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INTELLECTUAL CAPITAL AND SUSTAINABILITY REPORTING OF LISTED OIL AND GAS FIRMS IN NIGERIA

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ABSTRACT:

The study ascertains the effect of intellectual capital on sustainability reporting of listed oil and gas firms in Nigeria Exchange (NGX) Group. The study specifically intends to determine the effect of Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency on Environmental Sustainability Reporting, Economic Sustainability Reporting and Social Sustainability Reporting, respectively. Ex-post facto research design was applied. The population of this study comprises the entire twelve (12) Oil and Gas firms listed on the floor of the Nigerian Exchange (NGX) Group while the sample size comprises 11 of those firms. Secondary data were sourced from the annual reports of the selected firms over a period of fourteen (14) years spanning from 2008 to 2021. The results of the Panel Least Square (PLS) regression analysis conducted revealed that: Human Capital Efficiency has a significant and positive effect on Environmental Sustainability Reporting of listed Oil and Gas firms in Nigeria at 5% level of significance ($\beta1=0.004298$; p-value = 0.0181<0.05); Structural Capital Efficiency has a significant and positive effect on Economic Sustainability Reporting of listed Oil and Gas firms in Nigeria at 5% level of significance ($\beta2=0.010781$; p-value = 0.0000<0.05); Capital Employed Efficiency has a significant and positive effect on Social Sustainability Reporting of listed Oil and Gas firms in Nigeria at 5% level of significance ($\beta3=0.262799$; p-value = 0.0000<0.05). The study concludes that Intellectual Capital significantly affect Sustainability Reporting of listed Oil and Gas firms in Nigeria. It was recommended that corporate entities in Nigeria should invest in economic sustainability activities in all its ramification in order to boost their image/reputation thereby increasing their returns.

1. INTRODUCTION

In today's innovation-driven world, learning and the command of intellectual and knowledge capital have become the key success factors of international competitiveness. Society is experimenting what is called knowledge economy or knowledge society, based on the rapid development of intellectual and knowledge capital. Competing in the future will be increasingly dependent on mobilizing this capital at all the levels: local, regional, national and global trends which influence the way people live, the way business is done, the way the natural environment; the way in which sustainable development is implemented. In this contemporary times, less people will do physical work and more people will do brain work. This is called intellectual capital (IC). It does not appear on the company statement of financial position but it has more value for organizations than physical assets. Economic wealth is driven more by knowledge and information than the production process. Intellectual capital (IC) is also known as the new invisible asset, it is the knowledge that is of value to an organization (Zhang & Wang, 2022). IC includes human capital, process capital, client capital, innovation capital and network capital. The complexity of these characteristics represents the competitive advantage originated inside and within the company. Therefore, survival and competitive success of a firm depends highly on the strategic management of its IC as compared to financial resources (Zhang & Wang, 2022).

In the knowledge era, material and financial assets have lost their effect over the success of businesses in the long run. Therefore, knowledge has become an important and critical asset for the organizations in this era. Consequently, knowledge era directs organizations to have non-material assets based on knowledge rather than physical assets. The resources-based perspective focuses on strategies for exploiting existing firm specific assets. Since some of the firm's assets are intellectual, it follows that issues such as skills acquisition, the management of knowledge and know-how, and learning become fundamental strategic issues (Si, Xu & Chen, 2020). A critical challenge for the most enterprise is how to achieve and sustain competitive advantage (Pirogova & Plotnilov, 2020). Intangible resources in the form of knowledge possessed by organisations have over the years become indispensable in their quest for survival. According to the resource and capabilities theory of the firm, resources and capabilities that are unique, rare, difficult to imitate and non-substitutable create competitive power and above average performance, this makes intellectual capital a silent weapon that smart managers deploy for the improved performance of their organisation. The ability to attract the best of employees with the right skill and retain them is the foundation for modern day businesses survival. Businesses are now in the know that the depth of intellectual capital sometimes explains the best of innovation and creativity in the organisation (Pirogova & Plotnilov, 2020). Thus, the push for most business to

adopt a dual approach to ensuring that requisite knowledge is acquired and they are transformed to meet the compelling need of the organisation at the time. The rise in global technological advancement has characterized the dynamic nature of the twenty-first century business world, increased business connections, expansionary network relationships as well as shortened or decreased product life cycle, which has created a complex environment for organizations to flourish or fail.

Critical is the fact that the business world today despite the declaration of tremendous financial assets by firms, there is still evident poor performance that has led to the closure of some business both locally and globally. This development implies that the outward possession of substantial capital and physical assets is not just sufficient to sustain an organisation to gain competitive advantage and stay competitive in its industry and beyond even in the face of threat. Sustainability means meeting the needs of the present generation without compromising the ability of future generation to meet their own needs. In other words, sustainability advocates intergenerational equity. Sustainability reporting is the disclosure and communication of environmental, social, and governance (ESG) goals as well as a company's progress towards them (Ekwueme, Egbunike & Onyali, 2013). The benefits of sustainability reporting include improved corporate reputation, building consumer confidence, increased innovation, and even improvement of risk management. The emergence of sustainability reporting was a direct respond on 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 determine the effect of intellectual capital on sustainability reporting of quoted oil and gas firms in Nigeria.

Knowledge is the primary competitive factor in business; it is a non-traditional intangible resource; and that the accumulation, transformation, creation and valuation of this resource lies at the heart of intellectual capital management (Ionita & Dinu, 2021). However, industrial era managerial paradigms, based on the tangible sources of value (land, labour and financial-capital) and the predict-direct-exploit-control bureaucratic machine metaphor are proving increasingly incapable of dealing with the emergent complexities of visualising, creating and leveraging this resource. Furthermore, little is known about how these intellectual resources, structures, institutions, processes or dynamics actually

