maintaining a stable flow of returns that supports its survival and growth (Okoba & Chukwu, 2023).

Economic sustainability also refers to the long-term endurance of a firm's economic performance in a way that ensures ongoing value creation (Udodiugwu & Enyinna, 2023). It captures how well a firm maintains its financial strength while adapting to changes in the operating environment. A firm that sustains its economic position is able to continue meeting its obligations, reinvesting in its operations, and supporting its long term objectives without experiencing continuous financial decline (Agbeyangi et al., 2024).

Economic sustainability further reflects the ability of a firm to maintain balance between resource consumption and value generation (Doshiro et al., 2023). This involves ensuring that the use of financial, physical, and operational resources does not exceed the returns generated from them over time. When this balance is maintained, the firm is able to sustain its activities without gradually eroding its financial base.

2.1.2.1 Economic Value Added

Economic Value Added refers to a measure of financial performance that captures the extent to which a firm generates value beyond the total cost of the capital employed in its operations (Jakub et al., 2015). It reflects the residual wealth created after all operating expenses and the cost of financing have been accounted for. It shows whether a firm is truly generating wealth above the minimum required return expected by providers of capital. Economic Value Added also represents the level of real economic profit achieved by a firm within a given period (Silvia & Wangka, 2022). It goes beyond conventional accounting profit by incorporating the cost of both debt and equity financing. This provides a clearer picture of whether the firm is generating returns that exceed the overall cost of maintaining its operations and funding structure. It further reflects the efficiency with which a firm uses its invested capital to generate returns (Dobrowolski et al., 2022). It captures how effectively financial resources entrusted to the firm are converted into value that benefits both the organization and its investors.

When a firm generates positive value added, it indicates that it is creating wealth rather than merely covering costs. Economic Value Added also represents a comprehensive measure of financial performance that integrates operational results with capital

efficiency (Jakub et al., 2015). It reflects how well a firm manages its income generation relative to the resources employed to produce that income. This makes it a strong indicator of long term financial strength and performance quality. In broader terms, Economic Value Added reflects the true economic gain achieved by a firm after considering all costs associated with capital usage (Sabol & Sverer, 2017). It provides a clear picture of whether a firm is adding real economic value to its operations over time. This makes it an important measure for assessing long term financial performance and sustainability.

