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INTELLECTUAL CAPITAL AND SUSTAINABLE GROWTH RATE OF LISTED SERVICE FIRMS IN NIGERIA

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ABSTRACT

This study assessed the nexus between intellectual capital and sustainable growth rate of listed service firms in Nigeria for a ten year period covering from 2015-2024. Human capital efficiency, structural capital efficiency and capital employed efficiency were used to proxy Intellectual Capital, while sustainable growth rate served as the dependent variable. In line with the objectives of the study, three hypotheses were formulated. 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 and Panel Least Square (PLS) regression analysis. Findings from the empirical analysis showed that human capital efficiency (β_1 = 0.065789; p-value = 0.0000), structural capital efficiency (β_2 = 0.024239; p-value = 0.0000) and capital employed efficiency (β_3 = 0.090735; p-value = 0.0000) have a significant and positive effect on sustainable growth rate. Conclusively, intellectual capital has a positive and significant effect on sustainable growth rate of listed service firms in Nigeria at 5% level of significance. It was recommended inter alia that firms should invest more in Human capital efficiency to improve performance.

Key words: *Intellectual Capital, Return on Investment, Sustainable Growth.*

INTRODUCTION

In recent years, the vision of companies has changed considerably. Recent studies have attributed vital importance to knowledge management and intellectual capital reporting (ICR) as drivers for the creation of firm value (Amahalu & Eyide, 2026). The importance of the interaction between physical assets and intellectual capital could contribute to two basic explanations: not only does the value of the firm depend on tangible and financial capital, but the efficiency of equity markets also depends on the efficiency of the intellectual capital employed. In the information age, effective use of intellectual capital is the most important

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factor in the success or failure of a business. For achieving superior performance and competitive advantage, firms have shifted their focus from investment on tangible assets to investment on intangibles. Intellectual capital is one of these intangibles with human capital, structural capital, and customer capital as its components (Amahalu & Nworie, 2026). Tangible assets can be easily imitated or purchased in a free market; thus, they cannot be a strategic asset and cannot create competitive advantage for the business. Intellectual capital (IC) is a group of knowledge assets that are attributed to an organization and most significantly contribute to an improved competitive position of the organization by adding value to the defined key stakeholders (Amahalu, et.al., 2025). Conceptual analysis of the impact of intellectual capital accelerated considerably since the Second World War. The current generation of digital information and communications technology allows the mobilisation of complex information structures in a way not hitherto possible, enabling the coding, stocking, transmission, processing, buying and selling of digital artefacts independent of distance.

Sustainable growth rate (SGR) is a measurement that indicates how fast an organization can continue growing without overextending its resources. The sustainable growth rate (SGR) is the approximate rate at which a company could grow if its current capital structure, that is, the mixture of debt and equity is maintained. Usually, the profitability ratio is measured by the return on assets, which compares the net income to the firms' assets. However, in recent years the concept of firm's growth has become very important as it is the outcome of the firm's efficient performance (King, et,al., 2025). Currently, the main focus is how much growth the firm can achieve because it reflects how efficient the firm is in capitalizing its available resources and how the firm is efficient in its decision making process and appropriate financial planning. It is against this backdrop, that this study sought to examine the effect of intellectual capital on sustainable growth rate of listed service firms in Nigeria.
Intellectual capital is of substantial and growing importance in innovation and productivity growth, enterprise competitiveness and economic performance. Intellectual capital comprises a number of components, including research and development (R&D), technology and intellectual property rights; human resources; organizational and workplace structure; marketing, customer and supplier networks; and software (Sylvanus, et.al., 2025). However, these components are often poorly identified and measured, information is collected in widely different ways, and financial accounting and reporting practices in general fail to recognise them as assets. Where non-financial information is available, it is ad hoc, difficult to verify,

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and not comparable across companies or countries. The resulting gap in transparent, reliable and accurate information interferes with the effective management of intellectual capital, distorting the allocation of resources among different forms of intellectual capital, and between intellectual and other forms of capital.

In knowledge-based economy, the growing distance between the market and book value is attributed to intangible assets that cannot be properly measured and reported within the traditional accounting framework, thereby, causing each company to use a different accounting method, therefore, posing a challenge towards the measurement of IC in firms. However, the measurement of IC is difficult since it is intangible and non-physical in nature (Ubeh, et.al., 2024). The relative lack of IC accounting recognition and its growing role in the value creation process, imply that financial statements have lost some of their value for shareholders and many other users.