develop, or how they should be managed, utilised, valued or accounted for. Nowadays, it is generally recognized that corporate performance must be assessed not only on the basis of financial results but also considering the impacts generated on the social, economic and environmental context (Nworie, Obi, Anaike & Uchechukwu-Obi, 2022). Nevertheless, sustainability reporting involves considerable challenges in terms of managing and communicating non-financial information. But the one of the biggest problems with sustainability reports is that they are often misaligned with company priorities. Achieving success for the triple bottom line (TBL) requires a healthy balance between social, environmental and economic performance, the measures for each, and how they should be weighted, varies from firm to firm. There are also several problems with the implementation of different measurement methods, such as the lack of necessary data, of accounting standards for intellectual capital, and of detailed method descriptions. Part of the problem stems from the fact that value is typically impossible to confirm due to the inability to liquidate a holding of the asset. Intangible assets are typically highly illiquid, in contrast to physical commodities such as gold or stock, which can be priced and sold almost immediately. The proliferation of disclosure frameworks and surveys has led to a number of challenges faced within corporate sustainability reporting. The most salient pain points are centered on the manual collection of sustainability data, the overlap of frameworks and the resultant fatigue, and the need to audit or validate data information. Currently, sustainability teams manage internal databases largely in excel files or google docs, a process that requires individuals to manually manage and keep track of hundreds of data points. But it is much more than just the hard data, companies need to track explanations, back-up files, who provided the data, and who provided sign off. Using these spreadsheet tools to collect sustainability data is simply a task they are not optimized for, and leads to intensified inefficiencies felt across the organization. In order to close the gap in literature, the focus of this study focuses on sustainability reporting contrary to prior studies that dwelt on financial performance, thereby bridging the variable gap. Again, unlike other previous studies on intellectual capital that focused majorly on financial sector, the consideration of this present study is on Oil and Gas firm, hence, resolving the sectorial gap, hence, the need for this study.

1.1 Objectives of the Study

The main objective of this study is to examine the effect of Intellectual Capital on Sustainability Reporting of listed Oil and Gas firms in Nigeria. The specific objectives are:

i. To determine the extent to which Human Capital Efficiency affects Environmental Sustainability Reporting of listed oil and gas firms in Nigeria.
ii. To evaluate the degree of effect of Structural Capital Efficiency on Economic Sustainability Reporting of listed Oil and Gas firms in Nigeria

iii. To ascertain the effect of Capital Employed Efficiency on Social Sustainability Reporting of listed Oil and Gas firms in Nigeria.

1.2 Hypotheses

Ho_1: Human Capital Efficiency has no significant effect on Environmental Sustainability Reporting of listed Oil and Gas firms in Nigeria.

Ho_2: Structural Capital Efficiency has no significant effect on Economic Sustainability Reporting of listed Oil and Gas firms in Nigeria.

Ho_3: Capital Employed Efficiency has no significant effect on Social Sustainability Reporting of listed Oil and Gas firms in Nigeria

2. LITERATURE REVIEW

2.1 Conceptual review

2.1.1 Intellectual Capital

Intellectual capital is the value of a company's employee knowledge, skills, business training, or any proprietary information that may provide the company with a competitive advantage (Madhuri 2022). Intellectual Capital is those intangible assets of an organization that are not recorded in financial statements but which may constitute 80% of the market value of the organization. Intellectual capital is the group of knowledge assets that are attributed to the value creation of an organization. Intellectual capital is the assets relating to employee knowledge and expertise, customer confidence in the company and its products, brands, franchises, information systems, administrative procedures, patents, trademarks and the efficiency of company business processes. 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. Intellectual capital is the assets relating to employee knowledge and expertise, customer confidence in the company and its products, brands, franchises, information systems, administrative procedures, patents, trademarks and the efficiency of company business processes. Intellectual Capital is the knowledge of organization's human resource that can be used for money-making or other useful purpose or any other information or knowledge that provide the organization with a competitive advantage. In other words it is an asset of the company as it is the informational resources which

company can use at its disposal for making profits, attracting customers, creating a new product, enhancing existing product or improve business.

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 (Madhuri 2022). 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.

2.1.2 Human Capital Efficiency

Human capital refers to the economic value of a worker's experience and skills. Human capital includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality. As such, it is an intangible asset or quality that is not (and cannot be) listed on a company's statement of financial position. Human capital is perceived to increase productivity and thus profitability. The more investment a company makes in its employees, the chances of its productivity and success becomes higher. Human capital consists of the knowledge, skills, and health that people invest in and accumulate throughout their lives, enabling them to realize their potential as productive members of society (Battaglia, Busato & Manganiello, 2022). Kenton (2022) defined Human Capital as employee's competence in creating both tangible and intangible assets by contributing in the continuous generation of knowledge and ideas. Human Capital is defined as the energies, skills, talents and knowledge of people which are, or which potentially can be applied to the production of goods or rendering useful services. Ionita and Dinu (2021) identify Human Capital to include innovation, capacity, creativity, know-how and previous experience, teamwork capacity, employee flexibility, tolerance for ambiguity, motivation, satisfaction, learning capacity, loyalty, formal training and education. More emphasis is being placed on the skills and knowledge of employees rather than on the physical assets of a company, this is because the skills, knowledge, competence and intellect an employee possess will determine how the physical assets will be utilized to achieve organizational objectives. Ibrahim and Lau (2019) explained that the knowledge held by employees are the primary source of value creation so therefore employees' expenses should be seen as investments rather than costs. Human capital includes employees, their knowledge and experience, the organization's relationship with employees, employee training and appraisal, employee satisfaction, employee review about the organization, all contribute to the capital of the organization. If an organization has a lower employee turnover rate, then there are chances of high intellectual capital.

2.1.3 Structural Capital Efficiency

Structural capital is one of the three primary components of intellectual capital, and consists of the supportive infrastructure, processes, and databases of the organisation that enable human capital to function (Xu & Zhang, 2021). Structural capital is owned by an organization and remains with an organization even when people leave. It includes: capabilities, routines, methods, procedures and methodologies embedded in organization (Xu, Chen & Zhang, 2020) Structural capital is the supportive non-physical infrastructure that enables human capital to function. It is organization processes, databases, policies, culture, vision, mission and value statement, etc. contribute to the capital of the organization. If the organization's work culture is good, and it provides quality products and its reputation in the market, its competitive advantage amongst others are real intellectual capital for the organization. Having the proper tools, equipment, technical resources, and intellectual property in a business is paramount to its success. Without strong structural capital, business will be unable to function in a repeatable and scalable way (Pirogova & Plotnilov, 2020).

Popoola, Edem and Agbi, 2019 described structural capital (SC) as the measure of intangible structures established by firms that enables human capital function effectively. Commensurate attention should be given to intangible structures (structural capital) rather than concentrating only on physical structures and equipment (Carlos-Maria& Amandio, 2020). Structural Capital is, in turn, characterised by two major types of substructures namely, external and internal capital. External capital, otherwise known as relational or customer capital refers to a firm's connection with external entities. Abiola and Mohammed (2021) show that external capital (EC) is the knowledge embedded in organisation's marketing channels and customer relationships developed over time via its business operations. Distinctively, customer loyalty, order levels and market share form part of relational capital. External capital entails all human and structural resources connected with relationships external to the firm, such as relationship with customers, suppliers and other stakeholders. This, by extension, includes perceptions about the firm, connections with customers, ties with suppliers, link with financial institutions, government, research and development, partners, and so on.

