

## Effect of Intellectual Capital on Sustainability Disclosure: Evidence from Listed Oil and Gas Firms in Nigeria

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### Abstract

*The aim of this study was to investigate the impact of intellectual capital on the sustainability disclosure of oil and gas firms listed in Nigeria. Specifically, the study aimed to determine the effect of Human Capital Efficiency, Structural Capital Efficiency, and Capital Employed Efficiency on Environmental Sustainability Disclosure, Economic Sustainability Disclosure, and Social Sustainability Disclosure. The study utilized an ex-post facto research design and the population of interest consisted of the 11 Oil and Gas firms listed on the Nigerian Exchange (NGX) Group. The sample size for the study was determined using complete enumeration technique, and it comprised of the 11 listed oil and gas firms in Nigeria. Secondary data was sourced from the annual reports of the selected firms covering a period of 14 years from 2008 to 2021. The Pooled Ordinary Least Square (POLS) regression analysis conducted revealed that Human Capital Efficiency, Structural Capital Efficiency, and Capital Employed Efficiency do not have a significant impact on the sustainability disclosure of oil and gas firms listed in Nigeria. The study recommends that companies should prioritize developing and implementing comprehensive sustainability strategies that take into account environmental concerns and ensure adequate disclosure of their impact on the environment. This can involve setting specific targets and goals related to environmental performance, investing in renewable energy and cleaner technologies, and regularly monitoring and reporting on progress.*

*Key words: Capital Employed Efficiency, Economic Sustainability Disclosure, Environmental Sustainability Disclosure, Human Capital Efficiency, Intellectual Capital, Social Sustainability Disclosure, Structural Capital Efficiency, Sustainability Disclosure,*

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## INTRODUCTION

In the current knowledge-driven era, the importance of material and financial assets has decreased in determining the long-term success of businesses. Instead, knowledge has become a crucial and valuable asset for organizations. As a result, organizations are encouraged to focus on non-material assets based on knowledge rather than physical assets. The resource-based perspective emphasizes strategies for leveraging existing firm-specific assets, some of which are intellectual. Consequently, issues such as skills acquisition, knowledge and know-how management, and learning become critical strategic concerns for firms (Si, Xu & Chen, 2020). The most significant challenge for most businesses is achieving and sustaining a competitive advantage. Intangible resources in the form of knowledge possessed by organizations have become essential for their survival and growth over the years.

As per the resource and capabilities theory of the firm, resources and capabilities that possess qualities such as uniqueness, rarity, difficult imitation, and non-substitutability, can create competitive advantages leading to above-average performance. In this regard, intellectual capital has become a crucial weapon that smart managers deploy to enhance the performance of their organizations. Retaining and attracting employees with the right skills is now seen as the foundation for business survival in the modern era. It is increasingly recognized that deep intellectual capital can explain innovative and creative practices within organizations. As a result, most businesses are now adopting a dual approach, which involves acquiring requisite knowledge and transforming it to meet the compelling needs of the organization. The complex nature of the twenty-first century business environment, characterized by technological advancements, increased business connections, and shorter product life cycles, has created a challenging environment for organizations to thrive or fail.

In contemporary business, it is widely acknowledged that evaluating corporate performance solely based on financial outcomes is inadequate, and impacts on the social, economic, and environmental context must also be taken into account (Nworie, Obi, Anaike & Uchechukwu-Obi, 2022). However, sustainability reporting poses significant challenges in terms of managing and conveying non-financial information. One of the major obstacles with sustainability reports is the lack of alignment with company priorities. Achieving success in the triple bottom line (TBL) demands a well-balanced approach towards social, environmental, and economic performance, with each measure and their weighting differing across organizations. Additionally, there are various issues with implementing different measurement methods, such as the absence of essential data, accounting standards for intellectual capital, and detailed method descriptions. The problem lies in the fact that the value of intangible assets is typically hard to confirm due to their illiquid nature. Unlike physical commodities like gold or stock that can be priced and traded immediately, intangible assets are usually highly illiquid.

Despite firms declaring tremendous financial assets, there is still evidence of poor performance that has led to the closure of some businesses both locally and globally. This highlights the fact that possessing substantial capital and physical assets alone is not enough to sustain an organization's competitive advantage and keep it competitive in its industry and beyond, even in the face of threats. Sustainability involves meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. This means advocating for intergenerational equity. Sustainability reporting entails the disclosure and communication of environmental, social, and governance (ESG) goals, as well as a company's progress towards achieving them. The benefits of sustainability reporting include improved corporate reputation, building consumer confidence, increased innovation, and even

*Received:* 2 March 2023

*Revised:* 24 March 2023

*Final Accepted for publication:* 6 April 2023

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improvement of risk management. The emergence of sustainability reporting was a direct response to a firm's negative activities on the environment. According to GRI (2016), sustainability reporting should provide a balance and a reasonable representation to a firm's negative and positive contributions to the objectives of sustainable development. Presently, through pressure from global sustainable movement and legislators, firms are now beginning to respond to sustainable practices especially with the global adoption of International Financial Reporting Standard (IFRS). Hence, the increased attention towards a deliberate approach to acquire, develop and maintain a high degree of following scarce and organised resources by firms in order to remain competitive in the business world, thus the need to determine the effect of intellectual capital on sustainability reporting of quoted oil and gas firms in Nigeria.

In the current business landscape, knowledge has become the key competitive factor, and it is considered as a non-traditional intangible resource. The accumulation, transformation, creation, and valuation of this resource are critical aspects of intellectual capital management. However, traditional managerial paradigms, which focus on tangible sources of value such as land, labour, and financial capital, are inadequate to address the complexities associated with creating and leveraging this resource. Additionally, there is limited understanding of how these intellectual resources, structures, institutions, processes, or dynamics evolve and how they should be managed, utilized, valued, or accounted for.

Corporate sustainability reporting faces several challenges due to the proliferation of disclosure frameworks and surveys. One of the most significant challenges is the manual collection of sustainability data, which requires individuals to manage and keep track of hundreds of data points in excel files or Google docs. In addition to the hard data, companies must track explanations, back-up files, who provided the data, and who provided sign off. This process leads to inefficiencies felt across the organization. There is also overlap between frameworks, which can lead to confusion and fatigue. Furthermore, data validation and auditing pose a challenge for sustainability reporting. This study aims to bridge the variable gap by focusing on sustainability reporting instead of financial performance. Additionally, this study addresses the sectorial gap by focusing on the oil and gas industry.