Objectives

The broad objective of this study is to evaluate the effect of intellectual capital on sustainable growth rate of listed service firms in Nigeria. The specific objectives of this study are to:

1. determine the effect of human capital efficiency on sustainable growth rate of listed service firms in Nigeria
2. ascertain the effect of structural capital efficiency on sustainable growth rate of listed service firms in Nigeria
3. examine the effect of capital employed efficiency on sustainable growth rate of listed service firms in Nigeria

LITERATURE REVIEW

Intellectual Capital (IC)

Intellectual capital is the intangible value of a business, covering its people (human capital), the value relating to its relationships (relational capital), and everything that is left when the employees go home (structural capital), of which intellectual property (IP) is but one component (Amahalu, et.al., 2022). Intellectual capital is the sum of everything everybody in a company knows that gives it a competitive edge (Tom-West, et.al., 2021). The IFRS (International Financial Reporting Standards) committee developed the International Accounting System 38 with the purpose of prescribing the accounting treatment for intangible assets. IAS 38.8 defines an intangible asset as an identifiable non-monetary asset without

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physical substance. An asset is a resource that is controlled by the entity as the result of past events (for example purchase or self-creation) and from which future economic benefits (inflows of cash or other benefits) are expected. Intellectual capital can be defined as the total of intangible assets that is, all the invisible, non-monetary assets held by an organization that are amassed over time, not included in the balance sheet, and can be identified and analyzed separately (Sumiati & Wati, 2024).

Human Capital Efficiency

Human capital is the most important asset of an organization and a source of innovation and strategic renewal. Human capital is a sum of technical expertise, leadership ability, risk-taking, and problem solving ability (Eyide & Amahalu, 2026). Human capital is an intangible asset or quality not listed on a company's statement of financial position. It can be classified as the economic value of a worker's experience and skills. This includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality (Ndu, et.al., 2024). Human capital is the economic value of the abilities and qualities of labor that influence productivity. These qualities include higher education, technical or on-the-job training, health, and values such as punctuality (Amahalu, et.al., 2023). Human capital is the stock of habits, knowledge, social and personality attributes (including creativity) embodied in the ability to perform labour so as to produce economic value. The concept of human capital recognizes that not all labor is equal. But employers can improve the quality of that capital by investing in employees - the education, experience, and abilities of employees all have economic value for employers and for the economy as a whole (Mbonu & Amahalu, 2023).

H_{o1}: Human capital efficiency has no significant effect on sustainable growth rate of listed service firms in Nigeria

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 (Amahalu & Okudo, 2023). 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 (Okudo, et.al., (2022). Structural capital is the supportive infrastructure that enables the rest

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of an organization to function in a repeatable, scalable way. It is owned by an organization and remains with an organization even when people leave. Structural capital includes processes, data, systems, designs, and knowledge. Some structural capital qualifies for special legal protection as intellectual property such as patents, trademarks, copyrights and trade secrets (Nwankwo et.al., 2024).

H_{o2}: *Structural capital efficiency has no significant effect on sustainable growth rate of listed service firms in Nigeria*

Capital Employed Efficiency

Capital employed refers to the amount of capital investment a business uses to operate and provides an indication of how a company is investing its money. It generally refers to the capital utilized by the company to generate profits (Onyeozili, et.al., 2022). Capital employed is the total amount of capital used for the acquisition of profits by a firm or project. Capital employed can also refer to as the value of all the assets used by a company to generate earnings (Aruna, et.al., 2024). Capital efficiency is the ratio between dollar expenses incurred by a company and dollars that are spent to make a product or service (Amahalu, et.al., 2024). This is the metric to look at because the more efficiently capital is used to produce a product or service, the better chance a company has for approaching profitability (Ezennia & Amahalu, 2024).

H_{o3}: *Capital employed efficiency has no significant effect on sustainable growth rate of listed service firms in Nigeria*

Sustainable Growth Rate (SGR)

A sustainable growth rate is the maximum rate of growth a company can attain without borrowing internal revenue from outsiders (Obumneme, et.a., 2026). Companies use their internal revenue to support their growth without taking on any extra debts or equity. The sustainable growth rate is the growth rate in profits that a company can reasonably achieve, consistent with its established financial policy. The sustainable growth rate is the rate of growth that a company can expect to see in the long term (Eze, et.al., 2025).