2.1.4 Capital Employed Efficiency

Capital employed, also known as funds employed, is the total amount of capital used for the acquisition of profits by a firm or project. Capital employed can also be referred to as the value of all the assets used by a company to generate earnings. By employing capital, companies invest in the long-term future of the company. Capital employed is helpful since it is used with other financial

metrics to determine the return on a company's assets as well as how effective management is at employing capital (Pernamasari & Sugiyanto 2021). Capital employed is the net operational assets of the business. Capital employed efficiency is one of the intellectual capital components based on value added intellectual capital model. Capital employed is used in many financial metrics which are used to measure a company's competence to utilize its capital effectively. It is calculated by dividing value added on capital employed. Operational cash flow is made from operating activities. It is expected that created value added from capital employed could make more operational cash flow.

2.1.5 Value Added Intellectual Capital

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:

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

According to Pulic (2004) , an increase in the VAIC signals an improvement in the efficiency of a firm's resources in general and employees' knowledge in particular and thus the ability of the firm to create new economic value (Iliemena, Goodluck & Amahalu, 2019). VAIC™ indicator may be perceived as the determinant of the company's success. It measures the efficiency with which a firm uses its physical, financial and intellectual capital to enhance stakeholders value (Tom-West, Okoye & Amahalu, 2021). The higher its value, the more favorable it is for the enterprise and the greater the ability to create value. Aggregated VAIC™ helps to understand the total business efficiency and indicates its intellectual capacity. It measures how much of the new value has been created with the resources invested in monetary units. The high rate of VAIC is associated with a high level of value creation through the use of corporate assets, including intangible resources.

2.1.6 Sustainability Reporting

A sustainability report is an organizational report that gives information about economic, environmental, social and governance performance (GRI, 2013). Sustainability reporting is not just report generation from collected data; instead it is a method to internalize and improve an organization's commitment to sustainable development in a way that can be demonstrated to both internal and external stakeholders (GRI, 2015).Sustainability reporting is the disclosure 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. A sustainability report also presents the organization's values and governance model, and demonstrates the link between its strategy and its commitment to a sustainable global economy. Sustainability reporting 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). A sustainability report is the key platform for communicating sustainability performance and impacts whether positive or negative.

Sustainability reporting 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). Stakeholders also play a crucial role in identifying these risks and opportunities for organizations, particularly those that are non-financial. This increased transparency leads to better decision making, which helps build and maintain trust in businesses and governments (Gray 2016). Sustainability reports are released by companies and organizations of all types, sizes and sectors, from every corner of the world. Sustainability reporting is the key platform for communicating sustainability performance and impacts. A sustainability report in its basic form is a report about an organization's environmental and social performance.

2.1.7 Environmental Sustainability Reporting

Environmental sustainability reporting is the communication of environmental performance information by an organisation to its stakeholders. Information on environmental performance includes among others: Impacts on the environment, Performance in managing those impacts, and Contribution to ecological and sustainable development. An environmental indicator provides information on a specific aspect of our environment. Environmental sustainability reporting relies on using a range of indicators to measure and report on the overall health of our environment in a cost-

effective, practical, and meaningful way. Disclosure on environmental performance helps firms to gain stakeholder's confidence, to evaluate potential risks involved in performing such activities and to moderate the impact of these activities on the environment (Nworie, Obi, Anaike & Uchechukwu-Obi, 2022). It considers impact of their operations on the surrounding environment and to reveal the results to multiple stakeholders such as employees, consumers, community, regulators, the media and shareholders which become critical for the long-lasting sustainability of the organizations (Margolis & Walsh, 2013). Environment Reporting offers an opportunity for firms to apprise stakeholders that their corporate operations and efforts are environmental friendly. Environmental reporting should be embraced by corporation as an opportunity rather than an impediment to the growth of business.

2.1.8 Economic Sustainability Reporting

Economic sustainability reporting 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. Sustainable economic growth is economic development that attempts to satisfy the needs of humans but in a manner that sustains natural resources and the environment for future generations. An economy functions in the ecosystem and the economy cannot be separated from ecosystem. In fact, an economy cannot exist without it (Buys, Oberholzer & Andrikopoulos, 2011). The ecosystem provides the factors of production that fuels economic growth: land, natural resources, labor, and capital (which is created by labor and natural resources).

Sustainable economic growth is managing these resources in a manner that they will not be depleted and will remain available for future generations (Galema, Plantinga & Scholtens, 2018). Economic sustainability implies a system of production that satisfies present consumption levels without compromising future needs. The sustainability that economic sustainability seeks is the sustainability of the economic system itself. Sustainable economic growth means a rate of growth which can be maintained without creating other significant economic problems, especially for future generations. There is clearly a trade-off between rapid economic growth today, and growth in the future. Rapid growth today may exhaust resources and create environmental problems for future generations, including the depletion of oil and fish stocks, and global warming.

2.1.9 Social Sustainability Reporting

Social sustainability reporting refers to a company's systematic disclosure of information on its social performance (Young & Marais, 2012). Social disclosure is the legal requirement for corporations to provide certain prescribed information which include non-financial data, particularly disclosure of

information oriented toward social issues including human rights and environmental disclosure. Social disclosure obligations can be used to provide information on a corporation's relationship to social policy issues to stakeholders and to society at large. Stakeholders can then use the disclosed information to determine on what basis, or whether at all, they will transact with a corporation. For instance, employees can use a corporation's disclosed social information as part of a collective bargaining strategy (Outtes-Wanderley, Soares, Lucian, Farache, & Filho, 2018).). Similarly, social disclosure can facilitate "the efficient allocation of resources by enabling individuals to more fully satisfy their preferences" when interacting with the corporation, such as when a customer buys a corporation's product or when an individual accepts employment (Young & Marais, 2012). More broadly, increased corporate transparency on social issues may enable society to hold corporations accountable.

2.2 Theoretical Review

The theoretical foundation of this study is based on the Knowledge Based View Theory.

