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Intellectual Capital and Corporate Performance: Evidence from Quoted Companies in Nigeria

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ABSTRACT

This study established the effect of intellectual capital on economic value added of quoted non-financial companies in Nigeria. Evaluate the effect of Structural Capital Efficiency (SCE) on Economic Value Added of quoted non-financial companies in Nigeria, and assess the effect of Value Added Intellectual Coefficient (VAIC) on Economic Value Added of quoted non-financial companies in Nigeria. Ex-Post Facto research design was adopted for the study and Data were extracted from audited accounts of non-financial companies in Nigeria from 2008 to 2020. Regression analysis was used to analyze the data using E-view10.0. The findings revealed that SCE has a significant effect on economic value added of quoted non-financial companies in Nigeria at 5% level of significance, also, that Value Added Intellectual Coefficient (VAIC) has significant positive effect on Economic Value Added of quoted non-financial companies in Nigeria at 5% significant level. Based on this hypothesis acceptance, companies should launch high-performance products and satisfy customers' needs by using their structural capital to guarantee their survival, thereby gaining competitive advantage.

KEYWORDS: *Structural Capital Efficiency, Value Added Intellectual Coefficient, and Economic Value Added*

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1.0 Introduction

In recent years, competitive advantage has been the focus of competitive strategies as regards intellectual capital in relation to economic value added which is a proxy for performance and have attracted debates by extant studies (Montequin, Fernandez, Cabal & Gutierrez, 2018; Muhammad & Ismail, 2019). To improve performance and out do competitors, firms are expected to have competitive advantage in order to gain higher performance in complex conditions of today's competitive business environment. Since, the focus of companies for gaining higher performance and competitive advantage has shifted from investments on tangibles to intangibles. Intellectual capital is one of intangibles like innovation and customer capitals. Nowadays, creating value and innovation are noticed by managers, investors, economic agents, and government. Many firms invest in staff education, research and development, customer relations, administrative, computer systems and so on. Such investments called intellectual capital are growing and even exceeding financial and physical investments. This change in investment structure has been attributed to knowledge which is the main source of value creation regarding intellectual capital towards enhancing financial performance in the organisation (Puntillo, 2019).

Traditional accounting model concentrates on financial and physical assets, ignoring intellectual capital. The lack of accounting recognition about intellectual capital and its role in creating value causes financial statements not revealing values for stockholders and other users (Young, Ling, Po, Hsing & Liu, 2016). On the other hand, Economic Value Added (EVA) is the financial performance measure that comes closer than any other to capturing the true economic profit of an enterprise. It is the performance measure that is most directly linked to the creation of shareholders wealth. More explicitly, EVA measure gives importance on how much economic value is added for the shareholders by the management for which they have been entrusted with the firm. EVA is exceptional from other traditional tools in the sense that all other tools mostly depend on information

generated by accounting. Traditional tools more often produce historical data or distorted data that may have no relation with the real status of the company.

The result of most research conducted on intellectual capital and economic value added are either inconclusive or contradicting, reporting positive or sometimes negative results, thereby establishing a gap in knowledge. It is therefore clear that the effect of intellectual capital on economic value added is yet to be ascertained based on the mixed, inconclusive and contradicting results revealed by the reviewed literature. This study sought to bridge the gap arising from earlier research works on this subject by adopting contemporary performance index; economic value added, in place of the traditional performance indices such as return on assets (ROA), return on equity (ROE), etc which lacked the ability to evaluate the future profit potentials of investors. Based on this review, this study sought to analyze the effect of intellectual capital (proxied by and structural capital efficiency and Value Added Intellectual Coefficient) on economic value added of quoted non-financial companies in Nigeria from 2008 to 2020. This study specifically;

1. Evaluate the effect of Structural Capital Efficiency (SCE) on Economic Value Added of quoted non-financial companies in Nigeria.
2. Assess the effect of Value Added Intellectual Coefficient (VAIC) on Economic Value Added of quoted non-financial companies in Nigeria.