### 1.1 Objectives of the Study

The main objective of this study is to examine the effect of intellectual capital on sustainability disclosure of listed Oil and Gas firms in Nigeria. The specific objectives are:

- i. To determine the extent to which intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) affects environmental sustainability disclosure of listed oil and gas firms in Nigeria.
- ii. To determine the extent to which intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) affects economic sustainability disclosure of listed oil and gas firms in Nigeria.
- iii. To determine the extent to which intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) affects social sustainability disclosure of listed oil and gas firms in Nigeria.

## 2.0 LITERATURE REVIEW

### 2.1 Conceptual Review

#### 2.1.1 Intellectual Capital

Intellectual capital is the technical expertise and process knowledge contained within an organization. If intellectual capital gives an organization a significant competitive advantage, it is entirely possible that a large portion of the firm's valuation is derived from this expertise and knowledge. If a firm does not recognize the value of its intellectual capital, it may engage in adverse personnel management practices, triggering an outflow of valuable employees. Conversely, a management team that is determined to maximize its use of intellectual capital will follow a detailed plan for focused knowledge acquisition and employee training, while also converting it into specific competitive advantages (Gómez Valenzuela, 2022). The intellectual capital assists in creating wealth and in the production of other high valued assets. Intellectual capital in a business includes the wealth of the ideas and the ability for innovation which highly determines the future of the firm (Tanaka, 2021).

Intellectual capital is considered as a business asset as any organization contributes for employee training, enhancing customers relationship, product development, goodwill building, and so on. Intellectual capital can be described as intellectual material that has been formalized, captured and leveraged to produce a higher-valued asset (Gupta, Rathore & Kashiramka, 2022). Zhang and Wang (2022) defined Intellectual capital is knowledge-based equity of a company. Intellectual capital is sum of all knowledge-based factors that is, resources, capabilities, and competences that are critical to the creation of organizational value and a long-term, sustained, competitive advantage. It includes human capital, relational capital, structural capital, intellectual property, know-how, copyrights, patents or any other information or resources that give a competitive advantage (Xu, Li, Wu & Zhang, 2021).

The value added intellectual coefficient (VAIC) is a measure of intellectual capital efficiency proposed by Pulic (2004) that is entirely consistent with the knowledge-based economy and a more objective alternative to traditional measures, such as earnings before interests, taxes, depreciation and amortization (EBITDA). The VAIC concerns the efficiency of three types of capital: human capital (HC), measured by the cost of employees; structural capital (SC), equal to the difference between the value added generated by the firm and human capital; and physical and financial capital employed (CE), that is., the amount of financial capital available to the firm.

The VAIC is the result of the sum of three efficiency ratios, all obtained through the combination of the value added (VA) with the three types of capital:

- Human capital efficiency ( $HCE=VA/HC$ );
- Structural capital efficiency ( $SCE=SC/VA=(VA-HC)/VA$ ), and
- Capital employed efficiency ( $CEE=VA/CE$ ).

#### 2.1.2 Sustainability Reporting

Sustainability disclosure is the reporting and communication of environmental, social, and governance (ESG) goals as well as a company's progress towards them (GRI, 2015). A sustainability report is a report published by a company or organization about the economic,

environmental and social impacts caused by its everyday activities. Sustainability disclosure also presents the organization's values and governance model, and demonstrates the link between its strategy and its commitment to a sustainable global economy (Tavares & Dias, 2018). Sustainability disclosure can help organizations to measure, understand and communicate their economic, environmental, social and governance performance, and then set goals, and manage change more effectively (Ekwueme, Egbunike & Onyali, 2013). Sustainability disclosure is the key platform for communicating sustainability performance and impacts whether positive or negative.

Sustainability disclosure can be considered as synonymous with other terms for non-financial reporting; triple bottom line reporting, corporate social responsibility (CSR) reporting, and more. It is also an intrinsic element of integrated reporting; a more recent development that combines the analysis of financial and non-financial performance (Sciulli, 2019). Environmental sustainability disclosure is the communication of environmental performance information by an organisation to its stakeholders (Nworie, Obi, Anaike & Uchechukwu-Obi, 2022). Economic sustainability disclosure is an integrated part of sustainability and means that we must use, safeguard and sustain resources (human and material) to create long-term sustainable values by optimal use, recovery and recycling (Buys, Oberholzer & Andrikopoulos, 2011). Social sustainability disclosure refers to a company's systematic disclosure of information on its social performance.

### **2.1.3 Human Capital Efficiency and Sustainability Reporting**

Human capital efficiency is the key component of the Value Added Intellectual Coefficients (VAIC) model, and it is defined as employees' skills, general knowledge, innovation, and ability (Sharma, 2018). Human Capital Efficiency (HCE) is one of the three components of Value Added Intellectual Coefficients (VAIC) as postulated by Pulic 1998 (Tom-West, Okoye & Amahalu, 2021). Human Capital Efficiency measures the value added by the Human Resources of an organization. Value Added Intellectual Coefficient (VAIC) is a method used to measure the value creation Efficiency of a company by using its accounting based figures (Pulic, 2000; Sonnenshein, 2022).

Human capital is the most important asset that exists within a firm. It represents the human factor in an organisation where by combination of intelligence, skills, knowledge, aptitudes and expertise that gives the organisation its distinctive character which those traits contributing to production and profitability, thus improve organizational performance (Okudo & Ndubuisi, 2021). Additionally, the ability of a corporate organization to successfully implement business strategies solely depends on efficient use of intangibles asset, particularly human capital. Previous studies have shown that there is a significant relationship between human capital efficiency and organizational performance (Amahalu, Abiahu, Obi & Okika, 2016). According to Parham and Heling (2015) human capital positively affects organizational performance because it can generate significant value for companies and provide them with sustainable competitive advantage.

Human capital remains a valuable asset to organizations for sustainable business practices (Arshad, Ab-Samad, Kamaluddin & Roslan, 2016). It is further disclosed that human capital has a positive and significant relationship with economic and environmental sustainability (Sunday, 2017). The higher the human capital, the higher the sustainable competitive advantage (Akhtar, Ismail, Ndaliman, Hussain & Haider, 2015; Hair, Risher, Sarstedt & Ringle, 2019; Saptia, Muafi & Setini, 2021). Meanwhile, other studies also confirm the link between green

human capital and business sustainability (Yusoff, Omar, Kamarul Zaman, and Samad, 2019). Other studies reveal that green human capital has no effect on business sustainability (Yusoff, Omar, Kamarul Zaman, and Samad, 2019).