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Human Capital Efficiency and Sustainable Growth Rate

Human Capital has long been acknowledged to be an important factor for the productivity of individuals and more recently has been increasingly identified as a factor influencing the competitiveness of firms (Okoye, et.al., 2015; Amahalu, et.al., 2016). Ndubuisi and Ezechukwu (2017) argue that the ability of a corporate organization to successfully implement business strategies solely depends on efficient use of intangibles asset, particularly Human Capital. According to Amahalu, et.al., (2017), the degree to which employees contributes to effective implementation of the organization strategy is linked to Human Capital performance. Hence, they believed that Human Capital performance is indeed performance behaviors that affect customers buying experience and one can conclude that it is the basis of the company's financial performance.

Structural Capital Efficiency and Sustainable Growth Rate

Value is not created by the quantity of goods and services, but through the quality contributed by employees, such as knowledge in designing, new software programs, or creating new medicine (Amahalu & Ezechukwu, 2017). People are the main carriers of knowledge. Employees are treated as investments, such as investments made in factories and machinery to create value during the industrial economy. Investing in employees means investing in the main drivers of the contemporary economy. Intangible assets, including intellectual capital are sources of economic value and corporate wealth, in addition to the products produced by companies (Amahalu & Obi, 2020;S Ndulue, et.al., 2021; Omabu, et.al., 2022).

Capital Employed Efficiency and Sustainable Growth Rate

Capital employed indicates the investment in the business, the total amount of funds used for expansion or acquisition by a firm as well as the total value of assets dedicated towards the business (Ndubuisi & Obi, 2020; Okafor, et. al., 2022). Capital Employed is the total funds deployed for running the business with the intent to earn profits (Otti, et.al., 2022). In contrast, the inefficient use of resources has economic costs that fall on society and rob its members of need fulfillment and the beneficial use of human resources. Such losses are counter to social responsibility and sustainability (Nweke, et.al., 2022; Adibeli & Amahalu, 2023; Ndubuisi, et.al., 2023).

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Theoretical Review

This study derives theoretical support from Knowledge Based View

Knowledge-Based Theory

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 (Eneh, et.al., 2023). The knowledge-based view of the firm was propounded Kogut and Zander (1993). 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.

Empirical Review

Ramli, Rahim, Mat-Nor and Marzuki (2022) usedSTATA software to conduct structural equation model (SEM) in analyzing data from 181 Shariah-compliant companies in Malaysia collected from 2007 to 2016. According to the results, the Shariah-compliant sample meets SEM requirements, such that the sustainable growth rate shows a significant relationship with share price performance. According to mediation effect results, capital structure, dividend policy, profitability and firm size were considered “indirect-only mediator.

Salman and abogun (2024) carried out a study on intellectual capital efficiency and the market value of Nigerian quoted companies. The specific objectives were to: determine the influence of human capital efficiency on market value of the listed Nigerian companies; examine the influence of structural capital efficiency on market value of the listed Nigerian companies; and evaluate the influence of capital employed efficiency on market of the listed Nigerian companies firms in Nigeria. The data were sourced from 2018 to 2022 annual audited accounts of the 117 companies quoted on the Nigerian Exchange Group. The regression technique was employed to analyse the data. The findings showed that capital employed efficiency positively influenced market value throughout the five years but the human capital efficiency and structural capital efficiency have mixed results. Human capital efficiency and structural capital efficiency were both positively and negatively influenced market value of the sampled Nigerian companies for the periods of observation. The study thus concluded that intellectual capital influenced the market value of the sampled Nigerian companies and

provided the recommendation that the sampled companies should improve their investments on intellectual capital resources (such as staffs' training, staff welfare) and physical assets.

Erawati, Hermuningsih, Grediani, Rofiqoh, Nugrahani, and Derang (2025) examined the impact of liquidity, leverage, and profitability on financial performance, with financial performance acting as an intervening variable in the sustainable growth rate (SGR) of companies listed on the Indonesia Stock Exchange from 2019-2023. Sustainable Growth Rate (SGR) and Sustainable Development Goals (SDGs) have a close relationship, because both focus on sustainable development that maintained a balance between economic, social and environmental aspects. Theoretical Framework: The research used stakeholder theory, which explained the company's relationship with various parties who have an interest in its activities and success. The study employed a quantitative approach using data from 470 companies across various sectors in Indonesia, selected through purposive sampling. Data analysis was conducted using empirical testing to assess the relationships between liquidity, leverage, profitability, financial performance, and sustainable growth. The results revealed that liquidity and profitability have a positive influence on financial performance, while leverage does not significantly affect financial performance. Financial performance, in turn, has a direct and significant effect on the sustainable growth rate.

