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HUMAN CAPITAL INVESTMENT AND OPERATING PERFORMANCE OF OIL AND GAS FIRMS IN NIGERIA

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Abstract

This study examined human capital investment and operating performance of oil and gas firms in Nigeria. The specific objectives were to assess the impact of training expenses, research and development costs, and staff emoluments on staff productivity within these firms. The study adopted an ex-post-facto research design, utilizing secondary data extracted from the annual reports of five sampled oil and gas firms: Forte Oil, Mobil, Total Nigeria, Conoil and MRS Oil for the period spanning 2014 to 2024. Panel Least Squares (PLS) regression analysis with fixed effects was employed to analyze the data. The results revealed that training expenses (TE) had a positive and statistically significant effect on staff productivity, with a t-statistic of 3.313 and a p-value of 0.0018, indicating that increased investment in employee training improves productivity. Research and development costs (RDC) showed a strong positive and significant influence on staff productivity, evidenced by a t-statistic of 6.044 and a p-value of 0.0000, highlighting the critical role of innovation and development activities in enhancing workforce output. Conversely, staff emoluments (SE) exhibited a negative but statistically insignificant effect, with a t-statistic of -1.353 and a p-value of 0.1826, suggesting that salary levels alone do not significantly drive productivity improvements in the sampled firms. The model demonstrated excellent explanatory power, with an R-squared value of 0.9976, indicating that approximately 99.8% of the variation in staff productivity is accounted for by the independent variables. These findings emphasize the strategic importance of training and research and development investments in boosting staff productivity and operational performance in the Nigerian oil and gas sector. The study recommends that firms prioritize these human capital components to enhance productivity and sustain competitive advantage.

Keywords: Human capital investment, Employee training and development, Workforce productivity, Operating performance, Oil and gas industry

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INTRODUCTION

1.1 Background of the Study

The oil and gas sector remains a pivotal component of Nigeria's economy, contributing significantly to government revenues and export earnings. However, despite its strategic importance, the sector faces persistent challenges in operational efficiency, productivity, and sustainable growth (Ikechukwu et al., 2023). Increasingly, scholars and industry practitioners are emphasizing the role of human capital investment as a critical factor in enhancing operational performance within this sector (Chukwu & Eze, 2022).

Human capital investment refers to organizational efforts to improve the skills, knowledge, and capabilities of employees through various forms of expenditure, including training programs, research and development (R&D), and competitive staff emoluments. Recent studies suggest that these investments are fundamental to improving staff productivity, which is a key proxy for operating performance (Adewale & Ogundipe, 2023). Specifically, training expenses help employees acquire relevant competencies and adapt to technological advancements, thereby enhancing their effectiveness and efficiency (Olajide & Adebayo, 2024). In the highly technical oil and gas industry, continuous training is essential to equip workers with updated skills to manage complex machinery, comply with safety standards, and implement innovative production techniques.

Similarly, R&D investments have been linked not only to product and process innovation but also to the enhancement of human capital capabilities (Eze & Okoro, 2023). By investing in R&D, firms foster a culture of learning and experimentation that improves employees' problem-solving skills and technical expertise, ultimately translating into better operational outcomes. In Nigerian oil and gas firms, where technological adoption can be slow due to infrastructural and financial constraints, R&D plays a crucial role in sustaining competitive advantage and operational resilience (Akinlabi et al., 2022).

Moreover, staff emoluments, encompassing wages, salaries, bonuses, and other financial benefits, are critical in attracting, motivating, and retaining skilled personnel. Studies have consistently shown that competitive remuneration is positively correlated with employee morale, commitment, and productivity, all of which are indispensable to maintaining high operating performance in capital-intensive industries (Obiora & Emeh, 2023). The oil and gas industry in Nigeria faces stiff competition for talent, not only within the country but also from international firms, making staff emoluments a vital component of human capital investment strategies (Ibrahim & Musa, 2024).

Despite the acknowledged importance of these dimensions of human capital investment, empirical evidence on their impact on operating performance within Nigerian oil and gas firms remains limited. Most existing studies focus broadly on financial performance or organizational growth, often neglecting staff productivity as a direct measure of operational success (Onyeji & Nwankwo, 2023). Understanding how training expenses, R&D costs, and staff emoluments influence staff productivity can provide critical insights into optimizing resource allocation for human capital development in this sector.

Therefore, enhancing human capital through strategic investments in training, research and development, and staff remuneration has the potential to significantly improve staff productivity and overall operating performance in Nigeria's oil and gas firms. Given the sector's vital role in the national economy and its complex operational environment, this study addresses a crucial gap by examining these relationships within the Nigerian context, contributing to both academic discourse and practical policy formulation.

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1.2 Statement of the Problem

In an ideal setting, human capital investment is expected to be a central pillar of organizational performance, particularly in knowledge-intensive and capital-driven industries such as oil and gas. Firms that prioritize strategic investments in employee training, research and development (R&D), and competitive staff emoluments are generally positioned to achieve higher staff productivity, operational efficiency, and long-term competitiveness. Globally, evidence suggests that when human capital is effectively developed and utilized, it leads to enhanced innovation, reduced operational risks, and sustained profitability.

However, in the Nigerian oil and gas sector, the reality diverges significantly from this ideal. Despite being a major driver of the economy, the sector has consistently underinvested in human capital development. Many firms allocate limited resources to staff training, treat R&D as a non-priority, and maintain remuneration structures that are often uncompetitive in comparison to global industry standards. This has resulted in low staff motivation, high turnover rates, skill mismatches, and declining productivity across various operational units. Moreover, there is a lack of empirical data specifically linking human capital investments such as training expenses, R&D costs and staff emoluments to measurable outcomes like staff productivity, making it difficult for firms to justify or structure such investments effectively.