#### 2.1.4 Structural Capital Efficiency and Sustainability Reporting

Structural capital is the supportive non-physical infrastructure that enables human capital to function (Vo & Tran, 2021). A firm's internal capital can be in the form of innovation capital and process capital. Innovation capital refers to new ideas created by employees of an organisation which enable them to translate the needs of customers into valuable products (Lu, Li, Luo, Anwar & Zhang, 2021). Internal capital, which is also known as organisational capital, refers to organisational capabilities of an entity. It includes organisational systems, policies, management philosophy, routines, culture, and networks designed to satisfy market requirements. From this perspective, internal capital could be said to be the internal dynamics that drive organizational progress. In this class are intellectual property such as patents, trademarks and copyrights, and other intangible assets (Barkat and Beh, 2018). On its part, process capital refers to the implementation of techniques, procedures, and programs that enhance the provision of goods and services, (Hasan, Mohammad, & Alam, 2017). Process capital is that element of structural capital that upholds corporate culture, process management, information systems, networking, standards and systems (Iqbal, Xu, Fareed, Wan & Ma, 2022).

Yusliza, Yong, Tanveer, Ramayah, Faezah and Muhammad, (2020) examined the relationship between green intellectual capital and sustainability, concluding that it, through its three components (in this case green human capital, green structural capital and green relational capital) positively impacted economic, environmental, and social performance, as long as companies adopt cleaner production capabilities. In a somewhat similar study, Sudibyo and Sutanto (2020) discovered that corporate social responsibility has a positive effect on green human capital, green structural capital, and green relationship capital, whereas environmental consciousness has a positive effect on green human capital and green structural capital, but not on the dimension of green relationship capital.

Maharani and Fuad (2020) also found out that structural capital efficiency and sustainability influence each other in answering a plurality of demands and logics. Similarly, in a study in Pakistan's listed textile firms, Ahmad, Mohammad and Nordin (2019) concluded that structural capital had a positive significant effect on sustainability and its dimensions can be considered as significant predictors of business performance. A high level of structural capital in a service company indicates a proper organizational culture and a willingness of employees to share knowledge and integrate it in formal structures and systems (Arshad, Ab Samad, Kamaluddin & Roslan, 2016; Upadhaya, Munir, Blount & Su, 2018; Luo, Wang, Zhang, Niu, & Tu, 2020). Other studies reveal that structural capital is important to achieve sustainability (Akhtar, Ismail, Ndaliman, Hussain and Haider, 2015; Wilson, Keni & Tan, 2019). Likewise, the results of other studies show that green structural capital has a positive and significant effect on business sustainability (Yusoff, Omar, Kamarul Zaman, and Samad, 2019; Andayani & Yanti, 2021).

#### 2.1.5 Capital Employed Efficiency and Sustainability Reporting

Capital employed refers to the capital that a business uses in order to generate profits or to the combined value of the assets that a business makes use of in order to generate income. Any business that is serious about enjoying a successful long-term future will need to invest capital in that future (Nguyen, Dang, Phan & Nguyen, 2020). Capital efficiency is the ratio of how

much a company is spending on growing revenue and how much they are getting in return. Capital efficiency is the ratio between spend and growth. For example, a 1:1 capital efficiency ratio means that one dollar is earned for every dollar invested into company growth (Guo, Legesse, Tang & Wu, 2021). Capital employed efficiency is one of the intellectual capital components based on value added intellectual capital model. It is calculated by dividing value added on capital employed (Pulic, 2000; Duan, Wang & Zhou, 2019).

The importance of providing sustainability reporting by companies to promote accountability and transparency has been widely acknowledged by scholars in both developed and developing economy. The available evidence indicates that companies that provide sustainability reporting enjoy a long-term competitive advantage, improve employee motivation and increase profitability, legitimacy and cost reduction (Nnamani, Onyekwelu & Ugwu, 2017; Sady, Zak, & Rzepka, 2019; Parker, 2021). While Relational Capital Efficiency (RCE) exhibits a significant positive association with corporate sustainable growth, it implies that an efficient management of marketing and selling expenditures makes a firm more competent to attain sustainable growth (Barbier & Burgess, 2017). This result is consistent with the findings of Xu and Wang (2018). Likewise, Innovation Capital Efficiency (InCE) as well demonstrates a significant positive influence on corporate sustainable growth. It implies that a continuous and well-planned allocation of funds in research and development activities is a pre-requisite for the firms to attain corporate sustainable growth (Kinderman, 2020). This result is consistent with the findings of Cardoni, Kiseleva and Lombardi (2020), yet contradicts the research by Xu and Wang (2018) that fails to explore any significant linkage between Capital Employed Efficiency and corporate sustainable growth.

## 2.2 Theoretical Framework

### 2.2.1 Knowledge-Based View (KBV) Theory

The fundamental assumptions of the knowledge-based theory of the firm are particularly believed to have stemmed from the resource-based view of the firm. However, the resource-based view of the firm does not give knowledge adequate recognition and, in fact, categorizes knowledge among the simple generic resources of the firm. Knowledge-based theory of the firm makes amends of these shortfalls by expounding on the strategic significance and distinctive characteristics of the different types of knowledge-based resources that portend competitive advantage for the firm, as demonstrated by the following assumptions: (Tom-West, Okoye & Amahalu, 2021).

Knowledge is a strategic management resource that initiates competitive advantage in the firm through value addition to business data, information processes, and system operations. Knowledge is an important tool for change management that managers can use to respond to issues of staff retention. Explicit knowledge and tacit knowledge are the two major types of knowledge that firms can observe when seeking to achieve competitive advantage. Explicit knowledge is the generalized knowledge that can easily be expressed and identified within the organization's routines, records, and information systems. Explicit knowledge defines industry trends that are generally practiced by competing firms rather as response to market demands and requirements than specific strategies for achieving competitive advantage. As such, the market value of explicit knowledge within a firm is more or less equivalent to its market value (Kengatharan, 2019). Firms utilize tacit knowledge to draw competitive advantage from the individual or firm-specific capabilities that are difficult to transmit or encapsulate. Firms apply

tacit knowledge whenever responding to changes in market structures (such as the launch of new products by a competitor) or changes in market regulations that open up the market to competitors. Acquisition of tacit knowledge by individuals within the firm heavily depends on the ability of employees to share skills as well as the resolve to conduct education and research beyond the firm's boundaries. Firms formulate knowledge management (KM) strategies so as to create and employ appropriate individual and collective knowledge resources in the pursuit of competitive advantage. Identifying, creating, storing, sharing, and applying knowledge are the main activities that define knowledge management.