2.2.1 Knowledge-Based View (KBV) Theory

Knowledge-Based View (KBV) Theory was propunded by Kogut and Zander in 1993. The knowledge-based theory of the firm considers knowledge as the most strategically significant resource of a firm. Its proponents argue that because knowledge-based resources are usually difficult to imitate and socially complex, heterogeneous knowledge bases and capabilities among firms are the major determinants of sustained competitive advantage and superior corporate performance. This knowledge is embedded and carried through multiple entities including organizational culture and identity, policies, routines, documents, systems, and employees. Originating from the strategic management literature, this perspective builds upon and extends the resource-based view of the firm (RBV) initially promoted by Penrose (1959) and later expanded by others (Wernerfelt 1984, Barney 1991). Although the resource-based view (RBV) of the firm recognizes the important role of knowledge in firms that achieve a competitive advantage, proponents of the knowledge-based view argue that the resource-based perspective does not go far enough. Specifically, the RBV treats knowledge as a generic resource, rather than having special characteristics. It therefore does not distinguish between different types of knowledge-based capabilities. Information technologies can play an important role in the knowledge-based view of the firm in that information systems can be used to synthesize, enhance, and expedite large-scale intra- and inter-firm knowledge management.

Knowledge-based view of the firm (KBV) is a management concept of organizational learning that provides firms with strategies for achieving competitive advantage. This is achieved through increased

employee involvement in the formulation and administration of the operational goals and long-term transformational objectives of the firm. The continuous acquisition and transfer of knowledge within business organizations is necessitated by such factors as ever-changing competitive conditions in markets initiated by globalization, frequent deregulations, and technical advancements (Chukwuka, Okegbe, Amahalu & Obi, 2022).

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. This theory is relevant to the present study since it emphasises that 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

Festus, Rufus and Janet (2020) examined the effect of sustainability reporting on turnover growth of quoted companies in Nigeria. The study adopted an ex-post facto research design with 167 listed firms as the population. 28 quoted firms were chosen with the use of purposive sampling. Data from 2009 to 2018 were obtained from secondary sources. Content analysis was employed as a tool to analyse the disclosures in sustainability reports. The model was estimated using Pooled OLS (multivariate regression). Company age and financial leverage were used as control variables. The study found that the compliance level of the sampled firms with sustainability reporting requirements for the four dimensions are below average, however, sustainability reporting has a significant effect on turnover growth with Prob. (F-stat) of 0.0463<0.05.

Rachmawati (2020) determined, (1) Effect of intellectual capital, on real earnings management (2) Effect of capital employed efficiency (CEE) on real earnings management (3) Effect of structural capital efficiency (SCE) on real earnings management (4) Effect of human capital efficiency (HCE) on real earnings management (5) Profitability as a moderating variable can strengthen the effect of intellectual capital on real earnings management. Sample collection was carried out using purposive sampling and produced a sample of 80 companies during the 2015 - 2017 periods which was 240

companies in Indonesia. The analytical tool used is multiple linear regression with the Fixed Effect method. The results of the study showed that intellectual capital has a negative effect on real earnings management. Neither can profitability strengthen the effect of intellectual capital on real earnings management.

Lukman and Helvenni (2020) aimed to obtain empirical evidence on how firm value is influenced by intellectual capital in addition to financial performance with corporate sustainability reports (CSR) as a mediating variable in the banking industry. Based on the path-analysis performed among the banks operating in Indonesia during 2016-2018, the data was then processed using the Statistical Package for Social Sciences (SPSS) ver 25.0 in performing the classical-assumption test, and Smart PLS v.3 for conducting the effect-test and path-analysis. The results show that financial performance and intellectual capital have a direct and positive effect on company value, but there is no significant effect of CSR as a mediating variable.

Aleša and Vasilije (2020) examined the relationship between intellectual capital and financial performance of listed Slovene companies from 2014-2018. Multiple regression technique was adopted. The dependent variable was measured with Market-to-Book Value and Tobin's q, while intellectual capital was proxied with human capital efficiency structural capital efficiency, capital employed efficiency. The regression result revealed the existence of a positive relationship between the components of intellectual capital and Tobin's Q.

Jin and Wang (2020) investigated the determinants and consequences of intellectual capital efficiency in the U.S. banking industry. The study used ordinary least square (OLS) regressions. The study also found that intellectual capital efficiency restricts banks' risk-taking behaviors and enhances their accounting conservatism. The sample consists of 6312 U.S. commercial banks with 106,272 quarterly observations for the period between 2000 and 2017. Finally, it was found that intellectual capital efficiency helps banks attract more wholesale funding deposits. Also, human capital efficiency and relational capital efficiency significantly impact on bank accounting conservatism.

Carlos-Maria and Amandio (2020) aimed at understanding the impact of structural capital on timber and related industries value chain of Galicia (Spain). Dynamic panel data was used from 2002-2018. Structural capital has significant and positive effect on timber and related industries value chain.

Rahman, Sobhan and Islam (2020) examined the impact of intellectual capital disclosure (ICD) on firm performance in the pharmaceutical and chemical industry of Bangladesh. In the study, 21 listed pharmaceutical and chemical companies have been selected as sample for 2016 and 2017. Content analysis was performed to assess the level of disclosure regarding intellectual capital and pooled cross-sectional analysis was used to assess the relationship between ICD and firm performance. The study found a positive and significant relationship between ICD and firm performance. Besides, an in-depth analysis of the study showed that all the components of ICD namely internal capital disclosure, external capital disclosure, and human capital disclosure are also positively and significantly associated with firm performance.

Tsai and Mutuc (2020) investigated the mediating effects of corporate financial performance on the relationship between IC components (ICs) and corporate sustainability reporting (CSR) of firms from the food industry in Asia. The study analyzed 308 firm-year observations of 44 listed firms from 2011 to 2017. The study employed a multivariate regression model to test the relationship between intellectual capital components and CSR and its pillars, and the mediating effect of corporate financial performance on the relationship between ICs and CSR and its pillars. The results of the study provided mixed findings regarding the effects of ICs and CSR. In addition, results vary from the disaggregated effects of each IC component on environmental, social, and governance pillars. The results also indicated that the combination of accounting and market-based estimates of financial performance was found to be significant mediating factor to explain the phenomenon which varies per ICs and dimensions of corporate sustainability reporting (CSR).

Rusgowanto and Panggabean (2021) determined the effect of company characteristics, intellectual capital, and CSR on firm value in companies listed on the Indonesia Stock Exchange period 2014-2017. The sample used in this study was taken using a purposive sampling method. 1,953 companies were selected as samples. The analysis technique in this study used linear regression analysis with the help of SPSS program version 24. The results of the study indicated that company characteristics affect firm value, but intellectual capital and firm size have no influence. The statistical test used in the study is multiple linear regression with a significant value of 5%. The results of the study found that disclosure of corporate social responsibility had no positive and significant effect on firm value.