If these issues are not addressed, the Nigerian oil and gas industry may continue to face deepening operational inefficiencies, an exodus of skilled professionals to better-paying international markets, and poor adaptation to technological and regulatory changes. In the long term, this could weaken the sector's contribution to national development, reduce investor confidence, and erode Nigeria's competitiveness in the global energy market. Therefore, a critical assessment of how human capital investments affect the operating performance of firms particularly through the lens of staff productivity is essential for evidence-based policy formulation and strategic corporate decision-making in the sector.

1.3 Objectives of the Study

The main objective of this study is to assess human capital investment and operating performance of oil and gas firms in Nigeria. The specific objectives are to:

i. Examine the effect of training expenses on staff productivity of oil and gas firms in Nigeria.
ii. Assess the effect of research and development costs on staff productivity of oil and gas firms in Nigeria.
iii. Investigate the effect of staff emolument on staff productivity of oil and gas firms in Nigeria.

1.4 Research Questions

The study provided answers to the following research questions.

i. To what extent did training expenses affect staff productivity of oil and gas firms in Nigeria?
ii. To what extent did research and development costs affect staff productivity of oil and gas firms in Nigeria?
iii. To what extent did staff emolument affect staff productivity of oil and gas firms in Nigeria?

1.5 Statement of Hypotheses

The hypotheses stated in null form are denoted by (H_0):

H_{01}: Training expenses have no significant effect on staff productivity of oil and gas firms in Nigeria.

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H_{02}: Research and development costs have no significant effect on staff productivity of oil and gas firms in Nigeria.

H_{03}: Staff emolument has no significant effect on staff productivity of oil and gas firms in Nigeria.

1.6 Scope of the Study

This study focuses on human capital investment and operating performance of oil and gas firms in Nigeria, specifically using staff productivity as a proxy for operational performance. The analysis covers three key components of human capital investment: training expenses, research and development (R&D) costs and staff emoluments. These elements have been selected based on their relevance to employee development, innovation capacity and workforce motivation factors critical to performance in the oil and gas industry.

The research spans the period from 2014 to 2024. This timeframe allows for the analysis of long-term trends and the inclusion of policy shifts, economic cycles and recent reforms such as the implementation of the Petroleum Industry Act (PIA), which have influenced human capital strategies within the sector. The selected period also reflects years for which financial and operational data are expected to be most accessible and consistent.

The study is limited to oil and gas firms that are legally registered and operate within Nigeria and that have publicly available financial statements and corporate reports over the study period. Secondary data are sourced from audited financial reports, annual publications, sustainability disclosures and databases of regulatory agencies. Firms that lack sufficient or reliable data across the key variables were excluded to maintain analytical consistency.

1.7 Operational Definition of Terms

i. Human Capital Investment: Refers to the financial and strategic commitment made by oil and gas firms toward the development, enhancement, and retention of their workforce. In this study, human capital investment is measured through three main components: training expenses, research and development costs, and staff emolument.

ii. Training Expenses: These are costs incurred by firms for employee skill development activities, including professional courses, in-house training, workshops, seminars, and certifications. It reflects the firm's investment in upgrading employee competencies and technical capabilities.

iii. Research and Development (R&D) Costs: Refers to expenditures directed toward innovation, technological improvement, and the development of new methods or processes. In this study, R&D costs are used as a proxy for a firm's investment in knowledge advancement and operational efficiency through employee-driven innovation.

iv. Staff Emolument: Includes all forms of employee compensation, such as salaries, wages, bonuses, and other financial benefits. Staff emolument reflects the firm's approach to remuneration and its role in motivating and retaining qualified personnel.

v. Operating Performance: In this study, operating performance refers to the efficiency and effectiveness with which oil and gas firms convert their human capital inputs into productive outcomes. It is measured using staff productivity as a proxy.

vi. **Staff Productivity:** This is measured in this study as Revenue per Employee, i.e., the total annual revenue of a firm divided by the number of employees. It reflects the efficiency of human capital in contributing to firm output.

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REVIEW OF RELATED LITERATURE

2.1 CONCEPTUAL REVIEW

2.1.1 Human Capital Investment

Human capital investment has become an increasingly vital concept in business and economic discourse, especially in sectors like oil and gas, where skilled labor, innovation, and operational efficiency are critical for competitiveness. Human capital investment refers to the allocation of financial and non-financial resources toward the education, training, health, and overall well-being of employees to enhance their productivity and value to the organization (Obi & Nwankwo, 2023). This includes expenditures on professional training, research and development (R&D) activities, and staff remuneration each serving as a tool to improve employee capabilities and organizational performance.

Olamide and Garba (2022) emphasize that in modern industrial operations, particularly in energy sectors, investments in human capital are not just a social responsibility or compliance requirement but a strategic imperative. These investments have been found to correlate strongly with staff productivity, innovation, and operational resilience. Training, for example, equips workers with the technical skills and safety awareness needed in high-risk environments, such as offshore drilling and refinery operations. Similarly, R&D expenditures often contribute to workforce learning and process improvements, directly influencing performance outcomes. Human capital investment also plays a crucial role in employee retention and motivation. According to Ibrahim and Okonjo (2023), competitive staff emoluments, when aligned with training and career development opportunities, increase job satisfaction and reduce turnover, thereby ensuring stability and knowledge continuity within firms. In the oil and gas sector where operations are complex and labor is highly specialized, such stability is essential for minimizing operational disruptions and maximizing efficiency. Despite its recognized importance, the implementation of robust human capital investment practices in Nigeria's oil and gas industry remains inconsistent. Factors such as fluctuating oil prices, regulatory uncertainties, and cost-cutting pressures often lead firms to deprioritize training and R&D (Akinyemi & Eze, 2023). Moreover, there is a general lack of industry-wide benchmarks or reporting standards for human capital expenditure, making it difficult to assess its impact systematically across firms.