### 2.3 Empirical Review

Ahamad, Al-Jaifi and Ehigiamusoe (2022) examined the impact of intellectual capital (IC) and its components (human capital, structural capital, and capital employed) on microfinance institutions' (MFIs) financial and social efficiency. It also determined the moderating impact of external governance on the relationship between IC and MFIs' financial and social efficiency. It employed the Truncated regression model and Data Envelopment Analysis (DEA), while the Tobit model and Generalized Method of Moments (GMM) were utilized to check the robustness of the estimations. The study used panel data of 661 MFIs from 86 countries covering 2010–2018 period. The study showed that MFIs are financially efficient rather than socially efficient, albeit MFIs that have high IC can be more financially efficient. Besides, good external governance positively moderated the impact of IC on financial efficiency. The three components of IC have significant effect on MFIs' financial efficiency, albeit external governance has a significant moderating role on the relationship between value of capital employed and financial efficiency only. As for the social outreach efficiency, this study indicated that IC has a significant positive impact on social outreach efficiency, while external governance has no significant moderating effect on the nexus between IC and MFIs' social outreach efficiency.

Asiaei, Jusoh, Barani and Asiaei (2022) examined the extent companies place emphasis on the use of environmental performance measurement to translate green intellectual capital into enhanced organizational performance in terms of both economic and environmental performance. Based on a survey of 105 Iranian public listed companies, the results showed that two elements of green intellectual capital, namely, green human capital and green structural capital are positively associated with both environmental performance measurement use and environmental performance. In contrast, green relational capital affects environmental performance only in the presence of environmental performance measurement as a mediating variable.

Buallay (2022) investigated the relationship between the level of sustainability reporting and retail sectors' performance (operational, financial and market). Using data culled from 4065 observations from 38 different countries for ten years (2008–2017), an independent variable derived from environmental, social and governance (ESG) score are regressed against dependent manufacture performance indicator variables [Return on Assets (ROA), Return on Equity (ROE) and Tobin's Q (TQ)]. Two types of control variables completed the regression analysis in this study: firm-specific and macroeconomic. The findings elicited from the empirical results demonstrated that there is a significant relationship between ESG and operational performance (ROA), financial performance (ROE) and market performance (TQ).

Bansal, Samad and Bashir (2021) investigated the relationship between firm performance and sustainability reporting using a sample of 210 Bombay Stock Exchange-listed firms spanning over 10 years from March 2010 to March 2019. The regression results illustrated that sustainability reporting positively impacts firms' market performance only up to a cut-off point.

Chukwuebuka, Obiora and Ikechukwu (2021) examined the effect of corporate social responsibility on financial sustainability of quoted oil and gas firms in Nigeria. The research work adopted for the study *ex-post facto* research design. Secondary data spanning 2009 to 2020 was sourced and collated from financial statement of oil and gas firms' annual report in Nigeria and Nigeria Stock Exchange factbook. The data were analyzed employing the Pearson coefficient correlation and least square regression technique. The study revealed that corporate social responsibility has a significant positive effect on net profit margin and return on asset of quoted oil and gas firms in Nigeria at 5% level of significance.

Duc, Thi, Thanh, Nguyen and Pham (2021) empirically explored the influence of sustainability practices on the financial performance of 116 listed Swedish companies in the year 2019. Descriptive statistics, correlation analysis, hypothesis testing and multiple regression analysis and multiple regression models were applied. The research findings indicated a positive relationship between corporate sustainability and financial performance that is measured by earnings yield, return on asset, return on equity and return on capital employed. However, when it comes to a market-based financial measure, Tobin's Q, the result is negative.

Ibrahim, Mohammed, Agbi, Nasiru and Umar (2021) examined the effect of sustainability reporting on financial performance of quoted Nigerian oil and gas firms. The population of the study comprised 12 listed oil and gas firms in Nigeria. Census sampling technique was adopted and filter was used. For firm to be selected it must be listed on or before 1st January 2009 and remain listed up to 31st December 2019. Data for this study were analysed using linear regression model. The regression result revealed that economic sustainability has a positive non-significant effect on ROA; environmental sustainability has a positive significant effect on ROA while social sustainability has a positive non-significant effect on ROA. Based on the findings, the study therefore, concluded that sustainability reporting has a significant effect on the financial performance of listed oil and gas firms in Nigeria.

Mahdi and Grzegorz (2021) evaluated the relationship between intellectual capital and corporate board characteristics on value creation and growth in Iran. The study's statistical population included companies listed on the Tehran Stock Exchange during 2012–2018. Panel data regression models were employed to elucidate the relationship between research variables. The obtained results indicated that the intellectual capital of the board members of companies listed on the Tehran Stock Exchange does not affect companies' value and growth. According to the results, appointing female managers should not be dependent on firm growth because gender diversity does not affect the value creation and growth of companies listed on the Tehran Stock Exchange.

Najib and Nawangsari (2021) examined the effect of intellectual capital on organizational sustainability with innovative employee behavior as an intervening variable at the PT. Jaya Maritime Services in Indonesia. The research method used was explanatory quantitative with SEM-PLS. 50 employees of PT. Jaya Maritime Services 2019 were the sample in the study. The results showed that human capital and structural capital have a positive and significant effect on innovative behavior, while relational capital has a positive and insignificant effect on

innovative behavior, innovative behavior has a positive and significant effect on organizational sustainability.

Naning and Erna (2021) analyzed the effect of intellectual capital elements as a proxy by VACA, VAHU, STVA, RCE and the effect of environmental disclosure on firm value in manufacturing companies listed on the Indonesia Stock Exchange. Firm value is measured using Tobins'Q. The sample in this study was 54 companies for the period 2017-2019; multiple linear regression analysis method was applied. The results of the study indicated that the elements of intellectual capital VACA, VAHU and STVA have no effect on firm value, while RCE and environmental disclosure have a significant effect on firm value.

Okoye and Izedonmi (2021) examined the relationship between Value-Added Intellectual Coefficients and Economic Value Added of quoted service firms in Nigeria. Ex Post Facto research design was adopted by the study. The sample comprised firms that met the following conditions: firms that have been listed on the Nigerian Stock Exchange (NSE) as at 2009; firms whose stocks have been trading actively on the floor of NSE during the period of interest (2010-2019); firms that have data available for the period of interest; firms that consistently filed their annual reports and accounts with the Nigeria Stock Exchange without missing any year during the study period. Given these conditions, fifty-one (51) firms were selected as the sample size. Descriptive statistics and regression analysis was employed to test the hypotheses with the aid of E-view 10.0 statistical software. This study revealed that human capital efficiency, structural capital efficiency, capital employed efficiency and value-added intellectual coefficients have a significant positive relationship with economic value added of quoted service firms in Nigeria at 5% level of significance.