2.0 REVIEW OF RELATED LITERATURE

Intellectual Capital (IC)

Intellectual capital is considered an asset, and can broadly be defined as the collection of all informational resources a company has at its disposal that can be used to drive profits, gain new customers, create new products or otherwise improve the business. It is the sum of employee expertise, organizational processes, and other intangibles that contribute to a company's bottom line (Spacey, 2017). Intellectual capital is the intangible value of a business. This includes anything that is not physical that adds to the productive capacity of a firm. The components of IC are human capital, structural capital and relational capital (Ståhle, Ståhle & Lin, 2015).

Structural capital (SC) is one of the three primary components of intellectual capital, and consists of the supportive infrastructure, processes, and database of the organisation that enable human capital to function (Brenner & Coners, 2010). 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. Structural capital is the supportive non-physical infrastructure that enables human capital to function (Khavandkar, Theodorakopoulos & Preston, 2016). Structural capital encompasses the enabling structures that allow the organization to exploit the intellectual capital. The structures ranges from tangible items offered by an organization such as patents, trademarks and databases, to complete intangible success such as culture, transparency and trust among employees (Yang & Lin, 2019). Youndt, Subramaniam and Snell (2014) defined structural capital as the knowledge in the organization, which is independent of people, that includes patents, contacts and databases. On the other hand, Plesis (2017) declares that structural capital as a non-thinking asset. This is agreed by Nahapiet and Ghoshal (2018) who refer it as a non-thinking asset as everything that remains when the employees go home, such as databases, customer files, manuals, trademark and organizational structure. This capital is resulted from the products or systems that firm has created over time and will remain with the enterprise when people leave (Kianto, 2017). Thus, organizations that possess strong structural capital will have a supportive culture that permits their employees to try new things, to learn and to practice them (Crossan, 2010). On the other hand, structural capital represent the competitive intelligence, formulas, information systems, patents, policies, processes, that result from the products or systems the firm has created over time. Structural capital also includes all the non-human storehouses of knowledge in organizations, which include the databases, organizational charts, process manuals, strategies, routines and anything whose value to the company is higher than its material value (Bessant & Tidd, 2007)).

VAIC™ Model

The VAIC™ method enables the firm to measure its value creation efficiency (Pulic, 2001, 2002).VAIC™ method used financial statements of a firm to calculate the efficiency coefficient on three types of capital – that is human capital, structural capital and capital employed. Though VAIC™ uses accounting data, it does not focus on the cost of the firm. It's only focus on the efficiency of resources that create values to the firm (Pulic 2000). Pulic (1998) proposed Value Added Intellectual Coefficient (VAIC) as an indirect measure of efficiency of value added by corporate Intellectual Capital. The VAIC™ method provides the information about the efficiency of tangible and intangible assets that can be used to generate value to a firm. Financial capital (monetary and physical), human capital, and structural capital have been recognized as major components of VAIC. A higher

value for VAIC shows a greater efficiency in the use of firm capital, since VAIC is calculated as the sum of capital employed efficiency, human capital efficiency and structural capital efficiency. Pulic (2001) identified that firms' market value have been created by capital employed (physical & financial) and intellectual capital.

Economic Value Added

Economic value added is a measure of surplus value created on a given investment. When a person is investing his funds, he does this only because he expects to earn a profit from the investment. Economic value added (EVA) is an estimate of a firm's economic profit, or the value created in excess of the required return of the company's shareholders. EVA is the net profit less the capital charge for raising the firm's capital. The idea is that value is created when the return on the firm's economic capital employed exceeds the cost of that capital (Bragg, 2019). EVA is the incremental difference in the rate of return over a company's cost of capital. Essentially, it is used to measure the value a company generates from funds invested into it. If a company's EVA is negative, it means the company is not generating value from the funds invested into the business. Conversely, a positive EVA shows a company is producing value from the funds invested in it. Value Added (EVA) is important because it is used as an indicator of how profitable company projects are and it therefore serves as a reflection of management performance. The idea behind EVA is that businesses are only truly profitable when they create wealth for their shareholders, and the measure of this goes beyond calculating net income. Economic value added asserts that businesses should create returns at a rate above their cost of capital (Firer & Williams, 2003). The economic value calculation succinctly summarizes how much and from where a company created wealth. It includes the statement of financial position in the calculation and encourages managers to think about assets as well as expenses in their decisions (Tai & Chen, 2019).