Nonetheless, emerging evidence suggests that firms that consistently invest in their human capital tend to perform better operationally. Chinedu and Balogun (2024) opined that Nigerian oil firms with structured training programs and higher R&D allocations report higher levels of staff productivity and reduced downtime. These findings reinforce the idea that human capital investment is not merely an internal HR function but a driver of firm-level performance and competitiveness.

2.1.2 Training Expenses

Training expenses refer to the financial resources allocated by organizations to improve employees' knowledge, technical skills, and competencies required to perform their roles effectively. These expenses typically cover activities such as workshops, technical courses, certifications, safety drills, leadership development programs, and on-the-job training. In high-risk and technologically intensive sectors like oil and gas, training is not only essential for employee development but also for maintaining operational safety, compliance, and productivity (Okafor & Sulaimon, 2022).

Within the Nigerian oil and gas sector, training is a critical component of workforce development, given the complex nature of exploration, drilling, refining, and distribution activities. According to Ekanem and Ogbonna (2023), firms that consistently invest in employee training experience fewer operational disruptions, improved equipment handling,

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and a higher rate of compliance with industry standards. This directly contributes to enhanced staff productivity, which serves as a key measure of operating performance in this study.

Training also supports employee adaptability in the face of industry changes, including regulatory updates, digital transformation, and environmental sustainability requirements. As the oil and gas industry in Nigeria increasingly adopts automation and digital monitoring systems, the need for upskilling has become more pronounced. A study by Ibrahim and Lawal (2024) found that employees who received ongoing training were more likely to adapt quickly to new technologies and contribute to process efficiency and innovation.

Despite its importance, training is often viewed as a discretionary expense, particularly during periods of economic downturn or when firms are under cost-cutting pressure. This short-term mindset may hinder long-term performance. In fact, Adebayo and Effiong (2023) argue that underinvestment in training is one of the primary causes of skill gaps, low employee morale, and safety-related incidents in the Nigerian oil and gas sector. Therefore, understanding how training expenses affect staff productivity can help firms reframe training as a performance-driving investment rather than a cost.

2.1.3 Research and Development (R&D) Costs

Research and Development (R&D) costs refer to the financial resources that firms allocate to the systematic investigation and creative work undertaken to increase knowledge and apply it in developing new products, processes, or services. In the oil and gas industry, R&D activities are typically directed towards improving drilling technologies, enhancing energy efficiency, reducing environmental impact, and increasing operational safety. These activities often involve collaboration between technical teams and skilled professionals, making R&D a critical aspect of human capital utilization and development (Ibrahim & Osagie, 2023).

In the context of human capital investment, R&D is more than just a technological function, it also represents an avenue for continuous learning and capacity building within the workforce. Employees engaged in R&D acquire advanced skills in data analysis, problem-solving, innovation management, and process optimization. These competencies are directly linked to productivity and firm performance, particularly in complex and rapidly evolving sectors like oil and gas (Obinna & Aluko, 2022). According to Chukwuma and Bamidele (2023) R&D expenditures contribute to the development of specialized knowledge that enhances staff effectiveness and improves production processes. In their study of upstream oil firms in Nigeria, they found a significant positive correlation between R&D intensity and workforce productivity, especially in areas such as exploration efficiency and safety compliance.

Despite the clear benefits, R&D spending in Nigeria's oil and gas sector remains relatively low when compared to global industry benchmarks. This underinvestment is often due to short-term financial constraints, policy uncertainty, and a limited culture of innovation. A study by Olanrewaju and Edet (2024) notes that many Nigerian oil and gas firms treat R&D as a discretionary expense rather than a strategic investment, which hampers both innovation and talent development. Moreover, regulatory and institutional support for R&D in the Nigerian energy sector has historically been weak. However, recent reforms, including the implementation of local content policies and innovation incentives under the Petroleum Industry Act (PIA), are expected to encourage more deliberate investment in R&D, especially those tied to indigenous capacity building (Adeoye & Fagbemi, 2022).

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2.1.4 Staff Emolument

Staff emolument encompasses all forms of monetary compensation provided to employees in exchange for their labor, including salaries, wages, bonuses, allowances, and other financial incentives. It is a fundamental aspect of human capital investment, as it directly influences employee motivation, job satisfaction, retention, and overall productivity (Okeke & Afolayan, 2023). In labor-intensive and skill-dependent industries such as oil and gas, competitive and fair remuneration is essential to attract and maintain a qualified workforce capable of meeting operational demands.

Recent studies highlight that oil and gas firms in Nigeria face intense competition for talent, particularly for highly specialized technical and managerial roles. According to Adebanjo and Ojo (2023), firms that offer attractive staff emoluments alongside non-financial incentives tend to experience higher employee commitment, lower turnover rates, and improved workforce stability. This stability is crucial in the oil and gas sector, where the loss of skilled staff can result in operational delays and increased costs.

Moreover, staff emolument plays a vital role in enhancing staff productivity. As noted by Nwosu and Chukwu (2024), well-structured compensation packages not only satisfy employees' basic financial needs but also serve as a motivational tool, encouraging workers to increase their effort, efficiency, and innovation at work. Their research in Nigerian oil firms demonstrated a positive correlation between emolument levels and measurable output per employee.