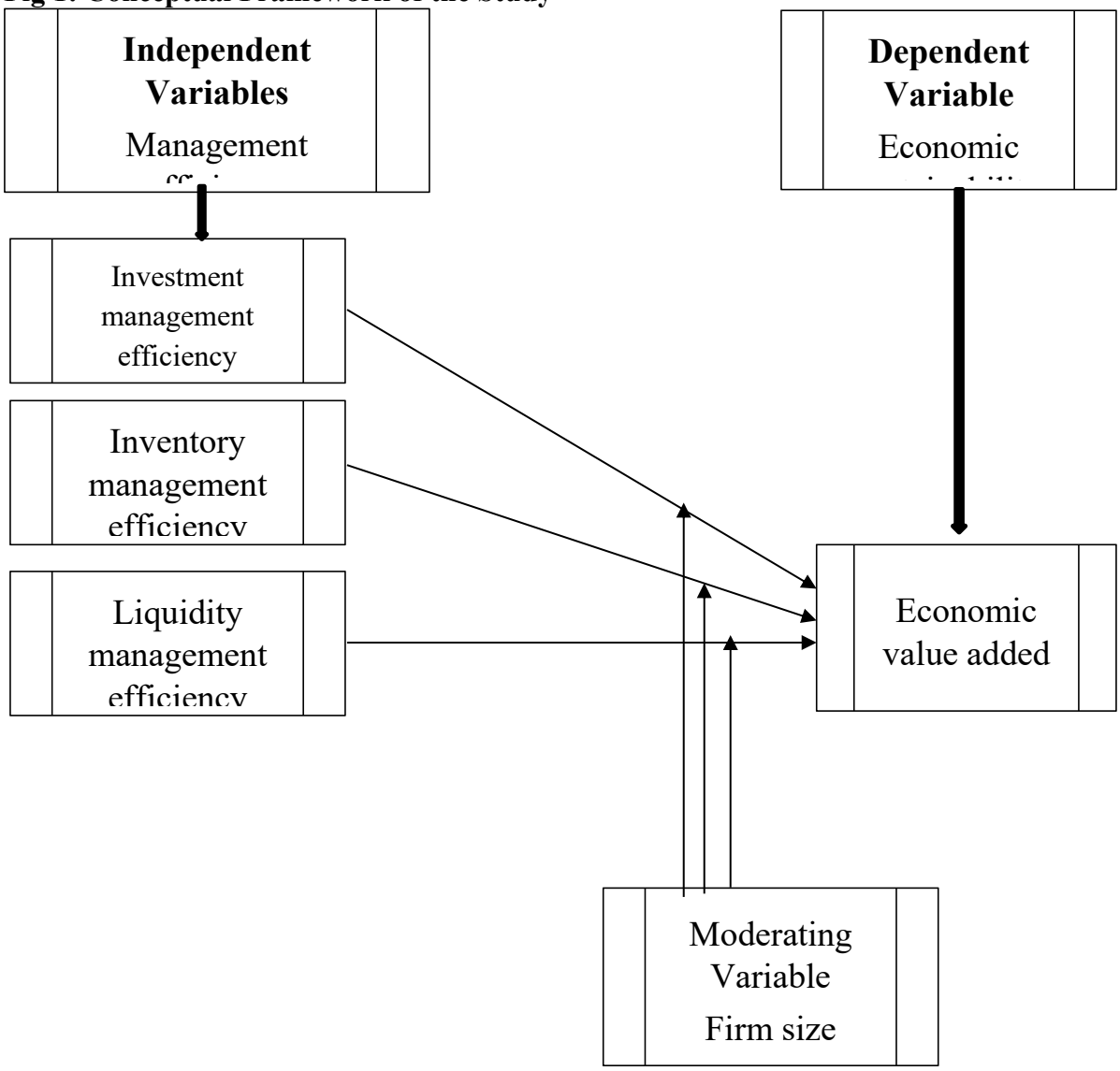
2.1.3 Firm Size

Firm size refers to the scale of operations of a business organization as reflected in the extent of its assets, revenue generation capacity, workforce strength, or overall market presence (Frances & Nworie, 2025). According to Muhindi and Ngaba (2018), it represents how large or small a firm is in relation to other firms within the same industry or economic environment. It captures the level of resources available to the firm for carrying out its activities. Firm size also reflects the breadth of operational capacity within an organization (Josefy et al., 2015). It shows the extent to which a firm is able to engage in production, distribution, and other business activities based on the volume of resources it controls.

A larger scale of operations often indicates greater capacity to handle diverse activities and sustain broader market engagement. Firm size further represents the level of structural development within a firm (Baba, 2026). This includes the organization of departments, the complexity of operations, and the range of activities undertaken. Firms with larger size tend to have more developed structures that support wider operational reach and more complex decision making processes (Ikwuo et al., 2025).

Firm size also captures the level of resource availability within an organization (Nworie & Okafor, 2023; Nworie et al., 2022). This includes financial resources, human capital, and physical assets that support business operations. The extent of these resources often determines the capacity of the firm to expand activities, invest in projects, and sustain operations over time (Frances & Nworie, 2025). In broader terms, firm size reflects the overall magnitude of a business entity within its operating environment. It represents how extensive and resourceful a firm is in comparison to others, shaping its ability to operate, compete, and sustain its activities in the market.

Fig 1: Conceptual Framework of the Study



Source: Author's Concept (2026)

2.2 Theoretical Framework

2.2.1 Resource Based View theory

This study is anchored on the resource based theory, the theory is propounded by penrose's (1995). The Resource Based View theory emerged from the works of scholars in strategic management as an explanation of why some firms consistently achieve superior performance compared to others even within the same industry. The foundations of the theory are commonly traced to the work of Edith Penrose in 1959 (Kor & Mahoney, 2004), who emphasized the role of internal firm resources in shaping growth and performance outcomes. The theory was later refined and popularized in the 1980s and 1990s through the contributions of scholars such as Wernerfelt in 1984 and Barney in 1991, who formally structured the framework within strategic management literature (Ferreira et al., 2016). Since then, it has become widely applied in explaining differences in firm performance based on internal capabilities rather than external market conditions alone.

The Resource Based View theory is based on the idea that firms achieve sustainable performance advantages through the possession and effective use of resources that are valuable, rare, difficult to imitate, and not easily substituted (Malhotra et al., 2025). It suggests that resources within a firm are the main drivers of performance differences, rather than external environmental factors. The theory also emphasizes that not all resources contribute equally to performance, as only those that are well organized and effectively utilized can lead to sustained outcomes. It further assumes that managerial ability plays a key role in combining and deploying resources in a way that improves efficiency and long term value creation. Firms that are able to manage their internal resources more effectively are therefore expected to perform better over time compared to those with poorly managed resources (Iliyas & Barca, 2025).

The Resource Based View theory is relevant to this study because it provides a strong foundation for explaining how management efficiency influences economic sustainability in listed manufacturing firms in Nigeria. Management efficiency variables such as investment management efficiency, inventory management efficiency, liquidity management efficiency, labour management efficiency, and overhead management efficiency represent internal resources and capabilities that determine how well a firm utilizes its assets. The theory helps explain why firms with better internal management practices are more likely to achieve higher economic value added, as they are able to deploy their resources in a more productive and value creating manner. It also supports the role of firm size as a moderating factor because larger firms often possess stronger resource bases that can enhance the effectiveness of management efficiency practices. In this way, the theory provides a useful explanation for differences in economic

sustainability outcomes among manufacturing firms based on how effectively their internal resources are managed and deployed.

2.3 Empirical Review

Ohanyere et al. (2026) investigated how Management by Objectives (MBO) influenced non-financial aspects of organizational performance in a commercial bank located in Awka South Local Government Area of Anambra State, Nigeria. The study utilized a descriptive survey approach and focused on 50 staff members drawn from senior, middle, and junior management levels. Data were gathered through structured questionnaires and analyzed using descriptive statistics such as mean and standard deviation, alongside Pearson correlation. A high response rate was recorded, with 100 out of 105 questionnaires returned. The demographic profile showed that most respondents were male, within the 31–40 age bracket, married, and largely in junior management positions. Findings indicated that MBO positively affected non-financial outcomes, including employee motivation, efficient resource use, customer-oriented goal setting, service quality, and innovation. The correlation results revealed a strong positive association between MBO and non-financial performance, suggesting that effective implementation of MBO improved operational outcomes beyond financial indicators.