Empirical Review

Abdelwahab (2014) explored the effect of intangible capital on the financial performance and market value of Jordanian companies. The study carried out an empirical study drawn from 51 listed companies in Amman Stock Exchange from 2007 till 2012. The results were analysed by using Pulic method. The results achieved showed that there is a significant relationship between intangible capital with market value and the financial performance of all the active companies.

Rezaei (2014) investigated the relationship between intellectual capital elements (human capital, customer capital and structural capital) and future performance of the listed companies on Tehran Stack Exchange during the years 2007-2012. The Pulic Model was used for the intellectual capital and the economic value added, price-earnings ratio, Tobin's Q, growth and return on assets for the performance of the companies. The statistical test used for data analysis was multiple linear regressions. E-views 6 software was used for test the hypotheses. The results of this study confirmed that there is a significant relationship between intellectual capital and two of the financial performance indexes, namely P/E and GR. But no relationship was observed between intellectual capital and Tobin Q index of financial performance. Human Resource Management has a significant impact on corporate success, according to Ezejiofor, Nwakoby, and Okoye (2015). The study used a survey research design, and the data was analyzed using a five-point Liker's scale. Simultaneous regression analysis was used to examine the hypotheses. Human Resource Management has an effect on the performance of a corporate company, according to the findings of this study. Training and development, a strong planning system, and competent management as a motivator were all engaged. Camfield, Giacomello and Sellitto (2018) analyzed comparatively the importance of intellectual capital and the impact of intellectual capital on the performance of Brazilian companies awarded the Rio Grande do Sul Quality Award in 2004 and 2017. A sample of 72% of the Brazilian companies that received this Quality Award of the Gaucho Quality and Productivity Program in 2004 and 70.5% in 2017 were investigated. The study affirmed that intellectual capital continues to be an essential asset, but during this period there have been some changes concerning the level of presence and importance among the elements that compose it. Nassar (2018) examined the impact of intellectual capital on firm performance of real estate companies listed in Borsa Istanbul, Turkey, using data of 27 listed companies over the period 2004-2015.Value Added Intellectual Coefficient (VAIC) method is utilized as a measure of intellectual capital (IC). An OLS regression is used to examine the impact of intellectual capital (VAIC); Human capital efficiency (HCE), Structural capital efficiency (SCE), and Capital employed efficiency (CEE) on market, productivity, and financial performance. The findings showed that SCE has a positive significant relation with MB, ROE and EPS before the crisis and with ROA and ROE after the crisis. HCE showed a positive significant relation with ROA and ROE before the crisis and a negative significant association