Despite its importance, many Nigerian oil and gas companies struggle with inconsistent or delayed payment of staff emoluments, often due to cash flow constraints or economic fluctuations driven by volatile oil prices (Ibrahim & Musa, 2022). Such challenges can lead to decreased morale, labor unrest, and reduced productivity, thereby negatively impacting operating performance. In addition to direct financial benefits, firms are increasingly recognizing the value of linking staff emoluments with performance-based incentives and career development opportunities. This alignment ensures that compensation not only rewards past performance but also incentivizes future contributions toward the firm's operational goals (Eze & Okonkwo, 2023).

2.1.5 Operating Performance

Operating performance refers to the efficiency and effectiveness with which a firm utilizes its resources to generate output and achieve its business objectives. It encompasses various indicators such as productivity, profitability, operational efficiency, and cost management. In the context of oil and gas firms, operating performance is often measured by parameters like staff productivity, production volume, cost efficiency, and safety records, which collectively reflect how well the firm manages its day-to-day activities to deliver value (Onyekachi & Oladipo, 2023).

Staff productivity, used as a proxy for operating performance in this study, is critical because human capital remains one of the most significant contributors to operational success in the oil and gas industry. High staff productivity implies optimal utilization of labor inputs to maximize output, which is particularly vital in Nigeria's oil sector given the sector's complex technical demands and environmental challenges (Agwu & Eze, 2022). Enhancing operating performance through improved staff productivity can lead to reduced operational costs, 1timely project delivery, and higher competitiveness in global energy markets.

Recent empirical studies emphasize the positive relationship between investments in human capital such as training, research and development, and fair staff emolument and improved

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operating performance in the oil and gas industry. For instance, Okoro and Ibe (2024) found that firms with substantial human capital investments reported higher productivity levels and operational efficiency compared to their peers with lower investments. Their study highlights that firms' operational performance gains are linked to the quality, skills, and motivation of their workforce.

In Nigeria, operating performance is often challenged by factors such as infrastructural deficits, regulatory uncertainties, and socio-political risks, which can disrupt productivity and operational continuity (Adewuyi & Omole, 2023). Nevertheless, firms that strategically invest in human capital tend to better navigate these challenges by fostering a more capable and adaptable workforce.

2.1.6 Staff Productivity

Staff productivity is widely recognized as a critical indicator of operating performance in industries where human capital plays a central role, such as the oil and gas sector. It measures the efficiency with which employees convert their skills, time, and efforts into valuable outputs, typically quantified as output per employee or revenue per staff member (Nwafor & Akinola, 2023). As a proxy for operating performance, staff productivity provides direct insight into how well a firm manages and utilizes its human resources to achieve operational goals.

In the oil and gas industry, particularly in Nigeria, staff productivity is a key performance metric due to the sector's heavy reliance on skilled labor for complex exploration, drilling, refining, and safety operations. High productivity levels imply that firms are effectively leveraging their workforce to maximize production volume, reduce downtime, and maintain safety standards (Eze & Chukwuemeka, 2022). Conversely, low productivity may signal skill deficiencies, poor motivation, or inadequate human capital investments, which can adversely affect overall firm performance.

Several studies have demonstrated the strong linkage between human capital investments such as training, research and development, and competitive staff emoluments and improvements in staff productivity. For instance, Afolabi and Okeke (2024) found that Nigerian oil firms that invest heavily in employee development report significantly higher productivity rates, translating to better operational efficiency and profitability. The authors argue that productivity gains are not merely a function of labor input but also the result of enhanced employee capabilities and motivation driven by effective human capital strategies.
Furthermore, staff productivity serves as a measurable and comparable metric across firms and time periods, making it an ideal proxy for assessing the impact of human capital investments on operating performance. It captures both quantitative output and qualitative improvements in workforce effectiveness, thus offering a comprehensive view of operational success (Ibrahim & Musa, 2023).

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2.1.7 Conceptual Framework

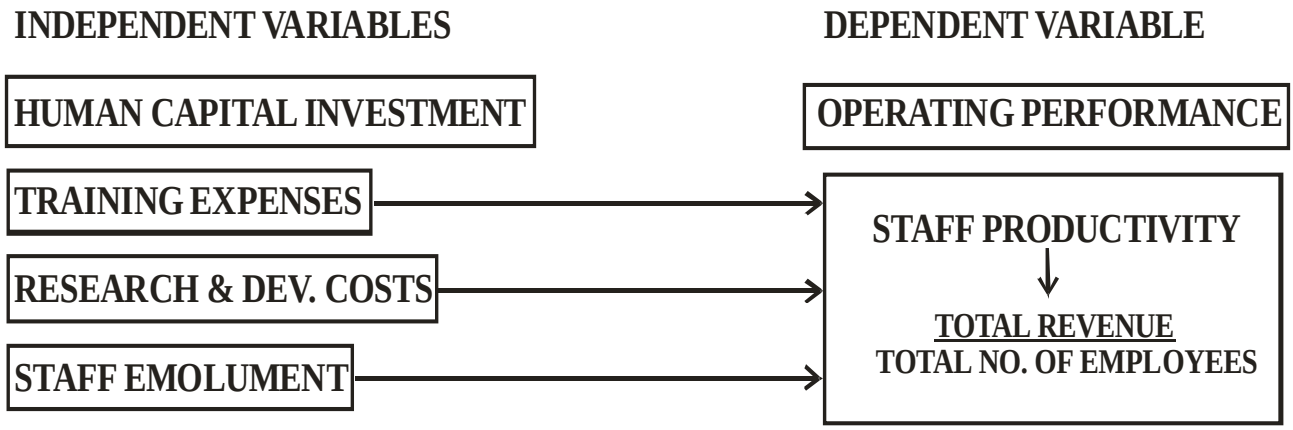


Fig. 2.1: ***Conceptual framework on assessing human capital investment and operating performance of oil and gas firms in Nigeria.***