Yousaf (2026) assessed the link between inventory management efficiency and firm performance among both quality-certified and non-certified firms. Data were obtained from the Albertina database covering the period from 2018 to 2022. The hypotheses were tested using a two-step system generalized method of moments (GMM). The findings demonstrated that inventory management efficiency had a positive effect on firm performance across both categories of firms. However, the impact was found to be stronger among firms with quality certification compared to those without certification.

Oraegbunam and Okeke (2026) explored the connection between inventory management practices and operational performance in food and beverage manufacturing companies in South-East Nigeria. The study specifically examined inventory safety stock, inventory control, and automated inventory systems in relation to production cycle time, cost efficiency, and employee task quality. A correlational research design was adopted, with data collected from both primary and secondary sources. The population consisted of 2,090 employees, from which a sample of 699 was selected. Questionnaires were used for data collection, while validity and reliability were ensured through appropriate methods. Data analysis included simple percentages and Pearson correlation. The results showed that safety stock and inventory control had significant positive relationships with production cycle time and cost efficiency respectively, whereas automated inventory systems did not show a significant relationship with employee task quality.

Chka and Onuora (2026) examined the effect of liquidity on the financial performance of oil and gas firms in Nigeria. The study focused on variables such as total debt to total assets ratio, cash reserve ratio, and loan-to-deposit ratio. Secondary data were sourced from annual reports of listed firms and analyzed using Panel Least Squares (OLS), alongside descriptive statistics and correlation analysis. The findings indicated that total debt to total assets ratio had a positive and significant effect on performance, while cash reserve ratio had a negative significant effect. The loan-to-deposit ratio showed a negative but insignificant effect. Overall, liquidity was found to significantly influence firm performance. The study recommended reconsideration of the role of cash reserve ratios in policy decisions and encouraged maintaining appropriate loan-to-deposit practices.

Ouko and Aluoch (2026) analyzed the relationship between liquidity management and profitability of construction and allied firms listed on the Nairobi Securities Exchange. The study was grounded in several financial theories and relied on secondary data from annual reports covering 2019 to 2023. A descriptive research design was used, with analysis conducted through both descriptive and inferential statistics at a 0.05 significance level. Diagnostic tests were also performed to ensure data validity. The results revealed that inventory, receivables, cash and cash equivalents, and payables had no significant effect on profitability among the firms studied.

Omete and Kering (2026) evaluated the influence of Human Capital Efficiency (HCE) on the performance of listed commercial banks on the Nairobi Securities Exchange between 2013 and 2022, using the VAICTM model. A linear regression model was applied in the analysis. The findings indicated that HCE did not significantly affect return on assets (ROA), but it had a significant positive relationship with return on equity (ROE). The results suggested that variations in ROE were largely explained by the predictor variables, while ROA was influenced by other factors. Based on these outcomes, the study recommended that banks should prioritize human capital development through training, mentoring, motivation, competitive compensation, and improved working conditions to enhance overall performance.

Olusola (2025) examined the influence of managerial efficiency on organizational performance within Nigeria's health sector. The study adopted a longitudinal design and relied on secondary panel data obtained from six publicly listed health and pharmaceutical firms over a nine-year period. A purposive sampling technique was used to select firms with consistent financial reporting between 2014 and 2024, resulting in 60 firm-year observations. The analysis was conducted using Ordinary Least Squares regression, supported by descriptive and correlation statistics, while controlling for firm size and leverage. The findings revealed that managerial efficiency and compensation did not significantly affect performance, whereas managerial ownership had a significant

positive impact. Firm size was positively related to performance, while leverage showed no significant influence. The study also incorporated diagnostic tests to ensure model reliability and recommended strengthening ownership structures and managerial frameworks to improve performance in the sector.

3.0 Methodology

This study adopted an ex-post facto research design to examine the moderating effect of firm size on the relationship between management efficiency and economic sustainability of listed manufacturing firms in Nigeria. The choice of this design was appropriate because the variables of interest, such as management efficiency indicators, firm size, and economic value added, are historical in nature and cannot be manipulated by the researcher. The study relied on already existing financial data reported in the annual reports of firms. This approach allowed for an objective assessment of how different dimensions of management efficiency influence economic sustainability over time, while also considering the role of firm size. The design further enables the study to analyse trends and relationships across firms and years without introducing bias associated with experimental manipulation. The population of this study consisted of all manufacturing firms listed on the Nigerian Exchange Group (NGX), covering the consumer goods, industrial goods, and oil and gas sectors. These sectors were considered appropriate because of their importance to Nigeria's economic activities and the scale of their operational impact within the business environment. As at the financial year ended 31st December 2025, a total of 39 firms were identified across the selected sectors, made up of 20 firms in the consumer goods sector, 12 firms in the industrial goods sector, and 7 firms in the oil and gas sector. A purposive sampling method was used to select the firms for this study. This approach was adopted because it allows the researcher to include only those firms that satisfy specific conditions that are relevant to the objectives of the research. The firms to be included must have been listed on the Nigerian Exchange Group as at the 2015 financial year and must have consistently published annual reports covering the period from 2015 to 2025. This period provided a ten year panel data structure that ensures sufficient observations across both firms and time periods. Based on these requirements, a total of 30 firms were selected from the population. This study made use of secondary data that were collected from published financial statements of the selected manufacturing firms, from 2015-2025. The study relied on secondary data obtained from the published annual reports and financial statements of the selected manufacturing firm. The data analysis is carried out using both descriptive and inferential statistical techniques. Descriptive statistics such as mean, standard deviation, minimum, and maximum values was computed to provide an overview of the data and to understand the distribution of each variable. This helped in identifying patterns and any unusual observations within the dataset.