Lu, Li, Luo, Anwar and Zhang (2021) scrutinized the impact of the dimensions of Intellectual Capital (IC) human capital, structural capital, and relational capital (RC) on sustainable growth (SG) with the mediating role of Sustainable Competitive Advantage (SCA). Data from 2010 to 2017 of 90 listed

firms of China and Pakistan, respectively, and applied linear regression analysis. The results indicate that IC plays a significant role in the SG of Chinese and Pakistani firms. IC has a significant influence on differentiation strategy (DS) in Chinese firms whereas only RC has an insignificant influence on DS in Pakistani firms. IC has a significant influence on cost leadership strategy (CLS) in Pakistani firms whereas structural and RC have an insignificant influence on the SG of Chinese firms.

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.

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.

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.

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 ($P<0.05$).

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.

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.

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-nsignificant 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.
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.

Abiola and Mohammed (2021) investigated the effect of intellectual capital (IC) on the financial performance (FP) of pharmaceutical firms listed on the Nigerian stock exchange. The study measure IC by Value added intellectual coefficient of a company (VAIC) model. The research sample consisted of pharmaceutical companies listed on the stock exchange in Nigeria during 2010-2019. The study adopted multiple regression analysis. The result showed that intellectual capital significantly and positively impacts the financial performance of the companies.

Osim and Idorenyin (2021) examined the effect of human and intellectual capital reporting on the profitability of listed manufacturing companies in Nigeria. The expost facto research design was adopted involving the application of content analysis to extract required data from published financial reports of 23 sampled industrial and natural resources manufacturing companies selected purposively

from 2009 to 2018. The data obtained were analyzed using descriptive and inferential statistics from the multiple regression analysis models. It was concluded that despite the fact listed manufacturing companies are yet to fully embrace human and intellectual capitals reporting, these categories of capitals have a significant positive effect on the profitability of manufacturing firms in Nigeria within the study period.

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.

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.

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.

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.

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.

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).

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.

Numerous studies have tried to establish the link between intellectual capital and firm's performance, yet findings remain inconclusive. Buallay (2022); Asiaei, Jusoh, Barani and Asiaei (2022); Okoye, Ifurueze, Agubata and Emeka-Nwokeji (2021); Olayinka (2021); Chukwuebuka, Obiora and Ikechukwu (2021); Osim and Idorenyin (2021); Abiola and Mohammed (2021); Abiola and Mohammed (2021); Duc, Thi, Thanh, Nguyen and Pham (2021); Tom-West, Okoye and Amahalu

(2021); Jaya, Dian and Damai (2021); Okoye and Izedonmi (2021) found a positive relationship between intellectual capital and firm's performance. Salawu, Mamman, Dahiru, Ado and Yunusa (2021); Reboredo and Sowaity (2021); Mahdi and Grzegorz (2021); Najib and Nawangsari (2021); Lu, Li, Luo, Anwar and Zhang (2021) reported a negative relationship between intellectual capital and financial performance. On the other hand, Ahamad, Al Jaifi and Ehigiamusoe (2022); Salawu, Mamman, Dahiru, Ado and Yunusa (2021); Reboredo and Sowaity (2021); Naning and Erna (2021); Ibrahim, Mohammed, Agbi, Nasiru and Umar (2021); Worimegbe and Oyewole (2021); Bansal, Samad and Bashir (2021); Rusgowanto and Panggabean (2021) showed a non-significant relationship between intellectual capital and performance.

3. MATERIAL AND METHOD

This study employed *ex-post facto* research design. This is because *ex-post facto* research design involves repeated observations of the same units (companies in this study) over a period of time (2008 to 2021). *Ex-post facto* research design also seeks to determine the cause-effect relationship between the dependent and independent variables of the study. The population of this study comprised the entire twelve (12) Oil and Gas firms listed on the floor of the Nigerian Exchange (NGX) Group as at 31st December, 2021. The population elements of this study are: 11 Plc (formerly Mobil Oil Plc); Anino International 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..

Eleven (11) listed Oil and Gas companies were selected as the sample size of this study with the utilization of purposive sampling method. Data were gathered from the published financial statements of listed eleven (11) Oil and Gas companies in Nigeria, which are: 11 Plc (formerly Mobil Oil Plc); Anino International Plc; Capital Oil Plc; Conoil Plc; Eterna Plc; Japaul Oil & Maritime Services; MRS Oil Nigeria Plc; Oando Plc; Rak Unity Petroleum Company Plc; Seplat Petroleum Development Company Plc; Total Nigeria Plc. This study made use of secondary data precisely. The data were sourced from publications of the Nigerian Exchange (NGX) Group, fact books, annual report and accounts, and websites of the sample listed oil and gas companies, particularly the comprehensive income statement and statement of financial positions of these companies as well as their respective notes to the accounts and stand alone sustainability report. In determining the presence of environmental, economic and social sustainability, the disclosure occurrence method of content analysis technique were applied to the information in corporate reports and sustainability reports. The

study adopted the Global Reporting Initiative (GRI) framework disclosures according to the G4 guidelines for the purpose of developing the environmental, economic and social disclosure indices. The study variables of this study were of two sets. The dependent variable is sustainability reporting, which was proxied using environmental sustainability reporting, economic sustainability reporting and social sustainability reporting while drivers for the independent variable (intellectual capital) include; human capital efficiency, structural capital efficiency and capital employed efficiency.

Intellectual capital which is the independent variable was proxied into 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) = book value of firm net assets.

CE = physical capital + financial assets

CE = Total assets – intangible assets

CEE = VA/CE

CE represents tangible resources while HC represents intangible resource.

VA_{it} = $OUTPUT_{it}$ - $INPUT_{it}$

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

- Human Capital Efficiency (HCE). In VAIC model, HC is defined as salary and wages in a period. Besides showing the firm size, high HC reflects higher employee skills that would add more value compared to employees with lower salary and wages. HCE shows the efficiency of HC usage in creating VA. If the human capital cost is low while VA is high then the firm uses its HC efficiently.