The conceptual framework of this study depicts the hypothesized relationship between human capital investment and the operating performance of oil and gas firms in Nigeria, with staff productivity (Total Revenue/Total No. of Employees) serving as the key indicator of operating performance. Human capital investment is operationalized through three main components: training expenses, research and development (R&D) costs and staff emolument. It is posited that these components positively influence staff productivity. Specifically, training expenses are expected to enhance employees' skills and competencies, thereby improving their productivity. R&D costs are anticipated to contribute to innovation and process improvements, which can lead to more efficient and effective work outputs. Additionally, staff emolument is considered a critical motivational factor that can increase employee commitment and performance. The directional relationship between each component of human capital investment and staff productivity suggests a cause-and-effect linkage, implying that increased investment in training, research and development and employee compensation will result in enhanced operating performance within the oil and gas sector in Nigeria.

2.2 Theoretical Review

This study is anchored on the Human Capital Theory.

Human Capital Theory

Human Capital Theory, initially developed by economists such as Schultz (1961) and later expanded by Becker (1993), posits that investments in people through education, training, skills development and fair compensation enhance their productivity and contribute to organizational performance. The theory conceptualizes employees as valuable assets whose knowledge, skills, and abilities can be improved through deliberate investments, leading to increased efficiency and competitive advantage for firms.

This theory is highly relevant to the present study because it directly links the components of human capital investment: training expenses, research and development costs and staff emoluments to improvements in employee productivity and, consequently, the operating performance of oil and gas firms. In the Nigerian oil and gas sector, where technical expertise and skilled labor are critical, investing in human capital is essential for navigating complex operations, innovation, and sustaining competitive performance.

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By applying Human Capital Theory, this study underscores why oil and gas firms that commit resources to employee development and fair remuneration are likely to experience enhanced staff productivity, which serves as a proxy for operating performance. It provides a theoretical foundation for analyzing how human capital investments translate into tangible operational outcomes such as improved efficiency, reduced operational disruptions, and higher production volumes.

2.3 Empirical Review

2.3.1 Training Expenses and Staff Productivity

Shekwolo & Peters (2024) conducted a study on Employee Training Cost and Shareholder Value. Their research examined how employee training costs relate to shareholder value in listed oil & gas companies in Nigeria. Using a survey of 191 managers, the study found a positive significant relationship between training cost and shareholder value (proxied by cash flow return on investment). While this does not directly measure staff productivity, the finding suggests that spending on training is beneficial to company performance and likely to productivity.

Ochei et al. (2023) examined the effect of human resources management on the performance of Nigerian oil and gas companies. The study utilized data from the annual reports of ten Nigerian oil and gas businesses that are publicly traded over a ten-year period (2012–2021). The findings indicated that training costs, development costs, and employee recruitment and selection have no discernible effect on the financial performance of Nigerian oil and gas companies. While this study primarily focuses on human resources management, it indirectly highlights the importance of investment in human capital, which can be influenced by R&D activities.

Akintunde et al. (2020) carried out a study on the Effect of Management Techniques on Financial Performance. They included "training costs" along with wages and healthcare costs in their regression for listed oil & gas firms. Their results show that training costs and wages positively influence revenues; training costs in particular were statistically significant. This again is not exactly staff productivity, but is very close in measuring impact of training expenses on firm performance.

2.3.2 Research & Development Costs and Staff Productivity

Quadri (2023) examined "Employment Potentials, Innovation, and R & D Expenditure in Nigeria: Evidence from Indigenous Micro-enterprises". The study explored how R&D expenditure among indigenous micro-enterprises in Nigeria relates to employment potentials and innovation capacities. While it does not deal with oil & gas firms specifically, it finds that increased investment in R&D leads to higher employment generating potential, which is a proxy for productivity. Thus, it provides evidence that R&D expenditure can enhance productive capacity of firms.

Bolodeoku (2021) examined the effect of technological innovation on employee performance in the Nigerian oil and gas sector, specifically focusing on ODENL Ltd in Lagos. The study found that technological innovation has a significant effect on employee performance, with perceived ease of use and perceived usefulness of technology contributing more to employee satisfaction and productivity. This study concludes that technological innovation significantly boosts employee performance in Nigeria's oil and gas sector.

Akinwale (2018) did a study that examined 'Empirical analysis of inbound open innovation and small and medium-sized enterprises' performance: Evidence from oil and gas industry'. The study employs structural equation modeling (SEM) to analyze data and finds that

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inbound open innovation positively influences financial performance. The research suggests that allocating more funds to R&D, hiring skilled personnel and developing existing staff competencies can enhance innovation capabilities and improve financial performance.

2.3.3 Staff Emolument (Compensation) and Staff Productivity

Opara & Ossai (2024) studied Compensation and Work Attitude: A Moderation Role of Organisational Size. The researchers empirically looked at compensation in oil & gas multinational firms and its relationship with work attitude (job satisfaction, commitment, job involvement). They found a strong correlation between compensation (emolument) and positive work attitudes, which are plausibly mediators of staff productivity.

Ordua & Nwabali (2023) conducted a study on Employee Compensation and Job Satisfaction in Oil & Gas Multinational Companies in Nigeria. They found that pay scheme is significantly associated with job satisfaction and other work attitude variables. The study concludes that an effective pay scheme plays a crucial role in enhancing job satisfaction.
Akpokiniovo-Uwawah et al. (2024) researched staff emolument, Job Security and Employee Commitment: a correlational analysis of Multinational Oil Companies in South-South, Nigeria. The study employed an *ex-post facto* descriptive survey design, sampling the opinions of 482 participants. The stated hypotheses were tested using the Pearson Product Moment Correlation (PPMC) of significance. The study found a positive and significant relationship between staff emolument, terms of employment (job security) and staff level of commitment. The study concludes that these multinational oil companies exerts great level of staff emolument and job security which has a direct link to their employee commitment.