For inferential analysis, panel regression techniques were employed to test the hypotheses of the study. The panel nature of the data allowed for the control of both cross sectional and time series variations among firms. The study considered fixed effects and random effects models, and the Hausman test is conducted to determine the most appropriate model for estimation.

Table 3.1: Measurement of Variables

Variable	Type	Measurement	Source
Investment Management Efficiency (IME)	Independent	Investment efficiency ratio = Investment returns divided by total investment	Nworie et al., 2023
Inventory Management Efficiency (INME)	Independent	Inventory turnover ratio = Cost of goods sold divided by inventory	Oyewobi & Adesoye, 2024
Liquidity Management Efficiency (LME)	Independent	Current ratio = Current assets divided by current liabilities	Almakura et al., 2024
Economic Sustainability (EVA)	Dependent	Net profit – (Invested capital X Weighted Average Cost of Capital)	Jankalová & Kurotová, 2019
Firm Size (FS)	Moderating	Natural log of total assets	Kwarbai & Akinpelu, 2016

Source: Author's Concept (2026)

Model Specification

The study adapted the model of Sunday and Agubata (2023) which used the function:

$EPS = \beta0 + \beta1ARTOit + \beta2INVTOit + \beta3NCATOit + \beta4OPEit + \mu$ ……..1

Where:
EPS = Earnings per Share
ARTO = Account Receivable Turnover
INVTO = Inventory Turnover
NCATO = Noncurrent Asset Turnover
OPE = Operating Expenses
β0 = Constant

β1,….. β5, = are the coefficient of the regression equation μ = Error term i = is the cross section of firms used t = is the year (time series)

To achieve the objectives of the study, a panel regression model was modified from the model afore-expressed. The model was specified to capture both the direct effects of management efficiency variables on economic sustainability and the moderating effect of firm size.

The functional relationship of the model was expressed as:

Direct Model

EVA = f(IME, INVE, LIQE, LABE, OVE, FS,) ----------eq (1)

The econometric form of the model is stated as:
EVAit = β0 + β1IMEit + β2INVEit + β3LIQEit + β6FSit + εit -------eq (2)

Moderating Model including Firm Size

EVA== f(FS**IME, FS*INVE, FS**LIQE*)----------eq (3)

The econometric form of the model is stated as:

EVAit = β0 + β1(IME**FS)it + β2(INVE*FS)it + β3(LIQE**FS)it* + εit----------eq (4)

Where:

EVA = Economic Value Added
IME = Investment Management Efficiency
INVE = Inventory Management Efficiency
LIQE = Liquidity Management Efficiency
FS = Firm Size

IMExFS = Moderation of Investment Management Efficiency with Firm Sustainability

INVExFS = Moderation of Inventory Management Efficiency with Firm Sustainability

LIQE x FS = Moderation of Liquidity Management Efficiency with Firm Sustainability

β0 = Intercept
β1–β6 = Coefficients of the explanatory variables
ε = Error term
i = Firm
t = Time period

Data Presentation and Analysis

4.1 Data Presentation

This study examined the moderating role of firm size on the effect of management efficiency on the economic sustainability of listed manufacturing firms in Nigeria, with specific emphasis on investment, inventory, and liquidity, management efficiency. Secondary data were collected from the published annual reports and financial statements of the sampled firms for the period 2015 to 2025

4.2 Descriptive Analysis of Data

Table 4.1 Descriptive Analysis

	EVA	IME	INME	LME	FS
Mean	-1.565042	0.047359	5.008830	1.570194	7.628105
Median	-0.061976	0.035820	3.769812	1.174276	7.735042
Maximum	3.959611	5.816481	73.70468	36.41061	9.992167
Minimum	-305.4391	-3.012121	0.000000	0.005775	4.758056
Std. Dev.	17.27274	0.461864	6.323772	2.683534	0.980946
Skewness	-16.72669	5.683481	5.808962	9.752876	-0.350954
Kurtosis	292.5523	90.64324	51.76915	114.7756	2.969024
Jarque-Bera	1168195.	107395.0	34559.34	177021.2	6.787461
Probability	0.000000	0.000000	0.000000	0.000000	0.033583
Sum	-516.4638	15.62860	1652.914	518.1639	2517.275
Sum Sq. Dev.	98156.33	70.18171	13156.74	2369.246	316.5818
Observations	330	330	330	330	330

Source: Author's Concept (2026)

Table 4.1 shows that Economic Sustainability (EVA) had a mean value of -1.565042, indicating that, on average, the sampled firms generated negative economic value over the study period. The maximum value of 3.959611 and the minimum value of -305.4391 reveal a wide range in performance across firms. The standard deviation of 17.27274 suggests considerable variation in EVA among the observations. The skewness value of -16.72669 indicates that the distribution was highly negatively skewed, while the kurtosis value of 292.5523 shows that the distribution was highly leptokurtic with extreme values. Although the Jarque Bera probability of 0.000000 indicates that the data were not normally distributed, the sample size of 330 observations satisfies the Central Limit Theorem, making the data suitable for further statistical analysis.