Okoye, Ifurueze, Agubata and Emeka-Nwokeji (2021) assessed the nexus between Intellectual Capital and Economic Value Added of quoted service firms in Nigeria for a ten year period covering from 2010-2019. Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency were used to proxy Intellectual Capital, while Economic Value Added served as the dependent variable. Ex-Post facto research design was employed. Fifty one (51) quoted service firms constituted the sample size of this study. Secondary data were extracted from the annual reports and accounts of the sampled firms and were analysed using E-Views 10.0 statistical software. The study employed inferential statistics using Pearson correlation, Heteroskedasticity test and Panel Least Square (PLS) regression analysis. Findings from the empirical analysis showed that there is a significant positive relationship between Human Capital Efficiency, Structural Capital Efficiency Capital Employed Efficiency and Economic Value Added at 5% level of significance. It was recommended inter alia that firms should invest more in Human Capital Efficiency to improve performance.

Olayinka (2021) examined the effect of corporate governance on economic sustainability reporting in quoted companies on Nigerian Stock Exchange. This study adopted ex-post facto research design. The population of the study comprised 169 quoted companies on the Nigerian Stock Exchange (NSE) as at December 31, 2019. A sample of 42 quoted companies for the period of 10years (2010-2019) was selected. Data were extracted from published audited annual reports and accounts of the companies. Data were analyzed using descriptive and inferential statistics. The findings revealed that board size, female director and board ownership have positive and significant effect on economic sustainability reporting of selected quoted companies in Nigeria while CEO duality has negative effect on economic sustainability

reporting and independent director has insignificant effect. The study concluded that corporate governance promotes economic sustainability reporting.

Reboredo and Sowaity (2021) explored the association between the intellectual capital (IC) efficiency of firms and their voluntary disclosure of environmental, social, and governance (ESG) information, using data on Jordanian listed firms and the value-added intellectual coefficient (VAIC) model with its three components of human, structural, and relational capital efficiency (HCE, SCE, and RCE, respectively). The data sample included observations for all non-financial (manufacturing, services, and real estate) companies listed on the Jordanian Amman Stock Exchange (ASE) over the decade 2009–2018. Ordinary least squares (OLS) and generalized least squares (GLS) were applied. The study found that disclosing environmental information is unrelated to IC efficiency, that disclosing governance information is associated with raised IC efficiency through the HCE and RCE components, and that disclosing social information is negatively associated with IC efficiency through the SCE and RCE components.

Salawu, Mamman, Dahiru, Ado and Yunusa (2021) examined the relationship of specific oil and gas firms' attributes; firms age, board composition, financial performance, existence of foreign directors on the board and financial leverage with Environmental Disclosures (ED). Data were collected from the published annual reports of nine listed oil and gas firms quoted on the floor of the Nigerian Stock Exchange (NSE) as at 2018, for a period of seven years (2012-2018). Generalized Least Square (GLS) was used to test the hypotheses after satisfying the criteria of post estimation tests. The result established a positive and significant relationship between board composition, financial leverage, existence of foreign directors on the board and ED. However, firm age and financial performance was found not to have significant relationship with ED.

Tom-West, Okoye and Amahalu (2021) ascertained Intellectual Capital (IC) performance and its relationship with Economic Value Added (EVA) of quoted Information, Communication and Technology (ICT) firms in Nigeria for the periods of 2010-2019. The study Used data drawn from the sample size of eight (8) quoted ICT companies' annual reports and accounts, the study employed inferential statistics using Correlation coefficient, Panel Least Square (PLS) regression models, Granger Causality test and Hausman test to examine the relationship between Intellectual Capital efficiency and firms' Economic Value Added via E-Views 9.0 statistical software. Ex-Post facto research design was adopted. The empirical results revealed that Human Capital Efficiency (HCE) has a significant positive relationship with Economic Valued Added at ( $P < 0.05$ ), Structural Capital Efficiency (SCE) exhibited a significant positive relationship with Economic Valued Added at ( $P < 0.05$ ) and Capital Employed Efficiency (CEE) exhibited a significant positive relationship with Economic Valued Added at ( $P < 0.05$ ).

Worimegbe and Oyewole (2021) assessed the level of environmental disclosure practice of manufacturing companies in Nigeria. Anchored on the legitimacy theory, the *ex post facto* research design was adopted by the study. The sample was drawn from a population of 60 quoted manufacturing companies on the floor of the Nigerian Stock Exchange as on 31 December 2017 using the judgmental sampling technique. The study variables were sourced from the annual reports and the stand-alone environmental reports of the selected companies from 2007 to 2017. The global reporting initiative environmental disclosure index was adopted in assessing the disclosure practice of the companies over the years. The findings showed concluded that there exists no significant difference in the level of environmental disclosure practice of manufacturing companies in Nigeria from 2007 to 2017.

Onyekwelu, Okoh, and Iyidiobi (2017) evaluated the impact of intellectual capital on financial performance of Nigerian enterprises in the banking industry (2004-2013). The ex post facto research design was used in this study. Data was gathered from these banks' annual reports and accounts, as well as data from the Nigerian Stock Exchange's (NSE) publications, and evaluated using a regression technique. The study found that IC has a positive and significant impact on bank financial performance, with some exceptions. The findings also revealed that the banks differed statistically in terms of intellectual capital and financial performance indicators.

Sidharta and Affandi (2016) examined the effect of intellectual capital on financial performance in the banking sector in Java, Indonesia. Causal and exploratory research methods were used as the designs for the study. The population of the study and the sample size was the 205 rural banks for the years 2011-2013. Public 1998 research model was used – VAIC Multiple regression techniques were adopted in the study for data analysis. The results showed that intellectual capital significantly influences the financial performance of the banks.

Roshayani, Nur Hayati, Amrizah and Nurfarahin (2016) examined the role of intellectual capital, in terms of human capital, structural capital and relational capital on the sustainability of social enterprise. Information on the sustainability of social enterprise and intellectual capital were obtained from the content analysis of the annual reports of 210 social enterprises registered under the Registry of Societies (ROS) in Malaysia for the financial period 2010. The results from the statistical analysis revealed that on average, most of the social enterprises in Malaysia would be able to survive in the future. In addition, the results also highlighted that of the intellectual capital and structural capital has the most significant positive influence on the sustainability of social enterprise while, human capital and relational capital have weaker significant positive relationship with the sustainability of social enterprise.

Anak and Reza (2016) examined the influence of sustainability report (SR) disclosure as moderating variable towards the impact of intellectual capital (IC) on company's performance based on 21 companies listed in Indonesia stock exchange and listed in National Center for SR chapter Indonesia for the period 2010-2013. This research used Pulic's model of value added intellectual coefficient (VAIC) to determine the IC of companies. Company's performance was presented as return on assets (ROA), return on equity (ROE), and revenue growth (RG). The required data to calculate the IC and company's performance was obtained from the annual reports while SR disclosure was obtained from SR. Results from linear regression analysis show that VAIC has positive effects on ROA and ROE. It means high ROA and ROE companies were associated with more VAIC. Aside from that, VAIC does not have effect to RG. Result from moderated regression analysis also showed that SR disclosure has positive effects on ROA and ROE, but does not have any influence on RG.