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**
Independent Variable (Intellectual Capital)			
	Human Capital Efficiency	HCE	$\frac{\text{Value Added}}{\text{Human Capital}}$
	Structural Capital Efficiency	SCE	$\frac{\text{Value Added - Human Capital}}{\text{Value Added}}$
	Capital Employed Efficiency	CEE	$\frac{\text{Output - Input}}{\text{Total Assets – Intangible Assets}}$
Dependent Variable (Sustainability Reporting)			
	Environmental Sustainability Reporting	ENVSR	Total Environmental Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
	Economic Sustainability Reporting	ECOSR	Total Economic Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
	Social Sustainability Reporting	SOCSR	Total Social Sustainability Disclosure Score/Maximum Sustainability Disclosure Score Possible for a Firm
Control Variables			
	Leverage	LEV	Ratio of Total debt/Total Assets
	Firm Size	FSZ	Natural logarithm of Total Assets

Source: Researcher's compilation

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);

$EVA = \beta o + \beta_1 HCE + \beta_2 SCE + \beta_2 CEE + \varepsilon$ …… (1)

Where:

βo is the intercept of the regression.

β_1, β_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:

$ENVSR_{it} = \beta o + \beta_1 HCE_{it} + \beta_2 LEV_{it} + \beta_3 FSZ_{it} + \mu_{it}$ - - - **Ho_1**

$ECOSR_{it} = \beta o + \beta_1 SCE_{it} + \beta_2 LEV_{it} + \beta_3 FSZ_{it} + \mu_{it}$ - - - **Ho_2**

$SOCSR_{it} = \beta o + \beta_1 CEE_{it} + \beta_2 LEV_{it} + \beta_3 FSZ_{it} + \mu_{it}$ - - - **Ho_3**

Where:

ε is the error term capturing other explanatory variables not explicitly included in the model.

βo is the intercept of the regression.

β_1,β_2 and β_3 are the coefficients of the regression

$ENVSR_{it}$ = Environmental Sustainability Reporting of firm í in period t

$ECOSR_{it}$ = Economic Sustainability Reporting of firm í in period t

$SOCSR_{it}$ = Social Sustainability Reporting of firm í in period t

HCE = Human Capital Efficiency

SCE = Structural Capital Efficiency

CEE = Capital Employed Efficiency

LEV_{it} = Leverage of firm í in period t

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

í = individual firms

t = time periods

Both the Descriptive and Inferential statistics were employed in this study. Preliminary data analysis refers to use of descriptive statistics in interpretation of data. These descriptive statistics include mean, median, standard deviation, kurtosis, skewness, maximum and minimum. On the other hand, inferential data analysis entails the use of statistical tools to test the hypotheses:

i. Pearson Correlation Analysis: Is a good measure of relationship between two variables, tells us about the strength of relationship and the direction of relationship as well.

ii. Multicollinearity Test: will be used to determine if one or more pairs of the explanatory (independent) variables are highly or perfectly correlated.

iii. Panel Least Square (PLS) regression analysis: will be used to predict the effect of the independent variable on the dependent variable.

4. RESULT AND DISCUSSIONS

4.1 Data Analysis

Table 2 Descriptive statistics for listed oil and gas firms in Nigeria

	ENVSR	ECOSR	SOCSR	HCE	SCE	CEE	LEV	FSZ
Mean	0.0679	0.0143	0.0471	3.6679	0.5993	0.1386	0.2764	10.2143
Median	0.0600	0.0100	0.0300	2.7350	0.6650	0.1350	0.2050	10.3200
Maximum	0.2400	0.0300	0.1800	10.4500	0.9000	0.2900	0.6500	10.6200
Minimum	0.0300	0.0100	0.0000	0.6000	0.0800	0.0300	0.0900	9.5700
Std. Dev.	0.0529	0.0076	0.0504	3.0071	0.2621	0.0809	0.1662	0.3041
Skewness	2.6649	1.3577	1.5058	1.2401	-0.9260	0.2741	1.0572	-0.6085
Kurtosis	9.3353	3.2337	4.4412	3.4864	2.7751	1.9583	2.8841	2.3790
Jarque-Bera	39.9824	4.3332	6.5022	3.7263	2.0301	0.8083	2.6158	1.0890
Probability	0.0000	0.1146	0.0387	0.1552	0.3624	0.6675	0.2704	0.5801
Sum	0.9500	0.2000	0.6600	51.3500	8.3900	1.9400	3.8700	143.0000
Sum Sq. Dev.	0.0364	0.0007	0.0331	117.5534	0.8931	0.0852	0.3589	1.2021
Observations	14	14	14	14	14	14	14	14

Source: E-Views 10 Descriptive output, 2023

4.1.1 Interpretation

Based on table 2, it can be observed that on average, as indicated by the mean, the ENVSR of oil and Gas firms in Nigeria is 0.0679. The implication is that the involvement of sampled firms in environmental performance is about 6.79%. However, throughout the period of 2008 to 2021, the maximum degree of their environmental performance for sampled firms is 24% while the minimum ENVSR is 3%. ECOSR has a mean of 0.0143 with a standard deviation of 0.0076 implies that involvement of oil and gas companies in Nigeria towards corporate economic sustainability is about 1.43% with a maximum level of 3% and a minimum of 1%. SOCSR with an average mean of 0.0471 and standard deviation of 0.0504 infers that the participation of oil and gas companies in Nigeria towards Social Sustainability is averagely 4.71%. The maximum level of oil and gas companies' participation in Social Sustainability is 18% with 0% minimum level. Averagely, the HCE of sampled firms stood at 3.6679, a maximum of 10.4500, a minimum HCE of 0.6000 at a standard deviation of

1.0071. The observed SCE of studied firms is 0.5993 with a maximum value at 0.9000, a minimum of 0.0800 and standard deviation of 0.2621. For CEE, the mean value is at 0.1386 having a minimum efficiency of 0.0300, a maximum CEE of 0.2900 and standard deviation of 0.0809.

Table 3: Pearson Correlation Matrix

	ENVSR	ECOSR	SOCSR	HCE	SCE	CEE	LEV	FSZ
ENVSR	1.0000	0.1785	-0.1868	0.0122	0.0015	0.0405	-0.1601	0.3571
ECOSR	0.1785	1.0000	-0.0864	0.4806	0.4520	0.3502	0.4969	-0.1726
SOCSR	-0.1868	-0.0864	1.0000	-0.3526	0.0266	-0.2554	0.1675	-0.0212
HCE	0.0122	0.4806	-0.3526	1.0000	0.7290	0.8701	0.6687	-0.3943
SCE	0.0015	0.4520	0.0266	0.7290	1.0000	0.7969	0.4964	-0.4835
CEE	0.0405	0.3502	-0.2554	0.8701	0.7969	1.0000	0.4549	-0.1251
LEV	-0.1601	0.4969	0.1675	0.6687	0.4964	0.4549	1.0000	-0.4565
FSZ	0.3571	-0.1726	-0.0212	-0.3943	-0.4835	-0.1251	-0.4565	1.0000

Source: E-Views 10.0 Correlation Output, 2023

The Pearson Correlation Matrix in Table 3 delineates the existence of a positive relationship between HCE (0.0122), SCE (0.0015), CEE(0.0405), FSZ (0.3571), while, LEV negatively relates ENVSR at -0.1601. Similarly, ECOSR has a positive relationship with HCE (0.4806), SCE (0.4520), CEE (0.3502) and LEV (0.4969) but negatively associates with FSZ at -0.1726. Moreso, SOCSR negatively correlate with HCE, CEE and FSZ at coefficient factors of -0.3526, -0.2554 and -0.0212 respectively, but associates positively with SCE at 0.0266.