Table 4.1 indicates that Investment Management Efficiency (IME) recorded a mean value of 0.047359, suggesting relatively low average investment returns relative to total investment. The values ranged from -3.012121 to 5.816481, reflecting differences in investment efficiency across firms. The standard deviation of 0.461864 shows moderate

dispersion around the mean. The skewness coefficient of 5.683481 indicates a highly positively skewed distribution, while the kurtosis value of 90.64324 reveals the presence of extreme observations. The Jarque Bera probability of 0.000000 suggests that the data were not normally distributed but with 330 observations, the Central Limit Theorem supports the use of parametric estimation techniques.

Table 4.1 reveals that Inventory Management Efficiency (INME) had a mean value of 5.008830, indicating that inventories were turned over about five times on average during the study period. The values ranged from 0.000000 to 73.70468, showing substantial variation in inventory management practices among the firms. The standard deviation of 6.323772 confirms this variability. The skewness value of 5.808962 indicates a highly positively skewed distribution, while the kurtosis value of 51.76915 suggests a distribution with heavy tails. The Jarque Bera probability of 0.000000 shows that the data departed from normality, but the sample size of 330 observations was sufficient to satisfy the Central Limit Theorem.

Table 4.1 shows that Liquidity Management Efficiency (LME) had a mean value of 1.570194, implying that current assets exceeded current liabilities on average. The maximum value of 36.41061 and the minimum value of 0.005775 indicate wide differences in liquidity positions across firms. The standard deviation of 2.683534 suggests moderate variability in liquidity management. The skewness coefficient of 9.752876 indicates a highly positively skewed distribution, while the kurtosis value of 114.7756 reflects the presence of extreme observations. Although the Jarque Bera probability of 0.000000 indicates non normality, the sample size of 330 observations satisfies the Central Limit Theorem for subsequent analysis.

Table 4.1 reveals that Firm Size (FS) had a mean value of 7.628105, indicating the average logarithm of total assets of the sampled firms. The values ranged from 4.758056 to 9.992167, showing differences in the scale of operations across firms. The standard deviation of 0.980946 suggests relatively low variability in firm size compared with the other variables. The skewness value of -0.350954 indicates a slight negative skewness, while the kurtosis value of 2.969024 is very close to the benchmark value of 3, suggesting an approximately normal distribution. Although the Jarque Bera probability of 0.033583 is below 0.05, indicating a slight departure from normality, the large sample size of 330 observations satisfies the Central Limit Theorem and supports the use of inferential statistical techniques.

4.2.1 Analysis of Research Questions

Table 4.2 Correlational Analysis

Correlational Analysis: Spearman rank-order
Date: 10/30/26 Time: 19:29
Sample: 1 330
Included observations: 330

Correlation Probability	EVA	IME	INME	LME
IME	0.481908	1.000000		
	0.0000	-----		
INME	-0.137374	0.056668	1.000000	
	0.0125	0.3047	-----	
LME	0.290788	0.293777	-0.065271	1.000000
	0.0000	0.0000	0.2370	-----
FS	-0.191872	0.085847	0.263481	-0.254429
	0.0005	0.1196	0.0000	0.0000

Source: Author's Concept (2026)

Table 4.2 presents the Spearman rank order correlation results between the explanatory variables and economic sustainability (EVA). The results show that investment management efficiency (IME) had a moderate positive and significant association with economic sustainability (r = 0.481908, p = 0.0000), indicating that improvements in investment management efficiency were associated with higher economic sustainability. Inventory management efficiency (INME) exhibited a weak negative but significant association with economic sustainability (r = -0.137374, p = 0.0125), suggesting that higher inventory management efficiency was associated with lower economic sustainability. Liquidity management efficiency (LME) had a weak positive and significant association with economic sustainability (r = 0.290788, p = 0.0000). Firm size (FS) also had a weak negative and significant association with economic sustainability (r = -0.191872, p = 0.0005).

4.2.2.3 Hausman Specification Test

Table 4.5 Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	6.679231	6	0.3515

Source: Author's Concept (2026)

The Hausman specification test was carried out to determine whether the fixed effects or random effects model was more appropriate for the analysis. Table 4.5 shows a Chi square statistic of 6.679231 with a probability value of 0.3515. Since the probability value was greater than 0.05, the null hypothesis was not rejected, indicating that the random effects estimator was more appropriate than the fixed effects estimator.