with MB and Asset Turn over (ATO) after the crisis. CEE showed a negative significant impact on ATO after the crisis. VAIC shows a significant positive impact on ROA, ROE, and EPS before the crisis, while it made the same relation with ROE after the crisis. Inyada (2018) examined the impact of intellectual capital on the financial performance of corporate establishments in Nigeria. Secondary sources of data collection were employed with the help of the Nigerian Stock Exchange Fact Book from 2007-2016. The timeframe for the study was five (5) years and five (5) quoted banks out of the listed banks in Nigeria were used based on purposive sampling. It was discovered that intellectual capital positively and significantly impacted on the financial performance of establishments. Also, physical and structural capitals have positive relationship with the financial performance of the organizations studied. Kaveh, Jusoh and Bontis (2018) empirically explored how the effect of intellectual capital (IC) on organizational performance is indirect and mediated through performance measurement (PM) systems. Data were collected from a survey of 128 chief financial officers of Iranian publicly listed companies from 2012-2016. Hypotheses were tested using partial least squares regression, a structural modeling technique which is appropriate for highly complex predictive models. Results from the structural model indicated that, in general, companies with a higher level of IC place a premium on the balanced use of PM systems in a diagnostic and interactive style. Waseem and Loo-See (2018) developed a conceptual model and to measure the individual dimensional effects of intellectual capital (human, structural, relational and technological capital) on knowledge process capability as well as organizational performance in the context of a developing country. The survey was conducted with 267 respondents from the textile industry in Pakistan. This research used structural equation modeling with partial least squares regression. The structural equation modeling (SEM) was applied to run the multiple regression analysis and the analysis is performed with Warp partial least square (WarpPLS) software. Results corroborated that all dimensions of intellectual capital have significant positive effects on organizational performance, except for structural capital. Similarly, knowledge process capability is partially mediated with relational, human and technological capital. Mohammad, Chandran, Kweh and Wen-Min (2019) used a dynamic network data envelopment analysis model to estimate the intellectual capital efficiency at three levels in the insurance industry in Malaysia over the period of 2005–2012. Within the insurance industry, deficiencies occurred in the human and structural capital stages as opposed to the physical capital stage. A further investigation indicated that total investment is the major concern for the deficiencies. Moreover, the cluster analysis highlighted the strengths and weaknesses of the insurers based on their inherently similar efficiencies. Mohd-Kamal, Mat, Rahim, Husin and Ismail (2019) determined the relationship between the level of intellectual capital efficiency in terms of Human Capital, Capital Employed and Structural Capital (VAIC) with the commercial banks performance in Malaysia from the traditional accounting based perspective that comprises of ROA and ROE from 2010-2017. Overall results revealed the relationship between intellectual capitals with performance of 18 commercial banks in Malaysia. Additionally, the results showed significance impact of intellectual capital variables namely Value Added Capital Employed (VACA), Value Added Human Capital (VAHU) towards bank performance. Hasan-Subhi (2019) investigated whether intellectual capital plays a significant role in financial performance of banking sector in Iraq from 2009-2017. The study used value-added intellectual coefficient approach to measure the intellectual capital by aggregating the capital-employed efficiency, Human capital efficiency and structural capital efficiency. For financial performance, the study used two proxies, return on assets and return on equity. The study regressed return on assets and return on equity on value-added intellectual coefficient approach separately and then regressed financial performance with each component of intellectual capital. Overall findings explained significant role of intellectual capital on the financial performance of banking sector in Iraq. Mačerinskienė and Simona (2019) analysed the relationship between intellectual capital and company value in Lithuania from 2012-2017. The OLS regression equation revealed a non-significant relationship between HCE, SCE, CEE and market-to-book value ratio in Lithuanian manufacturing companies. Chaabane (2021) analysed and provided empirical evidence about the impact of the intellectual capital (IC) characteristics on the firm performance on listed 26 companies in Tunisian Stock Exchange for the years 2010–2019. 260 companies were taken as a sample of this research using the purposive sampling method. The efficiency of intellectual capital was measured using the value added intellectual coefficient (VAIC) method developed by Pulic (2000). The research method used was multiple linear regression analysis. Empirical analysis substantiated the fundamental role of IC components in improving the financial and stock market performance of listed Tunisian companies. The results obtained on the human capital efficiency