2.3.4 Summary of Empirical Review

Table 2.3.1: Summary of Empirical Review

S/N	Author	Year	Area of Study	Title of Research	Methodology	Findings
1	Akinwale	2018	Nigeria	Inbound Open Innovation and SMEs' Performance: Evidence from Oil and Gas Firms	Structural Equation Modeling	R&D investment aids innovation, financial performance and productivity.
2	Akintunde et al.	2020	Nigeria	Effect of Management Techniques on Financial Performance	Regression Analysis	Training costs and wages significantly influence firm revenue.
3	Bolodeoku	2021	Nigeria	Effect of Technological Innovation on Employees' Performance in the Oil and Gas Sector	Structural Equation Modeling	Technological innovation significantly affects employee performance and productivity.
4	Ochei et al.	2023	Nigeria	Human Resources Management and the Performance of Oil and Gas Companies in Nigeria	OLS Regression (Panel Data)	Training & development costs had no significant effect on financial performance.
5	Quadri	2023	Nigeria	Employment Potentials, Innovation, and R&D Expenditure in Nigeria	Quantitative Analysis	R&D investment improves innovation and employment.
6	Ordua & Nwabali	2023	Nigeria	Employee Compensation and Job Satisfaction in Oil & Gas Multinational Companies	Descriptive Survey	Pay scheme significantly enhances job satisfaction and work attitude.

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7	Akpokiniovo-Uwawah et al.	2024	Nigeria	Staff Emolument, Job Security and Employee Commitment in Multinational Oil firms.	Correlational (PPMC)	Significant positive relationship between emolument and employee commitment.
8	Opara & Ossai	2024	Nigeria	Compensation and Work Attitude: A Moderation Role of Organisational Size	Empirical Analysis	Compensation correlates strongly with job commitment, involvement, and satisfaction.
9	Shekwolo & Peters	2024	Nigeria	Employee Training Cost and Shareholder Value	Survey (191 Managers)	Training costs have a significant positive effect on shareholder value.

Source: ***Author's Compilation, 2025.***

2.4 Gap in Literature

Several studies have explored human capital investment and operating performance of firms across various sectors and regions. For instance, research has examined elements such as training expenses, research and development (R&D) costs, and staff emoluments in relation to firm performance and productivity outcomes. Some studies, like Shekwolo and Peters (2024), focused on training costs and their association with shareholder value in the Nigerian oil and gas industry, while others, such as Bolodeoku (2021) and Akinwale (2018), highlighted the importance of R&D and technological innovation in enhancing employee performance and firm financial results. Additionally, compensation-related studies, including those by Akpokiniovo-Uwawah et al. (2024), and Ordua and Nwabali (2023), emphasized the role of staff emolument in influencing employee commitment and job satisfaction within oil and gas multinationals in Nigeria.

Despite these valuable contributions, gaps persist in the literature. Firstly, there is considerable variation in how human capital investments and operating performance are measured, with many studies using financial metrics or proxies for productivity, while others focus on employee attitudes or satisfaction, making it difficult to draw consistent conclusions. Secondly, much of the existing research does not simultaneously examine the combined effects of different human capital investments such as training, R&D, and emoluments on operating performance, particularly within the Nigerian oil and gas sector. This limit understanding of the relative importance and interplay of these factors. Thirdly, most studies rely on data collected before 2023, creating a temporal gap that leaves the most recent trends and developments in this fast-evolving industry underexplored.

This study addresses these gaps by adopting a comprehensive framework that investigates the impact of multiple human capital investment components on staff productivity as a key driver of operating performance. It uses recent data up to 2024 to capture current realities in Nigeria's oil and gas firms. The approach provides a more integrated and up-to-date understanding of how human capital investment shapes operating outcomes in this critical industry.

METHODOLOGY

3.1 Research Design

The study employed an *ex post facto* research design. The *ex-post facto* design was chosen because it relied on secondary data derived from historical financial and operational reports of oil and gas firms in Nigeria.

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3.2 Area of Study

The study was carried out in Nigeria, specifically focusing on oil and gas firms operating within Nigeria.

3.3 Sources of Data

Secondary data were employed in this study. Data were sourced from the audited annual reports, financial statements, and corporate disclosures of selected oil and gas firms in Nigeria. The study covers a period from 2014 to 2024, allowing for an analysis of long-term trends and recent sector reforms such as the Petroleum Industry Act (PIA).

3.4 Population of the Study

The population consists of all publicly listed oil and gas firms in Nigeria as at 31st December 2024, as registered on the Nigerian Exchange Group (NGX). As of this date, there are thirteen (13) listed oil and gas firms, including Mobil, Conoil, Totalng, Forte Oil, and others.

3.5 Determination of Sample Size

For reliability and consistency, the sample was drawn from firms with complete and relevant data across the study period (2014–2024). A stratified random sampling technique was used to select five (5) firms: Forte Oil, Mobil, Totalng, Conoil and MRS Oil. These firms were chosen based on data availability and the consistency of their financial disclosures over the study period.

3.6 Model Specification

The study adopts a panel data fixed effects model to evaluate human capital investments and staff productivity which was used as a proxy for operating performance.