Table 4.10 Test of Hypotheses

Variable	Unmoderated Model (β)	p-value	Moderated Model (β)	p-value
IME	1.793049	0.0000	IME × FS = 0.354206	0.0000
INME	-0.038886	0.0000	INME × FS = -0.007178	0.0000
LME	0.007127	0.6923	LME × FS = 0.006171	0.2079
FS	-0.700438	0.0000		
Constant (C)	4.660564	0.0001	-0.384972	0.0388
Adjusted R²	0.537365		0.420248	
F-statistic	64.69065		48.69689	
Prob. (F-statistic)	0.000000		0.000000	
Durbin-Watson Statistic	2.071263		2.056884	

Source: Author's Concept (2026)

Table 4.10 presents the results of the unmoderated and moderated Panel Estimated Generalized Least Squares (Panel EGLS) with Period Seemingly Unrelated Regression (Period SUR) models. The adjusted coefficient of determination (Adjusted R^2) for the unmoderated model is 0.537365, indicating that investment management efficiency, inventory management efficiency, liquidity management efficiency, labour management efficiency, overhead management efficiency, and firm size jointly explained 53.74% of the variations in economic sustainability, while the remaining 46.26% was explained by other factors outside the model. For the moderated model, the Adjusted R^2 is 0.420248, implying that the interaction terms between firm size and the management efficiency

variables explained 42.02% of the variations in economic sustainability. The F-statistic of 64.69065 with a probability value of 0.000000 for the unmoderated model and 48.69689 with a probability value of 0.000000 for the moderated model indicate that both models were statistically significant at the 5% level. This implies that the explanatory variables jointly had a significant effect on economic sustainability and that the models were valid for statistical inference. Furthermore, the Durbin Watson statistics of 2.071263 and 2.056884 were close to 2, indicating the absence of first order serial correlation in both models.

The constant term of the unmoderated model was 4.660564 with a probability value of 0.0001. This indicates that when all the explanatory variables were held constant at zero, economic sustainability would increase by 4.660564 units, and this intercept was statistically significant at the 5% level. In the moderated model, the constant coefficient was -0.384972 with a probability value of 0.0388, implying that in the absence of the interaction effects, economic sustainability would decline by 0.384972 units. Since the probability value was less than 0.05, the constant was also statistically significant.

4.3.1 Test of Hypothesis I

H_{01a} : Investment management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria

Table 4.10 shows that the coefficient of investment management efficiency was 1.793049 with a probability value of 0.0000. This implies that a one unit increase in investment management efficiency increased economic sustainability by approximately 1.793049 units, holding other variables constant. The positive coefficient indicates that improvements in investment management efficiency enhanced the economic sustainability of listed manufacturing firms in Nigeria. Since the probability value was less than the 5% significance level, the effect was statistically significant. Therefore, the null hypothesis which stated that investment management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria was rejected, while the alternative hypothesis was accepted. This finding suggests that efficient management of investments contributes significantly to the creation of economic value by improving the productive utilisation of invested resources.

H_{01b} : Firm size does not significantly moderate the effect of investment management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

The moderated result further shows that the interaction between investment management efficiency and firm size had a coefficient of 0.354206 with a probability value of 0.0000. This indicates that a one unit increase in the interaction between investment management efficiency and firm size increased economic sustainability by 0.354206 units. The positive interaction coefficient implies that larger firms strengthened the positive effect of

investment management efficiency on economic sustainability. Since the probability value was less than 0.05, the moderating effect was statistically significant. Therefore, the null hypothesis that firm size does not significantly moderate the effect of investment management efficiency on economic sustainability of listed manufacturing firms in Nigeria was rejected. This implies that the positive contribution of investment management efficiency to economic sustainability became stronger as firm size increased.

4.3.2 Test of Hypothesis II

H_{02a}.: Inventory management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria.

Table 4.10 indicates that inventory management efficiency had a coefficient of -0.038886 with a probability value of 0.0000. This means that a one unit increase in inventory management efficiency reduced economic sustainability by approximately 0.038886 units, holding other variables constant. The negative coefficient suggests that increases in the inventory management efficiency measure used in this study were associated with lower economic sustainability. Since the probability value was less than 0.05, the effect was statistically significant. Therefore, the null hypothesis that inventory management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria was rejected. This finding implies that inventory management practices, as measured in this study, significantly reduced economic sustainability during the study period.

H_{02b}: Firm size does not significantly moderate the effect of inventory management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

The interaction between inventory management efficiency and firm size recorded a coefficient of -0.007178 with a probability value of 0.0000. This indicates that a one unit increase in the interaction term reduced economic sustainability by 0.007178 units. The negative interaction coefficient implies that firm size weakened the effect of inventory management efficiency on economic sustainability. Since the probability value was less than 0.05, the moderating effect was statistically significant. Therefore, the null hypothesis that firm size does not significantly moderate the effect of inventory management efficiency on economic sustainability of listed manufacturing firms in Nigeria was rejected. This indicates that increases in firm size reinforced the negative effect of inventory management efficiency on economic sustainability.

4.3.3 Test of Hypothesis III

H_{03a}: Liquidity management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria.

Table 4.10 reveals that liquidity management efficiency had a coefficient of 0.007127 with a probability value of 0.6923. This implies that a one unit increase in liquidity management efficiency increased economic sustainability by only 0.007127 units, holding other variables constant. Although the coefficient wis positive, the probability value exceeded the 5% significance level, indicating that the effect is not statistically significant. Therefore, the null hypothesis that liquidity management efficiency has no significant effect on economic sustainability of listed manufacturing firms in Nigeria is not rejected. This suggests that changes in liquidity management efficiency did not produce a statistically meaningful effect on economic sustainability during the period covered by the study.