Ekundayo and Odhigu (2016) investigated the determinants of human capital accounting in Nigeria. Specifically, secondary data were used for the study, and data were obtained from the annual reports of 30 companies listed on the floor of the Nigerian Stock Exchange (NSE) as of 31st December 2014. Pooled data were used and ordinary least squares regression technique to test the relationship between the variables. The result revealed that welfare and training cost has a significant impact on human capital in Nigeria.

Utama and Mirhard (2016) examined the influence of sustainability report (SR) disclosure as moderating variable towards the impact of Intellectual Capital (IC) on company's performance

based on 21 companies listed in Indonesia Stock Exchange (IDX) and listed in National Center for Sustainability Reporting Chapter Indonesia (NCSR-ID) for the period 2010-2013. The research used Pulic's model of value added intellectual coefficient (VAIC) to determine the intellectual capital of companies. Company's performance was presented as Return on Assets (ROA), Return on Equity (ROE), and Revenue Growth (RG). The required data to calculate the IC and company's performance was obtained from the annual reports while SR disclosure was obtained from sustainability reports. Results from linear regression analysis showed that VAIC has positive effects on ROA and ROE. Result from moderated regression analysis also show that sustainability report disclosure has positive effects on ROA and ROE, but does not have any influence on RG.

Alhassan and Basariah (2016) determined the relationship between environmental information disclosure and ownership structure in combination with environmental agencies using the latest version of GRI (G4). The study is a pioneer application of environmental agencies' role in sustainability reporting and considers 81 companies in 6 environmentally sensitive industries of the economy. From a stratified random selected sample of 67 firms, the study tested for the relationship from 2009 to 2014. This was then analyzed using Stata13 through content analysis, descriptive statistics and regression. Analysis was based on panel data evaluation as a result of 67 firms being analyze for a period of 6 years (2009-2014). The outcome showed an inverse and significant relationship between environmental disclosure and ownership structure.

Eddy and Joung (2015) determined the influence of intellectual capital which was proxied with Human Capital, Structural Capital and Customer Capital on the company's financial performance measured by return on assets (ROA). Sample was the banking industry, which was listed on the Indonesian Stock Exchange (IDX) period 2008-2012. Using multiple regression analysis, intellectual Capital measurement model was that of Pulic (1998). The results showed that (1) Human Capital (HC) effect on the financial performance of +2.085 regression coefficient, that means the higher Human Capital (HC), the better the financial performance. (2) Customer Capital (CC) effect on financial performance of + 3.568 regression coefficient.

### 3.0 MATERIAL AND METHOD

The study utilized an ex-post facto research design to accomplish its objectives. The population for the study included all 11 Oil and Gas firms that were listed on the Nigerian Exchange (NGX) Group as of December 31, 2021. The population elements consisted of the following companies: 11 Plc (formerly Mobil Oil Plc); Capital Oil Plc; Conoil Plc; Eterna Plc; Ardova Plc (formerly Forte Oil Plc); Japaul Oil & Maritime Services; MRS Oil Nigeria Plc; Oando Plc; Rak Unity Petroleum Company Plc; Seplat Petroleum Development Company Plc; Total Nigeria Plc.

For this study, a sample size of all 11 listed Oil and Gas companies was selected. Secondary data was collected from the published financial statements of these companies. To determine the presence of environmental, economic, and social sustainability, content analysis using the disclosure occurrence method was applied to the information in corporate reports and sustainability reports. The study utilized the Global Reporting Initiative (GRI) framework and adhered to the G4 guidelines to develop the environmental, economic, and social disclosure indices.

The study employed both descriptive statistical analysis and Pooled Ordinary Least Square (OLS) regression analysis. OLS was utilized to establish the relationship between the variables. The study variables were divided into two sets. The dependent variable was sustainability disclosure, which was measured using proxies for environmental, economic, and social sustainability disclosure. The independent variable (intellectual capital) was determined using three drivers: human capital efficiency, structural capital efficiency, and capital employed efficiency.

Intellectual capital which is the independent variable was indexed by Capital Employed Efficiency (CEE); Human Capital Efficiency (HCE); and Structural Capital Efficiency (SCE):

- Capital Employed Efficiency (CEE) measure the efficiency of Capital Employed (CE), where  $(CE) = \text{book value of firm net assets}$ .

$CE = \text{physical capital} + \text{financial assets}$

$CE = \text{Total assets} - \text{intangible assets}$

$$CEE = VA/CE$$

CE represents tangible resources while HC represents intangible resource.

$$VA_{it} = \text{OUTPUT}_{it} - \text{INPUT}_{it}$$

$\text{Output}_{it}$  is the total income generated by the firm from all products and services sold during the period  $t$ , and  $\text{input}_{it}$  represents all the expenses incurred by the firm during the period  $t$  except cost of labour, tax, interest, dividends and depreciation.

$$HCE = VA/HC$$

- Structural Capital Efficiency (SCE). Structural capital (SC) includes strategy, organization network, patent, brand name. Internal structural capital is developed internally, consists of policy and process, work environment, innovation created by research and development. SC is measured using Pulic (2004)

$$SC = VA - HC$$

HC and SC are in reverse proportion, increasing HC will decrease SC. SCE is measured:

$$SCE = SC/VA$$

- Intellectual Capital Efficiency (ICE) is calculated:

$$ICE = HCE + SCE$$

- VAIC - value added efficiency of tangible and intangible assets:

$$VAIC = CEE + HCE + SCE$$

**Table 1: Variables Definition and Measurement Units**

Variable Type	Proxy	Variable Symbols	Variables Explanation
<b>Independent Variable (Intellectual Capital)</b>			
	Human Capital Efficiency	HCE	$\frac{\text{Value Added}}{\text{Human Capital}}$
	Structural Capital Efficiency	SCE	$\frac{\text{Value Added} - \text{Human Capital}}{\text{Value Added}}$
	Capital Employed Efficiency	CEE	$\frac{\text{Output} - \text{Input}}{\text{Total Assets} - \text{Intangible Assets}}$
<b>Dependent Variable (Sustainability Reporting)</b>			
	Environmental Sustainability Disclosure	ENVD	Total Environmental Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
	Economic Sustainability Disclosure	ECOD	Total Economic Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
	Social Sustainability Disclosure	SOCD	Total Social Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
<b>Control Variables</b>			
	Leverage	LEV	Ratio of Total debt/Total Assets
	Firm Size	FSZ	Natural logarithm of Total Assets

Sequel to the determination of the effect of Intellectual Capital on Sustainability Reporting of listed Oil and Gas firms in Nigeria, this study therefore adapted and modified the model of Tom-West, Okoye and Amahalu (2021);

$$EVA = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \epsilon \dots\dots\dots (1)$$

Where:

$\beta_0$  is the intercept of the regression.