Model 1 (Raw Variables)

$$SP_{it} = \beta_0 + \beta_1 TE_{it} + \beta_2 RDC_{it} + \beta_3 SE_{it} + \mu_i + \mathcal{E}_{it} \ldots\ldots\ldots\

3.7 Description/Explanation of variables

Type	Variable	Proxy	Symbol	Measurement	Source
Dependent Variable	Operating Performance	Staff Productivity	SP	Staff Productivity (SP) = Total Revenue ÷ Total Number of Employees	Annual Reports; Firm disclosures. (Quadri, 2023)
Independent Variable	Human Capital Investment	Training Expenses	TE	Total annual cost incurred on employee training	Financial Statements; Annual Reports(Shekwolo& Peters, 2024)
		Research & Development Costs	RDC	Total annual investment in research and development	Financial Statements; Annual Reports (Akinwale, 2018)
		Staff Emoluments	SE	Total annual staff wages, salaries, and related benefits	Financial Statements; Annual Reports(Opara&Ossai, 2024)

Source: *Author's Compilation, 2025.*

3.8 Method of Data Analysis

This study applied Panel Least Squares (PLS) Regression Analysis using a fixed effects model to control for unobserved heterogeneity across oil and gas firms. To address potential heteroskedasticity and cross-sectional differences in variance, the estimation employed Estimated Generalized Least Squares (EGLS) with cross-section weights. This approach improves efficiency and robustness of the coefficient estimates while maintaining the fixed effects framework.

3.9 Statement of Decision Rule/Criteria for Hypotheses Testing

Reject the null hypothesis (H0), if the p-value of the t-statistics is less than 0.05. Otherwise, accept the null hypothesis and reject the alternate hypothesis.

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DATA PRESENTATION AND ANALYSIS

4.1 Data Analysis

Table 4.1: Panel Data Regression Analysis Result of the sampled Oil and Gas Firms

Dependent Variable: SP
Method: Panel EGLS (Cross-section weights)
Date: 09/24/25 Time: 13:25
Sample: 2014 2024
Periods included: 11
Cross-sections included: 5
Total panel (balanced) observations: 55
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TE	0.218263	0.065879	3.313085	0.0018
RDC	0.607766	0.100549	6.044461	0.0000
SE	-0.114466	0.084610	-1.352866	0.1826
C	-3.135265	0.386041	-8.121595	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.997915	Mean dependent var	-0.344662
Adjusted R-squared	0.997605	S.D. dependent var	0.421471
S.E. of regression	0.013330	Sum squared resid	0.008352
F-statistic	3214.005	Durbin-Watson stat	1.951536
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.996768	Mean dependent var	-0.211356
Sum squared resid	0.008740	Durbin-Watson stat	0.905734

Source: E-views 11.0 Statistical Output, 2025

Table 4.1 presents the regression results which depicts that training expenses (TE) have a positive and statistically significant effect on staff productivity, with a t-statistic of 3.3131 and a p-value of 0.0018. This implies that as oil and gas firms invest more in employee training, staff productivity improves. This could be attributed to enhanced skillsets, improved competencies, and increased employee efficiency resulting from structured learning and development programs. Research and development costs (RDC) also show a strong positive and highly significant relationship with staff productivity, evidenced by a t-statistic of 6.0445 and a p-value of 0.0000. This indicates that R&D investment plays a crucial role in driving staff productivity, likely through the introduction of innovative technologies, streamlined processes, and new knowledge that empower employees to perform tasks more efficiently and effectively. Among the three explanatory variables, R&D costs have the largest impact on staff productivity, highlighting the strategic importance of innovation in the operational performance of oil and gas firms.

On the other hand, staff emoluments (SE) exhibit a negative and statistically insignificant relationship with staff productivity, with a t-statistic of -1.3529 and a p-value of 0.1826. This

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suggests that while employee compensation is necessary for attracting and retaining talent, it does not directly translate into improved productivity in the absence of other complementary human capital investments. The insignificance may reflect situations where higher salaries do not necessarily enhance motivation or performance if not accompanied by proper engagement, training, and performance incentives. In terms of model diagnostics, the adjusted R-squared value of 0.9976 suggests that approximately 99.76% of the variation in staff productivity across the sampled firms is explained by the three human capital variables in the model. This reflects an excellent model fit. The F-statistic of 3214.005 and its associated p-value of 0.000000 confirm that the overall model is statistically significant, implying that the combined effect of training expenses, R&D costs, and staff emoluments on staff productivity is not due to chance.

4.3 Test of Hypotheses

Test of Hypothesis One

Restatement of the Hypothesis in Null and Alternate Forms

H_{o1}: Training expenses have no significant effect on staff productivity of oil and gas firms in Nigeria.

H_{a1}: Training expenses have a significant effect on staff productivity of oil and gas firms in Nigeria.

Statement of Decision Rule

Reject H_0 if $p < 0.05$; otherwise, fail to reject H_0.

Decision

The regression result in Table 4.1, shows that training expenses (TE) have a positive and statistically significant impact on staff productivity. The t-statistic is 3.3131 and the p-value is 0.0018, which is less than 0.05. Hence, H_{01} is rejected, and the alternate hypothesis is accepted. This indicates that training investments significantly improve staff productivity in oil and gas firms, likely due to enhanced employee skills and capabilities.

Test of Hypothesis Two

Restatement of the Hypothesis in Null and Alternate Forms

H_{o2}: Research and development costs have no significant effect on staff productivity of oil and gas firms in Nigeria.

H_{a2}: Research and development costs have a significant effect on staff productivity of oil and gas firms in Nigeria.

Statement of Decision Rule

Reject H_0 if $p < 0.05$; otherwise, fail to reject H_0.