H_{03b}: Firm size does not significantly moderate the effect of liquidity management efficiency on economic sustainability of listed manufacturing firms in Nigeria.

The interaction between liquidity management efficiency and firm size had a coefficient of 0.006171 with a probability value of 0.2079. This indicates that a one unit increase in the interaction term increased economic sustainability by 0.006171 units. However, since the probability value was greater than 0.05, the moderating effect of firm size was not statistically significant. Therefore, the null hypothesis that firm size does not significantly moderate the effect of liquidity management efficiency on economic sustainability of listed manufacturing firms in Nigeria was not rejected. This implies that firm size did not significantly alter the effect of liquidity management efficiency on economic sustainability.

4.4 Discussion of Findings

Investment Management Efficiency, Firm Size, and Economic Sustainability

The study found that investment management efficiency had a positive and significant effect on the economic sustainability of listed manufacturing firms in Nigeria. This indicates that improvements in the efficient allocation and utilization of investment resources increased firms' ability to generate economic value after accounting for the cost of capital. Manufacturing firms rely heavily on long term investments in production facilities, technology, and other productive assets, and efficient investment decisions enable these resources to generate higher returns while minimizing waste. The study further found that firm size positively and significantly moderated this effect, implying

that the positive contribution of investment management efficiency became stronger as firms increased in size. Larger firms typically possess greater financial capacity, better managerial expertise, stronger governance structures, and easier access to capital, allowing them to convert efficient investment decisions into superior economic outcomes. Consequently, while efficient investment management improved economic sustainability across firms, its benefits were more pronounced among larger manufacturing firms.

This finding agrees with Brown and Okeke (2025) and Ibim and Austine (2025), who found that sound investment policies significantly improved firm value among Nigerian manufacturing firms. It also supports Obizue and Eme (2025), who reported that asset investment enhanced the performance of Nigerian banks, and Bamisaye et al. (2024), who found that strategic investment and reinvestment improved firm performance. The moderating role of firm size is consistent with Oyedele (2025), who concluded that firm size improved managerial efficiency, and with Salehi et al. (2022), who found that organizational characteristics strengthened the effect of investment efficiency on firm value. However, the finding differs from Bao and Motlagh (2024) and Raza et al. (2021), who reported no significant direct effect of investment efficiency on performance. These differences may reflect variations in industry, economic environment, and performance measures.

Inventory Management Efficiency, Firm Size, and Economic Sustainability

The study found that inventory management efficiency had a negative and significant effect on the economic sustainability of listed manufacturing firms in Nigeria. It further revealed that firm size negatively and significantly moderated this effect, indicating that the adverse effect of inventory management efficiency on economic sustainability became stronger as firm size increased. Although efficient inventory management is generally expected to improve performance, the negative result suggests that the inventory efficiency measure adopted in this study may have reflected practices such as excessive inventory turnover, inadequate inventory levels, or aggressive stock reduction, which could have disrupted production, increased stock out incidents, and reduced firms' ability to meet customer demand. In addition, larger manufacturing firms often operate more complex supply chains and production systems. As a result, inefficient inventory decisions in such firms may lead to greater operational disruptions, higher replacement costs, and larger financial losses, thereby amplifying the negative effect on economic sustainability.

This finding contradicts Yousaf (2026), who reported that inventory efficiency improved firm performance and that the effect was stronger among certified firms. It also disagrees with Oraegbunam and Okeke (2026), who found that inventory control improved operational performance and cost efficiency in Nigerian food and beverage manufacturing firms. Similarly, Ajibola et al. (2025) concluded that inventory turnover significantly improved return on assets, while Oyewobi and Adesoye (2024) reported that inventory turnover positively affected the financial performance of consumer goods firms. Ilori and Majiyagbe (2024) and Alo and Lugard (2024) also found that effective inventory control enhanced profitability and operational efficiency in manufacturing firms. However, the present finding agrees with Onwubiko et al. (2025), who found that finished goods inventory negatively affected firm performance, Okeke and Ehichoya (2025), who reported that inventory holding costs reduced profitability, Moedu et al. (2023), who found that inventory turnover negatively affected return on assets, and Akintola (2023), who observed that prolonged inventory conversion periods reduced firm performance. The differences across studies may be attributed to variations in inventory measures, industrial characteristics, and performance indicators.

Liquidity Management Efficiency, Firm Size, and Economic Sustainability

The study found that liquidity management efficiency had a positive but insignificant effect on the economic sustainability of listed manufacturing firms in Nigeria. It also revealed that firm size had a positive but insignificant moderating effect on this relationship. These findings suggest that maintaining adequate liquidity alone was not sufficient to significantly improve the economic sustainability of the sampled firms. Although sound liquidity management enables firms to meet short term obligations, avoid financial distress, and support day to day operations, excessive liquidity may result in idle funds that generate little or no return. Conversely, inadequate liquidity may constrain production and investment activities. The insignificant moderating effect further implies that increases in firm size did not materially alter the contribution of liquidity management efficiency to economic sustainability. This may be because both large and small firms are equally constrained by prevailing macroeconomic conditions, high financing costs, and unstable cash flows, which limit the ability of liquidity resources to generate additional economic value.