variable contributed to improving the market of Tunisian listed companies and confirm the role attributed to human capital in the knowledge economy and even the basic hypothesis of the VAIC method. Investors do not place any importance on the following variables: structural capital, human capital and the efficiency of structural capital during market valuation. Sears (2021) examined the relationship between intellectual capital and firms' financial and market performance during the peak levels of digitalization, focusing on the COVID-19 Pandemic. Utilizing the recently validated Value Added Intellectual Coefficient (VAIC), alongside its necessary controls, the study conducted an empirical analysis on North American firms over the period of 2010-2020 using fixed effects and pooled ordinary least squares analysis. Findings from the empirical analysis provided evidence that intellectual capital is a driving factor in enhancing firms' financial and market performance. Additionally, results indicated that the COVID-19 pandemic increased the impact of intellectual capital on firms' financial performance. Rezende and Silva (2021) aimed at discussing the Value Creation based on the VAIC™ method and as a research field the companies that are part of the B3 (BM&FBOVESPA) Corporate Sustainability Index (ISE) portfolio in Brazil. As a first approach, the study selected the year 2016 after ten years of ISE history. The VAIC™ components were recovered and computed from the International Financial Reporting Standards ended in December 31, 2015. The hypotheses allowed to affirm the following: (i) there is interdependence among Invested Financial Capital, Intellectual Capital, and Value Creation; (ii) there are dimensions of Value Creation capable of differentiating and clustering the observations; and (iii) the allocative efficiency of companies can vary according to clusters. Saymeh, Arikat, Hashem and Al-Khalieh (2021) the effect of intellectual capital on the outcomes of Jordan's banks listed on Amman Stock Exchange (ASE). The study group consisted of all the banks listed on ASE for (2012-2018) period. The study used the descriptive statistics and the basic fundamental analysis tools to measure the effect of ideological capital as well as financial intelligence on the financial performance of sample banks. The research revealed a statistically significant positive effect of intellectual capital on the performance of the sample banks represented by the return on assets, while the research indicated that there was no significant effect of intellectual capital on the assets returns of ASE banks. Olarewaju and Msomi (2021) ascertained the effect of intellectual capital on financial performance of South African firms for the period 2008 to 2019. A total of 696 observations were generated from data collected from 56 general insurance companies in 12 years. The Value Added Intelligent Coefficient Model was used and data was analysed using both static (two stage least square, fixed and random effect) and dynamic panel regression analysis (two step system generalised method of moments). The findings showed a significant and direct relationship between lagged return on assets, intellectual capital and financial performance of insurers in the South African Development Community. Out of the components of intellectual capital, human capital and structural capital are significantly and directly related with return on assets while capital employed is inversely and insignificantly related with return on assets. The control variables-underwriting risk, insurer size and leverage are all inversely and significantly affecting return on assets. Thus, a U-shape relationship exists between intellectual capital and financial performance in general insurance companies in the South African Development Community.

3.0 METHODOLOGY

Research Design

The research design employed in this study is *ex-post facto* research design. *Ex-post facto* research design was employed to establish a meaningful relationship between intellectual capital and economic value added. This study was treated as *ex-post facto* research since it relies on historical data. An *ex-post facto* research determines the cause-effect relationship among variables (Torres-Reyar, 2009).

This study made use of secondary data precisely. The data were sourced from publications of the Nigerian stock exchange (NSE), fact books and the annual report and accounts of the sampled quoted non-financial companies, particularly the comprehensive income statement and statement of financial positions of these companies as well as their respective notes to the accounts for the period 2008-2020.

Population and Sample of the Study

The population of this study centered on the performance indices of 124 quoted non-financial companies in Nigeria from 2008 to 31st December 2020 (thirteen years period). These companies were quoted under ten (10) sectors as at the end of the year.

The sample size of this study comprised of thirty-two (32) non-financial companies which was selected using purposive sampling technique (that is selecting all the companies that consistently filed their annual financial statements with the Nigerian Stock Exchange from 2008-2020).

Independent Variables

This study includes three independent variables: and Structural Capital Efficiency (SCE) as the components of the Value Added Intellectual Coefficient (VAIC), which is a measure of the company's IC in this research.

Value Added Intellectual Coefficient Indices include:

- 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 (Mondal & Ghosh, 2012).

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

$Output_{it}$ 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.

- 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)

SC = VA – HC

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

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

Dependent Variable

In this study one (1) dependent variable was calculated:

i. Economic Value Added (EVA™): is one of a number of measures available to determine an organization's performance. EVA™ reflects the residual wealth calculated by deducting cost of capital from the operating profit (adjusted for taxes on a cash basis) (Stewart 1990).

Control Variables

In conducting the linear multiple regression analysis, the following control variables were included:

(a) Size of the firm (FSZ): Size of the firm as measured by the natural log of total assets, is used to control the impact of size on wealth creation (Deep & Narwal 2014).

(b) Leverage (LEV):

Financial leverage as measured by total debt divided by total equity is used to control the impact of debt servicing on corporate performance and wealth creation

$$LEV = \frac{\text{Total debt}}{\text{Total equity}}$$

Method of Data Analysis

Our method of data analysis includes descriptive and inferential statistics:

Descriptive statistics were used to summarise the mean, median, standard deviation, skeweness, kurtosis, maximum and minimum of the study variables.