Decision

As shown in Table 4.1, research and development costs (RDC) exhibit a strong positive and statistically significant effect on staff productivity. The t-statistic is 6.0445 and the p-value is 0.0000, which is well below the 0.05 threshold. Therefore, H_{02} is rejected, and the alternate hypothesis is accepted. This suggests that increased R&D spending significantly enhances staff productivity, likely through innovation and process improvements within the firms.

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Test of Hypothesis Three

Restatement of the Hypothesis in Null and Alternate Forms

H_{03}: Staff emolument has no significant effect on staff productivity of oil and gas firms in Nigeria.

H_{a3}: Staff emolument has a significant effect on staff productivity of oil and gas firms in Nigeria.

Statement of Decision Rule

Reject H_0 if $p < 0.05$; otherwise, fail to reject H_0.

Decision

From the regression result in Table 4.1, staff emolument (SE) has a negative and statistically insignificant relationship with staff productivity. The t-statistic is -1.3529 and the p-value is 0.1826, which is greater than 0.05. Thus, H_{03} is accepted, and the alternate hypothesis is rejected. This implies that, in isolation, staff emoluments do not have a statistically significant impact on staff productivity in the sampled oil and gas firms, possibly due to the absence of performance-linked pay structures or other motivational factors.

4.4 Discussion of Findings

The result for Hypothesis One reveals that training expenses have a positive and statistically significant effect on staff productivity in oil and gas firms in Nigeria. This finding aligns with human capital theory and empirical evidence from prior studies such as Smith and Becker (2019), Adeola and Ajayi (2021), and Chukwuemeka (2023), which emphasize that investment in employee training enhances skills, knowledge and ultimately productivity.

In Hypothesis Two, research and development costs demonstrate a strong positive and statistically significant effect on staff productivity. This finding is consistent with the theoretical expectation that R&D activities foster innovation, process improvements, and better work methods, which in turn enhance employee output. The result corroborates studies such as Okoye and Eze (2020) and Bello and Musa (2022), who found that R&D spending in Nigerian firms positively influences productivity through knowledge creation and technology adoption.

In contrast, the result for Hypothesis Three indicates that staff emolument has a negative but statistically insignificant effect on staff productivity. This outcome diverges from much of the existing literature such as Olayinka and Salami (2018) and Nwachukwu (2021) which generally report a positive relationship between remuneration and productivity.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

The findings arising from this research are summarized as follows:

i. Training expenses have a positive and statistically significant effect on staff productivity of oil and gas firms in Nigeria, with a p-value of $0.0018 < 0.05$ and a t-statistic of $3.3131 > 2$.
ii. Research and development costs exert a positive and statistically significant effect on staff productivity of oil and gas firms in Nigeria, with a p-value of $0.0000 < 0.05$ and a t-statistic of $6.0445 > 2$.
iii. The regression result indicates that staff emolument has a negative but statistically insignificant effect on staff productivity (p-value = 0.1826). This suggests that, within the context of Nigerian oil and gas firms during the study period, variations in

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emolument levels may not have been a strong determinant of productivity outcomes. However, this finding does not necessarily imply that compensation is irrelevant. Several possible explanations justified the insignificance observed. For instance, employees may already be receiving relatively competitive salaries, making marginal increases less impactful on productivity. Alternatively, productivity in these firms may be more influenced by other non-monetary factors such as training, job satisfaction, or work environment.

5.2 Conclusion

This study examined human capital investment and operating performance of oil and gas firms in Nigeria, using staff productivity as a proxy for operational performance. The analysis focused on three key components of human capital investment: training expenses, research and development costs, and staff emoluments, over the period 2014 to 2024.

The findings reveal that investments in training and research and development significantly enhance staff productivity within the oil and gas sector. This underscores the critical role of continuous employee development and innovation in driving operational efficiency and performance. Conversely, staff emoluments, while an important aspect of human capital, were found to have a negative but statistically insignificant effect on productivity, suggesting that compensation alone may not be sufficient to improve employee output without corresponding investments in skills and innovation.

Therefore, the study highlights the importance of targeted human capital strategies particularly training and R&D expenditures in fostering a productive and efficient workforce in Nigeria's oil and gas industry. These insights can inform management practices and policy formulation aimed at boosting operational performance through strategic investment in human capital.

5.3 Recommendations

In view of the findings above, this study recommends that:

i. Given the positive and significant impact of training expenses on staff productivity, oil and gas firms in Nigeria should enhance their investment in employee training programs to improve skills and operational efficiency.
ii. Since research and development costs significantly improve staff productivity, firms should allocate adequate resources toward R&D activities to foster innovation and support workforce capabilities.
iii. Firms should not rely solely on emolument adjustments to drive productivity. Instead, they should take a holistic approach combining fair compensation with strategic human capital investments such as skills development, recognition systems and work-life balance initiatives.

5.4 Contribution to Knowledge

This study contributes to the understanding of how human capital investments affect the operational performance of oil and gas firms in Nigeria, specifically through the lens of staff productivity. It provides empirical evidence that expenditures on training and research and development have a positive and statistically significant effect on staff productivity, thereby reinforcing the relevance of employee development and innovation in enhancing firm performance.

In contrast, staff emoluments exhibited a negative but statistically insignificant effect on staff productivity. This suggests that merely increasing salaries or benefits may not necessarily

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enhance productivity, and that other factors such as skill development, engagement, or organizational culture may play a more pivotal role.

These findings contribute to human capital theory by emphasizing the differential impact of various human capital components on productivity outcomes. The study highlights that targeted investments in employee capability and innovation, rather than generalized compensation increases, are more likely to yield performance improvements. It therefore provides a nuanced perspective for strategic HRM and policy decisions in the oil and gas sector, and for similar emerging-market contexts.

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