$\beta_1, \beta_3$  are the coefficients of the regression

EVA = Economic Value Added

For the test of the study hypotheses, this study estimated the following regression equations:

$$ENVD_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \beta_4 LEV_{it} + \beta_5 FSZ_{it} + \mu_{it} \dots\dots\dots (2)$$

$$ECOD_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \beta_4 LEV_{it} + \beta_5 FSZ_{it} + \mu_{it} \dots\dots\dots (3)$$

$$SOCD_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \beta_4 LEV_{it} + \beta_5 FSZ_{it} + \mu_{it} \dots\dots\dots (4)$$

**Where:**

$\epsilon$  is the error term

$\beta_0$  is the intercept of the regression.

$\beta_{1-5}$  are the coefficients of the regression

$ENVD_{it}$  = Environmental Sustainability Disclosure of firm  $i$  in period  $t$

$ECOD_{it}$  = Economic Sustainability Disclosure of firm  $i$  in period  $t$

$S OCD_{it}$  = Social Sustainability Disclosure of firm  $i$  in period  $t$

HCE = Human Capital Efficiency

SCE = Structural Capital Efficiency

CEE = Capital Employed Efficiency

$LEV_{it}$  = Leverage of firm  $i$  in period  $t$

$FSZ_{it}$  = Firm Size of firm  $i$  in period  $t$

$i$  = individual firms

$t$  = time periods

**4.0 RESULT AND DISCUSSION**

**4.1 Data Analysis**

**Table 2 Descriptive statistics**

	<b>ENVD</b>	<b>ECOD</b>	<b>S OCD</b>	<b>HCE</b>	<b>SCE</b>	<b>CEE</b>	<b>LEV</b>	<b>FSZ</b>
Mean	0.05851	0.02701	0.04136	3.87734	0.81909	0.19247	0.38390	9.62662
Median	0.04000	0.02000	0.03000	3.13000	0.73500	0.16000	0.35500	9.72000
Maximum	0.79000	0.09000	0.53000	18.0500	6.94000	0.87000	1.21000	10.7600
Minimum	0.00000	0.00000	0.00000	0.08000	0.00000	0.01000	0.08000	8.36000
Std. Dev.	0.08719	0.02093	0.06729	2.99339	0.77087	0.13824	0.20666	0.53547
Skewness	6.94116	0.98742	4.97570	2.03499	5.33711	2.02230	0.85163	-0.49016
Kurtosis	55.9219	3.33802	30.93705	8.89995	38.3467	9.41803	3.85180	2.53478
Jarque-Bera	19207.9	25.7583	5643.519	329.651	8748.01	369.279	23.271	7.55527
Probability	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	0.02288
Sum	9.01000	4.16000	6.37000	597.110	126.140	29.6400	59.120	1482.50

*Received: 2 March 2023*

*Revised: 24 March 2023*

*Final Accepted for publication: 6 April 2023*

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Sum Sq. Dev.	1.16316	0.06703	0.69281	1370.93	90.9185	2.92366	6.5343	43.870
Observations	154	154	154	154	154	154	154	154

*Source: E-Views 10 Descriptive output, 2023*

### **Interpretation**

Based on table 2, it can be observed that on average, as indicated by the mean, the ENVD of oil and Gas firms in Nigeria is 0.06. The implication is that the involvement of sampled firms in environmental performance is about 6%. However, throughout the period of 2008 to 2021, the maximum degree of their environmental performance for sampled firms is 79% while the minimum ENVD is 0%. ECOD has a mean of 0.027 with a standard deviation of 0.0209 implies that involvement of oil and gas companies in Nigeria towards corporate economic sustainability is about 2.7% with a maximum level of 9% and a minimum of 0%. SOCD with an average mean of 0.041 and standard deviation of 0.067 infers that the participation of oil and gas companies in Nigeria towards Social Sustainability is averagely 4.1%. The maximum level of oil and gas companies' participation in Social Sustainability is 53% with 0% minimum level. Averagely, the HCE of sampled firms stood at 3.88, a maximum of 18.0500, a minimum HCE of 0.08000 at a standard deviation of 2.99339. The mean observed SCE of studied firms is 0.81909 with a maximum value at 6.94000, a minimum of 0.00000 and standard deviation of 0.77087. For CEE, the mean value is at 0.19247 having a minimum efficiency of 0.01000, a maximum CEE of 0.87000 and standard deviation of 0.13824.

### **4.3 Test of Hypotheses**

The hypotheses were tested using Pooled Ordinary Least Square regression at 5% significance level.

#### **4.3.1 Test of Hypothesis**

**H<sub>01</sub>:** Intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) does not significantly affect environmental sustainability disclosure of listed oil and gas firms in Nigeria.

**Table 3: Test of Hypothesis I**

Dependent Variable: ENVD  
Method: Panel Least Squares  
Date: 03/21/23 Time: 23:19  
Sample: 2008 2021  
Periods included: 14  
Cross-sections included: 11  
Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.158612	0.145147	-1.092764	0.2763
HCE	0.001031	0.002734	0.377158	0.7066
SCE	-0.002694	0.009208	-0.292533	0.7703
CEE	-0.015013	0.064339	-0.233340	0.8158
FSZ	0.026268	0.014252	1.843099	0.0673
LEV	-0.090267	0.034368	-2.626455	0.0095
R-squared	0.075064	Mean dependent var		0.058506
Adjusted R-squared	0.043816	S.D. dependent var		0.087191
S.E. of regression	0.085260	Akaike info criterion		-2.048047
Sum squared resid	1.075845	Schwarz criterion		-1.929724
Log likelihood	163.6996	Hannan-Quinn criter.		-1.999984
F-statistic	2.402217	Durbin-Watson stat		1.118635
Prob(F-statistic)	0.039687			

Source: E-Views 10.0 Regression Output, 2023

### Interpretation of Regression Output

The regression result in Table 3 shows the output of the regression on the effect of intellectual capital on environmental sustainability disclosure. The adjusted R-Squared of 0.043816 shows that 4.38% of the systematic variation in ENVD were explained by HCE, SCE, CEE, LEV and FSZ. Following the F-statistics of 2.402217 with an associated P-value of 0.039687 ( $p < 0.05$ ) which is less than 5%, the model as a whole is significant. However, the individual *prob*(t-statistic) for HCE (0.7066), SCE (0.7703), and CEE (0.8158) show that the effect of intellectual capital on environmental sustainability disclosure is not significant. Therefore, the null hypothesis of zero effect was accepted. This result countered those of Buallay (2022);

**Received:** 2 March 2023

**Revised:** 24 March 2023

**Final Accepted for publication:** 6 April 2023

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Chukwuebuka, Obiora and Ikechukwu (2021); Ahamad, Al-Jaifi and Ehigiamusoe (2022); Reboredo and Sowaity (2021).