4.1.2. Pre-Estimation Test

4.1.2.1 Multicollinearity Test

Table 4: Test of Multicollinearity

Variance Inflation Factors

Date: 02/09/23 Time: 11:19

Sample: 2008 2021

Included observations: 14

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.829735	3942.865	NA
HCE	0.000256	2.655114	1.020333
SCE	0.018984	3.815408	5.754866
CEE	0.478635	5.751118	1.383703
LEV	0.017787	8.625657	2.166958
FSZ	0.007574	3757.964	3.090348

Source: E-Views 10.0 output file, 2023

Table 4 shows that the variance inflation factors (VIF) for the study variables are less than 10 respectively as revealed by the values of the Centered VIF. This is an indication of non existence of multicollinearity among the variables in the model. Thus, the data set is good for regression purpose.

4.2 Test of Hypotheses

4.2.1 Hypothesis One

Ho_1: Human Capital Efficiency has no significant effect on Environmental Sustainability Reporting of listed Oil and Gas firms in Nigeria.

Table 5: Panel Least Square Regression analysis testing the effect of Human Capital Efficiency on Environmental Sustainability Reporting

Dependent Variable: ENVSR

Method: Panel Least Squares

Date: 02/09/23 Time: 11:29

Sample: 2008 2021

Periods included: 14

Cross-sections included: 11

Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.623676	0.157491	-3.960088	0.0001
HCE	0.004298	0.001799	2.389783	0.0181
LEV	-0.047623	0.033339	-1.428453	0.1552
FSZ	0.067405	0.015051	4.478298	0.0000

R-squared	0.158056	Mean dependent var	0.067483
Adjusted R-squared	0.141217	S.D. dependent var	0.051821
S.E. of regression	0.048022	Akaike info criterion	-3.208665
Sum squared resid	0.345924	Schwarz criterion	-3.129783
Log likelihood	251.0672	Hannan-Quinn criter.	-3.176623
F-statistic	9.386366	Durbin-Watson stat	1.858640
Prob(F-statistic)	0.000010		

Source: E-Views 10.0 Regression Output, 2023

4.2.1.1 Interpretation of Regression Output

Table 5 shows the output of the regression on the effect of Human Capital Efficiency on Environmental Sustainability Reporting:

$ENVSR_{it} = -0.623676 + 0.004298HCE_{it} - 0.047623LEV_{it} + 0.067405FSZ_{it} + \mu_{it}$

The model infers that 1% increase in HCE and FSZ will exert 0.04% and 6.74% increase on ENVSR of listed oil and gas firms in Nigeria, while, a unit increase in LEV will cause ENVSR to reduce ENVSR by 4.762%. It also shows that HCE (β_1=0.004298) and FSZ (β_3= 0.067405) have a positive relationship towards ENVSR, while, LEV (-0.047623) negatively relates with ENVSR. The slope coefficient reveal that; P(x_1=0.0181<0.05; x_2=0.1552>0,05; x_3=0.0000<0.05). The model delineate that at 95% confidence level, there is a significant positive relationship between HCE and ENVSR; a non-significant negative relationship between LEV and ENVSR; a significant positive relationship between FSZ and ENVSR. The Durbin-Watson Value of 1.858640 buttressed the fact that the model does not contain auto-correlation, thereby, making the regression fit for prediction purpose. The adjusted R-Squared of 0.241217 shows that 24.12% of the systematic variation in ENVSR could be explained by HCE, LEV and FSZ, while the remaining 75.88% is explained by the error term as part of the ENVSR which is not interpreted by the regression model.

4.2.1.2 Decision

Following the F-statistics of 9.386366 with an associated P-value of 0.000010 (p<0.05) which is less than 5%. Therefore, hypothesis H_1 is accepted while Ho is rejected. Hence, Human Capital Efficiency has a significant and positive effect on Environmental Sustainability Reporting of listed Oil and Gas firms in Nigeria at 5% level of significance. The result of this study is in line with the works of Buallay (2022); Chukwuebuka, Obiora and Ikechukwu (2021) but contradicts the findings of Ahamad, Al-Jaifi and Ehigiamusoe (2022); Reboredo and Sowaity (2021).

4.2.2 Hypothesis Two

Ho_2: Structural Capital Efficiency has no significant effect on Economic Sustainability Reporting of listed Oil and Gas firms in Nigeria.

Table 6: Panel Least Square Regression analysis testing the effect of Structural Capital Efficiency on Economic Sustainability Reporting

Dependent Variable: ECOSR

Method: Panel Least Squares

Date: 02/09/23 Time: 11:33

Sample: 2008 2021

Periods included: 14

Cross-sections included: 11

Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.051197	0.022544	-2.270918	0.0246
SCE	0.010781	0.002482	4.343700	0.0000
LEV	0.010708	0.003852	2.779862	0.0061
FSZ	0.005370	0.002124	2.528731	0.0125

R-squared	0.213805	Mean dependent var	0.013075
Adjusted R-squared	0.198081	S.D. dependent var	0.007195
S.E. of regression	0.006443	Akaike info criterion	-7.226045
Sum squared resid	0.006227	Schwarz criterion	-7.147163
Log likelihood	560.4055	Hannan-Quinn criter.	-7.194004
F-statistic	13.59747	Durbin-Watson stat	1.890072
Prob(F-statistic)	0.000000		

Source: E-Views 10.0 Regression Output, 2023

4.2.2.1 Interpretation of Regression Coefficient Result

The following regression equation was obtained from Table 6:

ECOSR = -0.051197 + 0.010781SCE + 0.010708LEV + 0.005370FSZ

Using the above model, it is possible to determine the relationship between SCE, LEV, FSZ and ECOSR of listed oil and gas firms. Holding all other factors constant, an increase in one unit of the

independent and control variables (SCE, LEV and FSZ OCSR) results into a corresponding increase in one unit of ECOSR to the tune of 1%, 1% an 0.5% respectively. The slope coefficient shows that that the probability values; P(x_1=0.0000<0.05; x2=0.0061<0.05; x3=0.0125<0.05) are less than the critical P-value of 0.05. This implies that SCE, LEV, FSZ have a positive significant relationship with and ECOSR. Results in Table 6 indicate that the adjusted R-squared for the model is 0.218081, meaning that the regression model used for this study is a good predictor. The independent variables explained 21.80% of the variation in ECOSR of listed oil and gas firms. Only 78.20% of variation in ECOSR is not explained by the regression model. The Durbin-Watson value of 1.890072 indicates the absence of serial correlation in the model. From the test of coefficients result in Table 6, the probability value of the F-statistics = 0.000000 implies that the regression model is significant in predicting the relationship between the independent variables (SCE, LEV, FSZ) and the dependent variable (ECOSR). The degree of significance between the variables is less than α=0.05, therefore, the result indicates that the overall regression model is statistically significant and is useful for prediction purposes at 5% significance level.

4.2.2.2 Decision

The P-Value of the test Prob(F-statistic) = 0.000000 is less than the α-value value of 0.05; therefore H_1 is accepted and Ho is rejected. Thus, Structural Capital Efficiency has significant and positive effect on Economic Sustainability Reporting of listed Oil and Gas firms in Nigeria. at 5% level of significance. The findings of this study is consistent with the results of Asiaei, Jusoh, Barani and Asiaei (2022) ; Salawu, Mamman, Dahiru, Ado and Yunusa (2021); Osim and Idorenyin (2021) but negates the results of Worimegbe and Oyewole (2021); Mahdi and Grzegorz (2021).

4.2.3 Hypothesis Three

Ho_3: Capital Employed Efficiency has no significant effect on Social Sustainability Reporting of listed Oil and Gas firms in Nigeria

Table 7: Panel Least Square Regression analysis testing the effect of Capital Employed Efficiency on Economic Sustainability Reporting

Dependent Variable: SOCSR

Method: Panel Least Squares

Date: 02/09/23 Time: 11:35

Sample: 2008 2021

Periods included: 14

Cross-sections included: 11

Total panel (balanced) observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.123458	0.141799	-0.870655	0.3853
CEE	0.262799	0.050619	5.191740	0.0000
LEV	0.116033	0.027428	4.230479	0.0000
FSZ	0.017181	0.013593	1.263990	0.2082

R-squared	0.173304	Mean dependent var	0.047768
Adjusted R-squared	0.156770	S.D. dependent var	0.047420
S.E. of regression	0.043545	Akaike info criterion	-3.404434
Sum squared resid	0.284419	Schwarz criterion	-3.325552
Log likelihood	266.1414	Hannan-Quinn criter.	-3.372392
F-statistic	10.48170	Durbin-Watson stat	1.385097
Prob(F-statistic)	0.000003		

Source: E-Views 10 Regression Output, 2023

4.2.3.1 Interpretation of Regression Result

Table 23 has shown the meaningful role of Capital Employed Efficiency in determining the strength of Social Sustainability Reporting. The results are satisfactory in terms of standard analytic tests. The value of adjusted R-square showed that 26% of the total variation in dependent variable (SOCSR) is explained by independent variables (CEE, LEV, FSZ) to the determination of SOCSR while the remaining 74% is caused by other explanatory factors outside this model and this is captured by the

error term. There is no problem of autocorrelation in the model as shown by the value of Durbin-Watson stats of 1.385097. The overall performance of the model is satisfactory as shown by Prob(F-statistics) = 0.000003. From the empirical evidence, it is clearly obvious that there is a positive significant relationship between the CEE and SOCSR.

SOCR = -0.123458 + 0.262799CEE +μ

This implies that a unit increase in CEE will exert 26.28% corresponding increase on SOCSR. The implication of this model also proves that CEE has a significant effect on SOCSR and that CEE is significant in influencing the value of SOCSR.

4.2.3.2 Decision

Since there is strong evidence that SOCSR is affected by CEE at 5% level of significance. This research upholds that Capital Employed Efficiency has a significant and positive effect on Social Sustainability Reporting of listed Oil and Gas firms in Nigeria for the period of 2008 to 2021. This finding corroborates the works of Okoye, Ifurueze, Agubata and Emeka-Nwokeji (2021); Olayinka (2021); Abiola and Mohammed (2021) but opposite to the findings of Naning and Erna (2021); Ibrahim, Mohammed, Agbi, Nasiru and Umar (2021).

CONCLUSION AND RECOMMENDATIONS

The thrust of this study is to ascertain the effect of Intellectual Capital on Sustainability Reporting of listed Oil and Gas firms in Nigeria for a period of fourteen years (14) spanning from 2008-2021. Intellectual Capital which is the independent variable was proxied with Human Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency, while Sustainability Reporting served as the dependent variable of this study, measured by Environmental Sustainability Reporting, Economic Sustainability Reporting and Social Sustainability Reporting. Panel data were obtained from annual reports and accounts of the sampled oil and gas firms for the study period, using eleven (11) listed oil and gas firms in Nigeria. Panel Least Square (PLS) Regression analysis was employed via E-Views 10. The results of the tested hypotheses revealed that; Human Capital Efficiency has a significant and positive effect on Environmental Sustainability Reporting (β_1=0.004298; p-value = 0.0181<0.05); Structural Capital Efficiency has a significant and positive effect on Economic Sustainability Reporting (β_2=0.010781; p-value = 0.0000<0.05); Capital Employed Efficiency has a significant and positive effect on Social Sustainability Reporting (β_3=0.262799; p-value = 0.0000<0.05) of listed Oil and Gas firms in Nigeria at 5% level of significance. In conclusion, this study holds that Intellectual Capital significantly affect Sustainability Reporting of listed Oil and Gas firms in Nigeria.

Based on the findings of this study, the following recommendations were made:

i. Government agencies should give tax credit to organizations that comply with its environmental laws of the land which will encourage environmental reporting and in the long run enhance firm performance.

ii. Corporate entities in Nigeria should invest in economic sustainability activities in all its ramification in order to boost their image/reputation thereby increasing their returns.

iii. Based on the positive effect of intellectual capital and social sustainability reporting, companies should be socially responsible in order to enlarge the value for the shareholders and other stakeholders, hence, social accounting practices should be viewed as authorized not to be voluntary in all companies in Nigeria.

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