Inferential statistics of the stated hypotheses were carried out with the aid of E-views10.0 statistical software, using:

1. Pearson coefficient of correlation: This is a good measure of relationship between two variables, tells us about the strength of relationship and the direction of relationship as well.
2. Regression Analysis: Predicts the value of a variable based on the value of the other variable and explains the impact or effect of changes in the values of variable on the values of the other variables. Panel Least Square (PLS) Regression Analysis was used for the study.

Model Specification

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

$$ROE = \beta_o + \beta_1 CEE + \beta_2 SCE + \beta_3 HCE + \varepsilon \quad - \quad 1$$

Where:

ROE = Return on Equity

SCE = Structural Capital Efficiency

Upon the model specified, the following constructs were modified for the purpose of hypothesis testing:

$$EVA_{it} = \beta_0 + \beta_1 SCE_{it} + \beta_2 FSZ_{it} + \beta_3 LEV_{it} + \varepsilon_{it} \quad - \quad - \quad i$$

$EVA_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 FSZ_{it} + \beta_3 LEV_{it} + \varepsilon_{it}$ - - ii

Where:

β_o = Constant term (intercept)

β_{it} = Coefficients to be estimated for firm í in period t

ε_{it} = Error term/unexplained variable(s) for firm í in period t

EVA_{it} = Economic Value Added of firm í in period t

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

$VAIC_{it}$ = Value Added Intellectual Coefficients of firm í in period t

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

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

Decision Rule:
Accept H_o, if the P-value of the test is greater than 0.05, otherwise reject.

4.0 DATA ANALYSIS

Table 1 Descriptive Statistics

	EVA	SCE	VAIC	FSZ	LEV
Mean	0.1285	0.7015	5.8823	11.5985	0.6108
Median	0.1100	0.7400	4.8500	11.7400	0.6200
Maximum	0.2300	0.8900	12.7200	12.2400	1.5000
Minimum	0.0600	0.2600	2.6800	11.0800	0.1400
Std. Dev.	0.0571	0.1853	2.7542	0.4229	0.3863
Skewness	0.9455	-1.1409	1.1998	-0.0204	0.8343
Kurtosis	2.4660	3.4785	3.9501	1.5833	3.4496
Jarque-Bera	2.0913	2.9444	3.6081	1.0880	1.6175
Probability	0.3515	0.2294	0.1646	0.5804	0.4454
Sum	1.6700	9.1200	76.4700	150.7800	7.9400
Sum Sq. Dev.	0.0392	0.4122	91.0288	2.1460	1.7909
Observations	416	416	416	416	416

Source: Researchers' Computation (2021)

Interpretation
The table in 1 shows the descriptive statistics of intellectual capital indices (SCE, and VAIC) as well as that of EVA and the control variables; FSZ and LEV. The result shows that observation of the study is 416 which is a reflection of 32 firms x 13 years. The mean of EVA is 0.1285with a variability of 0.9455, this shows the stability of EVA earned across the firms under consideration. The maximum amount of EVA earned by a firm stood at 0.2300 while the minimum EVA for the sampled firms remained at 0.0600. Structural Capital Employed is observed to be 0.7015indicating the degree of value-added efficiency of structural capital amongst the sampled firms is 70.15% on the average. Similarly, VAIC is evidenced to be 5.8823 meaning that the level of efficiency of tangible and intangible assets that can be used to generate value to the sample firms is 588.23% on the average.

The correlation matrix explains the nature of relationship between the dependent and independent variables of the study as well as the independent variables among themselves.