The finding agrees with Ouko and Aluoch (2026), who found that liquidity management variables had no significant effect on the profitability of construction firms in Kenya. It is also consistent with Chka and Onuora (2026), who reported that the loan to deposit ratio had no significant effect on the financial performance of Nigerian oil and gas firms. Similarly, Almakura et al. (2024) found that the quick ratio and cash ratio had no significant effect on the performance of oil and gas firms, while Anzughul et al. (2024) reported that the current ratio had no significant effect on the performance of consumer goods manufacturing firms. However, the finding differs from Bagana et al. (2024), who

found that cash holdings, current ratio, and working capital positively and significantly affected firm performance. It also contradicts Adaramola et al. (2025), Ofulue et al. (2025), and Alagbe and Yinus (2024), all of whom reported significant positive effects of liquidity management on firm performance. These differences may have resulted from variations in the liquidity measures adopted, industry characteristics, and performance indicators.

5.1 Summary of Findings

This study examined the moderating role of firm size on the effect of management efficiency on the economic sustainability of listed manufacturing firms in Nigeria, with specific emphasis on investment, inventory, and liquidity management efficiency. The findings revealed that:

1a. Investment management efficiency had a positive and significant effect on economic sustainability of listed manufacturing firms in Nigeria (β = 1.793049; p = 0.0000).
1b. Firm size had a positive and significant moderating effect on the effect of investment management efficiency on economic sustainability (β = 0.354206; p = 0.0000).
2a. Inventory management efficiency had a negative and significant effect on economic sustainability of listed manufacturing firms in Nigeria (β = -0.038886; p = 0.0000).
2b. Firm size had a negative and significant moderating effect on the effect of inventory management efficiency on economic sustainability (β = -0.007178; p = 0.0000).
3a. Liquidity management efficiency had a positive but insignificant effect on economic sustainability of listed manufacturing firms in Nigeria (β = 0.007127; p = 0.6923).
3b. Firm size had a positive but insignificant moderating effect on the effect of liquidity management efficiency on economic sustainability (β = 0.006171; p = 0.2079).

5.2. Conclusion

The study examined the moderating role of firm size on the effect of management efficiency on the economic sustainability of listed manufacturing firms in Nigeria, with particular emphasis on investment management efficiency, inventory management efficiency, and liquidity management efficiency. Based on the findings, the study concludes that management efficiency plays an important role in determining the economic sustainability of listed manufacturing firms in Nigeria, although its influence varies across the dimensions examined. The findings demonstrate that the ability of manufacturing firms to allocate investment resources effectively and manage inventory efficiently has significant implications for their economic sustainability, while liquidity management efficiency does not appear to exert a significant influence within the period covered by the study.

Specifically, the study concludes that investment management efficiency significantly enhances the economic sustainability of listed manufacturing firms in Nigeria. This

suggests that firms that effectively allocate, monitor, and utilise their investment resources are more likely to achieve improved economic sustainability. Furthermore, firm size strengthens the positive relationship between investment management efficiency and economic sustainability, indicating that larger firms are better positioned to translate efficient investment decisions into sustainable economic outcomes, possibly due to their greater financial resources, investment capacity, and operational advantages. The study also concludes that inventory management efficiency has a significant negative effect on the economic sustainability of listed manufacturing firms in Nigeria. This implies that inefficiencies or excessive commitments of resources to inventory management may constrain firms' ability to achieve sustainable economic performance. The negative moderating effect of firm size further indicates that an increase in firm size intensifies the negative relationship between inventory management efficiency and economic sustainability. This suggests that larger manufacturing firms may experience greater economic implications from inventory-related inefficiencies due to the scale of their inventory holdings, storage costs, and associated operational commitments.

The study concludes that liquidity management efficiency does not have a significant effect on the economic sustainability of listed manufacturing firms in Nigeria. Similarly, firm size does not significantly moderate the relationship between liquidity management efficiency and economic sustainability. This indicates that variations in the efficiency of liquidity management do not sufficiently explain differences in economic sustainability among the sampled firms. It further suggests that firm size alone does not significantly alter the relationship between liquidity management efficiency and economic sustainability.

5.3 Recommendations

The study recommended that:

Manufacturing firms in Nigeria that want to achieve investment should strengthen their investment planning, appraisal, monitoring, and evaluation processes while aligning investment decisions with the scale of their operations, as this was found to significantly affect sustainability economic value. This will enable firms to allocate capital to projects that generate sustainable economic value and allow larger firms to make better use of their financial and operational capacity.

Production, procurement, and inventory managers of listed manufacturing firms should adopt more effective inventory control systems that maintain optimal stock levels, improve demand forecasting, and reduce excessive inventory holding or stock shortages. Larger firms should also strengthen coordination across their supply chains to minimize the negative consequences of inventory inefficiencies on economic sustainability.

Financial managers of listed manufacturing firms should maintain adequate liquidity to support day to day operations while ensuring that excess cash is invested in productive activities that generate economic value. This will help firms achieve a better balance between liquidity management and long term economic sustainability regardless of their size.

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