MATERIALS AND METHODS

The research design that was employed in this study is the *ex-post facto* research design. The population of this study consists of the eighty two (82) service firms listed on the Nigeria stock exchange as at 31st December, 2023 (See Appendix A). This study adopted purposive sampling technique. Fifty-one (51) firms were selected as the sample size (refer to appendix B). This study made use of secondary data precisely.

Independent Variables

Intellectual capital which is the independent variable would be 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*

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CE = book value of firm net assets (CE = physical capital + financial assets or CE = Total assets – intangible assets)

CEE = VA/CE …….. Eqn 1.

CEE represents tangible resources while HC represents intangible resource (Pulic, 2000).

VA_{it} = $OUTPUT_{it}$ - $INPUT_{it}$ …….. Eqn 2.

$Output_{it}$ 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 (Pulic, 1998). 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 ……. Eqn 3.

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 (1998)

SCE = SC/VA ……. Eqn 4.

SC = VA – HC ……. Eqn 5.

where HC and SC are in reverse proportion, increasing HC will decrease SC. SCE is measured (Pulic, 1998):

Intellectual Capital Efficiency (ICE) is calculated:

ICE = HCE + SCE ……. Eqn 6.

value added efficiency of tangible and intangible assets (VAIC):

VAIC = CEE + HCE + SCE ……. Eqn 7.

Dependent Variable

SGR = ROE × (1-Dividend Payout Ratio)

Where,

SGR = Sustainable Growth Rate

ROE= Net Income ÷ Shareholder's Equity

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Dividend Payout Ratio = Dividends Paid ÷ Net Income

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	$\frac{\text{Output - Input}}{\text{Total Assets – Intangible Assets}}$
	Value Added Intellectual Coefficients	VAIC	CEE + HCE + SCE
Dependent Variable			
	Sustainable Growth Rate	SGR	ROE×(1-Dividend Payout Ratio)

Source: Authors' compilation (2026)

The model for this study was adapted from Pulic (2000):

$ROA = \beta_o + \beta_1 CEE + \beta_2 SCE + \beta_3 HCE + \varepsilon$ ..... Eqn 7.

Where

ROA = Return on Assets

CEE = Capital Employed Efficiency

SCE = Structural Capital Efficiency

HCE = Human Capital Efficiency

To test H_1, H_2, H_3 and H_4, this study estimated the following regression equations:

$SGR = f(HCE, SCE, CEE) + \varepsilon$..... Eqn 8.

The specific model constructs would be:

$SGR_{it} = \beta_0 + \beta_1 HCE_{it} + \varepsilon_{it}$ ..... Eqn 9

$SGR_{it} = \beta_0 + \beta_1 SCE_{it} + \varepsilon_{it}$ ..... Eqn 10.

$SGR_{it} = \beta_0 + \beta_1 CEE_{it} + \varepsilon_{it}$ ..... Eqn 11.

Equations 9, 10, and 11 represents models for the test of hypotheses 1, 2 and 3 respectively.

Thus:

$SGR_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \varepsilon_{it}$ ..... Eqn 12.

Where:

ε_{it} is the error term capturing other explanatory variables of the firm not explicitly included in the model.

βo is the intercept of the regression.

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β_1, β_2, β_3 and β_4 are the coefficients of the regression (Intellectual Capital)

SGR_{it} = Sustainable Growth Rate of firm i in period t

HCE_{it} = Human capital efficiency of firm i in period t

SCE_{it} = Structural Capital efficiency of firm i in period t

CEE_{it} = Capital Employed Efficiency of firm i in period t

i = individual firms

t = time periods

RESULTS AND DISCUSSIONS

Table 2 Pearson Correlation Matrix

	SGR	HCE	SCE	CEE
SGR	1.0000			
HCE	0.4464	1.0000		
SCE	0.5278	0.6806	1.0000	
CEE	0.0303	0.2000	0.2516	1.0000

Source: E-Views Correlation Output, 2026

As indicated in table 2, the study found that HCE (0.4464); SCE (0.5278) and CEE (0.0303) have a positive relationship with SGR.