Table 2 Pearson Correlation Matrix

	EVA	SCE	VAIC	FSZ	LEV
EVA	1.0000				
CEE	0.4176				
HCE	0.1735				
SCE	0.8741	1.0000			
VAIC	0.7671	-0.6292	1.0000		
FSZ	-0.3802	0.4904	-0.4775	1.0000	
LEV	0.0272	-0.1548	-0.1850	-0.3435	1.0000

Source: Researchers' Computation (2021)

Interpretation of Correlation Matrix
The result of the Pearson Coefficient analysis in table 4.2 indicates that EVA positively correlates with SCE, VAIC and LEV at correlation coefficients of 0.8741, 0.7671 and 0.0272 but inversely associates with FSZ as revealed by the coefficient factor of -0.3802 respectively.

Test of Hypothesis One
Ho_1: Structural Capital Efficiency (SCE) has no significant effect on Economic Value Added of quoted non-financial companies in Nigeria.

H_1: Structural Capital Efficiency (SCE) has significant effect on Economic Value Added of quoted non-financial companies in Nigeria.

Table 3 Panel Least Square Regression Analysis testing the effect of Structural Capital Efficiency on Economic Value Added

Dependent Variable: EVA
Method: Panel Least Squares
Date: 07/17/21 Time: 17:25
Sample: 2008 2020
Periods included: 13
Cross-sections included: 32
Total panel (balanced) observations: 416

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.788104	0.121417	6.490905	0.0000
SCE	0.054938	0.013162	4.173830	0.0000
FSZ	-0.055016	0.011569	-4.755311	0.0000
LEV	-0.001744	0.005481	-0.318269	0.7504
R-squared	0.892359	Mean dependent var		0.273654
Adjusted R-squared	0.885750	S.D. dependent var		0.278410
S.E. of regression	0.266206	Akaike info criterion		0.200477
Sum squared resid	29.19667	Schwarz criterion		0.239234
Log likelihood	-37.69928	Hannan-Quinn criter.		0.215802
F-statistic	13.97467	Durbin-Watson stat		1.543680
Prob(F-statistic)	0.000000			

Source: Researchers' Computation (2021)

Interpretation of Regression Result

Panel least square regression analysis was conducted to test the effect of structural capital efficiency on economic value added of quoted non-financial companies in Nigeria. Adjusted R squared is coefficient of determination which tells us the variation in the dependent variable due to changes in the independent variable. From the findings in the table 3, the value of adjusted R squared was 0.885750, an indication that there was variation of 88.58% on EVA due to changes in SCE, FSZ and LEV. This implies that only 88.58% changes in EVA of non-financial companies could be accounted for by SCE, FSZ and LEV, while 11.42% was explained by unknown variables that were not included in the model. The probability of the slope coefficients indicate that; P(x_1= 0.0000<0.05; x_2= 0.0000<0.05; x_3= 0.7504>0.05). The co-efficient value of; β_1= 0.054938 for SCE implies that EVA is statistically significant and positively related to SCE at 5% level of significance; β_2= -0.055016 implies that FSZ has a negative relationship with EVA, however, significant, whileβ_3= -0.001744 implies that LEV has a non-significant negative relationship with EVA.

The linear regression model becomes;

EVA = 0.788104+0.054938SCE- 0.055016 FSZ - 0.001744 LEV + μ

The implication of this model is that for there to be one unit increase in EVA, there would be 0.054938 units increase in SCE; 0.055016 units reduction in FSZ; similarly, leverage would equally reduce by 0.001744 units. The Durbin-Watson Statistic of 1.543680 suggests that the model does not contain serial correlation. The F-statistic of the EVA regression is equal to 13.97467 and the associated F-statistic probability is equal to 0.000000, thus, the null hypothesis is rejected and the alternative hypothesis was accepted.

Decision

Since the Prob (F-statistic) of 0.000000 is less than the critical value of 5% (0.05), the null hypothesis is rejected and the alternative accepted. We therefore conclude that SCE has a significant effect on economic value added of quoted non-financial companies in Nigeria at 5% level of significance, hence,

Test of Hypothesis II

Ho_2: Value Added Intellectual Coefficient (VAIC) has no significant effect on Economic Value Added of quoted non-financial companies in Nigeria.

H_2: Value Added Intellectual Coefficient (VAIC) has significant effect on Economic Value Added of quoted non-financial companies in Nigeria.