### 4.3.2 Test of Hypothesis

**H<sub>02</sub>:** Intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) does not significantly affect economic sustainability disclosure of listed oil and gas firms in Nigeria.

**Table 4: Test of Hypothesis II**

Dependent Variable: ECOD  
Method: Panel Least Squares  
Date: 03/21/23 Time: 23:18  
Sample: 2008 2021  
Periods included: 14  
Cross-sections included: 11  
Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.061024	0.035384	1.724655	0.0867
HCE	0.001116	0.000667	1.673561	0.0963
SCE	-0.003611	0.002245	-1.608491	0.1099
CEE	-0.015787	0.015684	-1.006520	0.3158
FSZ	-0.003593	0.003474	-1.034073	0.3028
LEV	0.005846	0.008378	0.697705	0.4865
R-squared	0.046121	Mean dependent var		0.027013
Adjusted R-squared	0.013896	S.D. dependent var		0.020930
S.E. of regression	0.020784	Akaike info criterion		-4.871047
Sum squared resid	0.063935	Schwarz criterion		-4.752724
Log likelihood	381.0706	Hannan-Quinn criter.		-4.822985
F-statistic	1.431197	Durbin-Watson stat		1.235860
Prob(F-statistic)	0.216316			

Source: E-Views 10.0 Regression Output, 2023

### Interpretation of Regression Coefficient Result

The regression result in Table 4 shows the output of the regression on the effect of intellectual capital on economic sustainability disclosure. The adjusted R-Squared of 0.046121 shows that

4.61% of the systematic variation in ECOD were explained by HCE, SCE, CEE, LEV and FSZ. Following the F-statistics of 1.431197 with an associated P-value of 0.216316 ( $p > 0.05$ ) which is greater than 5%, the model as a whole is not significant. In addition, the individual *prob*(t-statistic) for HCE (0.0963), SCE (0.1099), and CEE (0.3158) show that the effect of intellectual capital on economic sustainability disclosure is not significant. Therefore, the null hypothesis of zero effect was accepted. The finding is not consistent with the results of Asiaei, Jusoh, Barani and Asiaei (2022); Salawu, Mamman, Dahiru, Ado and Yunusa (2021); Osim and Idorenyin (2021); Worimegbe and Oyewole (2021); Mahdi and Grzegorz (2021).

### 4.3.3 Test of Hypothesis III

**H<sub>03</sub>:** Intellectual capital (proxies by Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency) does not significantly affect social sustainability disclosure of listed oil and gas firms in Nigeria.

**Table 5: Test of Hypothesis III**

Dependent Variable: SOCD  
Method: Panel Least Squares  
Date: 03/21/23 Time: 23:22  
Sample: 2008 2021  
Periods included: 14  
Cross-sections included: 11  
Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000941	0.112130	-0.008389	0.9933
HCE	-0.003541	0.002112	-1.676204	0.0958
SCE	-0.005280	0.007114	-0.742254	0.4591
CEE	-0.013532	0.049703	-0.272264	0.7858
FSZ	0.003896	0.011010	0.353882	0.7239
LEV	0.066308	0.026550	2.497444	0.0136
R-squared	0.073263	Mean dependent var		0.041364
Adjusted R-squared	0.041954	S.D. dependent var		0.067292
S.E. of regression	0.065865	Akaike info criterion		-2.564233
Sum squared resid	0.642056	Schwarz criterion		-2.445910
Log likelihood	203.4459	Hannan-Quinn criter.		-2.516171
F-statistic	2.340019	Durbin-Watson stat		1.929032
Prob(F-statistic)	0.044456			

Source: E-Views 10 Regression Output, 2023

### Interpretation of Regression Result

The regression result in Table 5 shows the output of the regression on the effect of intellectual capital on social sustainability disclosure. The adjusted R-Squared of 0.073263 shows that 7.32% of the systematic variation in SOCD were explained by HCE, SCE, CEE, LEV and FSZ. Following the F-statistics of 2.340019 with an associated P-value of 0.044456 ( $p < 0.05$ ) which is less than 5%, the model as a whole is significant. However, the individual *prob*(t-statistic) for HCE (0.0958), SCE (0.4591), and CEE (0.7858) show that the effect of intellectual capital on social sustainability disclosure is not significant. Therefore, the null hypothesis of zero effect was accepted. This finding refutes those by Okoye, Ifurueze, Agubata and Emeka-Nwokeji (2021); Olayinka (2021); Naning and Erna (2021); Ibrahim, Mohammed, Agbi, Nasiru and Umar (2021).

### 5.0 CONCLUSION AND RECOMMENDATION

Based on the findings of the study, it can be concluded that intellectual capital, as measured by Human Capital Efficiency, Structural Capital Efficiency, and Capital Employed Efficiency, does not have a significant impact on environmental, economic, and social sustainability disclosure of listed oil and gas firms in Nigeria. This means that even if a company has high intellectual capital efficiency, it may not necessarily translate to better sustainability disclosure practices. The results of the study suggest that other factors may be more influential in determining a firm's sustainability disclosure practices, such as the regulatory environment, corporate culture, stakeholder pressure, and resource availability.

Generally, this study highlights the need for oil and gas firms in Nigeria to improve their sustainability disclosure practices, regardless of their level of intellectual capital efficiency. By doing so, these firms can enhance transparency and accountability, improve their reputation, and contribute to sustainable development in the country. The study recommends the following:

1. Companies should prioritize developing and implementing comprehensive sustainability strategies that take into account environmental concerns and ensure adequate disclosure of their impact on the environment. This can involve setting specific targets and goals related to environmental performance, investing in renewable energy and cleaner technologies, and regularly monitoring and reporting on progress.
2. Companies should focus on improving their financial reporting practices and providing more detailed and transparent information on their economic performance. This can include disclosing their revenue sources, cost structures, investments, and profits, as well as highlighting any initiatives or programs aimed at improving their economic sustainability.
3. Companies should engage more proactively with their stakeholders, including local communities, employees, customers, and suppliers, to better understand their social

needs and concerns. This can involve conducting regular stakeholder consultations, implementing community development programs, promoting diversity and inclusion in the workplace, and disclosing their social impact and performance metrics.

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