Table 3: Panel Least Square Regression Analysis testing the effect of HCE, SCE, CEE on SGR

Dependent Variable: SGR
Method: Panel Least Squares
Date: 02/15/26 Time: 08:56
Sample: 2015 2024
Periods included: 10
Cross-sections included: 51
Total panel (balanced) observations: 510

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.106267	0.001165	91.21724	0.0000
HCE	0.065789	0.001895	34.71319	0.0000
SCE	0.024239	0.002906	8.340367	0.0000
CEE	0.090735	0.019668	4.613411	0.0000

R-squared	0.609131	Mean dependent var	0.115000
Adjusted R-squared	0.605034	S.D. dependent var	0.009229
S.E. of regression	0.007693	Akaike info criterion	-6.889100
Sum squared resid	0.029949	Schwarz criterion	-6.855889
Log likelihood	1760.721	Hannan-Quinn criter.	-6.876079
F-statistic	75.47013	Durbin-Watson stat	1.898468
Prob(F-statistic)	0.000000		

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Source: E-Views 10.0 Regression Output, 2026

The effect of Intellectual capital on sustainable growth rate is evaluated based on the result of table 3:

SGR = 0.106267 + 0.065789HCE + 0.024239SCE + 0.090735CEE + μ

The drawn inference from the model implies that one unit increase in HCE will cause SGR to increase by 65.79%; also one unit increase in SCE will exert 2.42% in SGR; while a unit increase in CEE will lead to a corresponding increase of 9.07%. From table 3, HCE with a positive co-efficient (β_1) of 0.065789 has a significant effect on SGR as indicated by the t-statistic of 34.71319 and its associated probability value of 0.0000 < 0.05; SCE with a positive co-efficient (β_2) of 0.024239 has a significant effect on SGR as indicated by the t-statistic of 8.340367 and its associated probability value of 0.0000 < 0.05; CEE with a positive co-efficient (β_3) of 0.090735 has a significant effect on SGR as indicated by the t-statistic of 4.613411 and its associated probability value of 0.0000 < 0.05. The adjusted R squared which examines the extent to which the predictors (HCE, SCE and CEE) explain the variations in the dependent variable (SGR) shows that the R Squared figure of 0.605034 indicates that, reliance on this model will account for 60.50% of the variations in the dependent variable (SGR, while the remaining 39.5% is accounted by other factors outside the scope of this model The Durbin-Watson value of 1.898468 buttressed the fact that the model does not contain auto-correlation, since the value1.898468 is not more than 2 approximately, thereby, making the regression fit for prediction purpose. The analysis resulted in F-statistic value of 75.47013 with corresponding p-value of 0.000000. This confirms that, the model is significantly reliable. That means one can rely on the model to predict SGR with high accuracy.

Decision: Since the p-value of the test = 0.000000 is less than the critical significant value of 5%, thus H_1 is accepted and Ho rejected. Therefore, this study upholds that Human Capital Efficiency had a positive and significant effect on sustainability growth rate of listed service firms in Nigeria at 5% level of significance (β_1 = 0.065789; p-value = 0.0000); Structural Capital Efficiency had a positive and significant effect on sustainability growth rate of listed service firms in Nigeria at 5% level of significance (β_2 = 0.024239; p-value = 0.0000); and finally, Capital Employed Efficiency had a positive and significant effect on sustainability growth rate of listed service firms in Nigeria at 5% level of significance (β_3 = 0.090735; p-value = 0.0000)

CONCLUSIONS AND RECOMMENDATIONS

Given the outcome of the relevant analysis and the findings made, the study concludes that intellectual capital had a significant and positive effect on sustainability growth rate of listed oil and gas firms in Nigeria at 5% level of significance.

On the premise of these study findings, the following recommendations were made:

i. Consequent upon the positive relationship between human capital efficiency and sustainable growth rate of all service firms under study, therefore, firms should invest more in human capital efficiency to improve performance. Also, firms should endeavor to recruit and employ competent professionals with great skills and competencies to motivate employees to give their best.

ii. Based on the positive relationship between structural capital efficiency and sustainable growth rate, firms should continue to invest in information technology, databases, training and development to spur performance.

iii. Firms should enhance their capital employed efficiency by ensuring that capital is allocated to the most deserving activities of the corporation as this will have bigger impact on overall firm performance.

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