Table 4: Panel Least Square Regression Analysis testing the effect of VAIC on Economic Value Added

Dependent Variable: EVA
Method: Panel Least Squares
Date: 07/17/21 Time: 17:31
Sample: 2008 2020
Periods included: 13
Cross-sections included: 32
Total panel (balanced) observations: 416

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.843520	0.126073	6.690748	0.0000
VAIC	0.700919	0.003787	8.242780	0.0000
FSZ	-0.056536	0.011842	-4.774370	0.0000
LEV	-0.002062	0.005596	-0.368527	0.7127

R-squared	0.854116	Mean dependent var	0.273654
Adjusted R-squared	0.847229	S.D. dependent var	0.278410
S.E. of regression	0.271757	Akaike info criterion	0.241748
Sum squared resid	30.42686	Schwarz criterion	0.280505
Log likelihood	-46.28366	Hannan-Quinn criter.	0.257073
F-statistic	37.85711	Durbin-Watson stat	1.774230
Prob(F-statistic)	0.000000		

Source: Researchers' Computation (2021)

Interpretation of Regression Analysis

The value of the Adjusted R-squared in table 4 showed that 84.73% of the total variation in dependent variable (EVA) is explained by the independent variable (VAIC) and control variables (FSZ and LEV) to the determination of EVA while the remaining 15.27% was caused by other explanatory factors outside this model and this is captured by the error term. The coefficient result shows that VAIC (β_1=0.700919) is positively related with EVA while, FSZ (β_2=-0.056536) and LEV (β_3=-0.002062) are negatively related with EVA. The probability value of the slope coefficients indicate that P(x_1=0.0000<0.05; x_2=0.0000<0.05; x_3=0.7127>0.05). This implies that EVA has a significant positive relationship with VAIC; a significant negative relationship with FSZ a non-significant negative relationship with LEV. The Durbin-Watson figure of 1.774230 indicates the absence of autocorrelation in the regression model. The overall performance of the model is satisfactory as shown by Prob (F-statistics) = 0.000000

The regression equation is:

$$EVA = 0.843520 + 0.700919VAIC - 0.056536FSZ - 0.002062LEV + \mu$$

The implication is that, for there to be a unit/one naira increase in EVA there will be 0.700919 units increase in VAIC, 0.056536 units decrease in FSZ and 0.002062 units decrease in LEV.

Decision

Sequel to the evidence that Prob (F-statistic) of 0.000000 is less than the critical value of 5% significance level, the null hypothesis is rejected and the alternative is accepted leading to the conclusion that Value Added Intellectual Coefficient (VAIC) has significant positive effect on Economic Value Added of quoted non-financial companies in Nigeria at 5% significant level.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

This study ascertained the effect of intellectual capital on economic value added of quoted non-financial companies in Nigeria during the period 2008-2020. The independent variable (intellectual capital) was

proxied by Structural Capital Efficiency (SCE) and Value Added Intellectual Coefficient (VAIC) while, Economic Value Added (EVA) served as the dependent variable of the study. For a robust regression analysis, Firm Size (FSZ) and Leverage (LEV) were employed to serve as control variables. Panel data were sourced from the annual reports and accounts of the sampled firms. Inferential statistics using correlation analysis, panel least square regression, and hausman test were employed via E-Views 10 statistical software. Data analysis revealed that intellectual capital has a significant effect on economic value added. As disaggregated components, Structural Capital Efficiency (SCE) and Value Added Intellectual Coefficient (VAIC) have a significant positive effect on Economic Value Added of quoted non-financial companies in Nigeria respectively. Consequently, this analysis supports growing evidence that intellectual capital exerts a significant effect on Economic Value Added at 5% significant level.

Recommendations

The following recommendations were made in line with the findings and conclusion of this study:

- Based on this hypothesis acceptance, companies should launch high-performance products and satisfy customers' needs by using their structural capital to guarantee their survival, thereby gaining competitive advantage.
- The use of Value Added Intellectual Coefficient (VAIC) model to evaluate a firm's financial performance should be sustained in order to obtain a better insight on a firm's ability in creating firm values.

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