STRUCTURAL CAPITAL EFFICIENCY AND ECONOMIC VALUE ADDED OF QUOTED SERVICE FIRMS IN NIGERIA

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Abstract
The study ascertains the relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria. Ex-Post Facto research design was adopted for the study. Data were gathered from the sampled mentioned service firms' annual reports and accounts, specifically the comprehensive income statement and statement of financial situations, as well as their respective comments to the accounts for the period. The data for the studies came from the Nigerian Stock Exchange's (NSE) publications as well as the annual reports and accounts of the sample listed companies. PLS Regression (Panel Least Square) Analysis was employed to test the hypothesis. The study revealed that there is a significant positive relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria at 5% level of significance. On the premise of these study findings, the study recommended that the positive relationship between Structural Capital Efficiency and Economic Value Added, firms should continue to invest in information technology, databases, training and development to spur performance.

Keywords: Structural Capital Efficiency, Economic Value Added and Intellectual capital

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 (Kesse & Pattanayak, 2019). 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 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 (Campanella, Derhy & Gangi, 2018).

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 (Ozkan, Cakan & Kayacan, 2017). Intellectual capital (IC) can be defined as the intangible assets that comprise of knowledge, experience, customer rapport and infrastructure that elevate the performance of organization due to its ability to create value creation and competitive advantage (Si, 2019). IC is Value-Added Intellectual Coefficients (VAIC) that has been developed by Pulic (2000a). With the gradual shift of global business world into the knowledge economy, it is becoming increasingly important and obvious to business organizations that to survive in business in this complex and dynamic world, adequate attention must be paid to the intellectual capital base of the firm. Gone are the days when firms focus only on their physical capital with little or no attention to their intellectual capitals and still post huge profits. Competition in business today has become so intense that managers utilize every resource at their disposal to edge others out of business. Intellectual capital has also become an important business resource that organizations can leverage on to gain competitive advantage. Vidyarthi (2018) discovers that enterprises, which have managed their intellectual capital better, had achieved stronger competitive advantage than the other enterprises. Tran and Vo (2018) opine that human capital, which is an integral part of intellectual capital, has been recognized as one of the key determinants of growth today in any business enterprise.

Firms' earnings must exceed the cost of debt and equity, in order to create wealth. Economic value added (EVA) measures the difference between the return on company's capital and the cost of that capital. EVA is a measurement of the true economic profit generated by a firm (Amahalu, Okoye & Obi, 2018) and is calculated by comparing a firm's net operating profit after tax (NOPAT) to the total cost all its forms of capital which includes debt as well. If NOPAT exceeds the cost of capital, it gives a positive EVA and on the other hand, if the NOPAT is less than the cost of capital, it gives a negative EVA. Stewart (2013) asserts that EVA stands well out from the crowd as the single best measure of value creation on continuous basis and EVA is almost 50% better than traditional accounting based measures in explaining changes in the shareholders wealth. Stewart (2013) further advocates EVA saying that the best practical periodic performance measure is EVA while earnings, earnings per share, and earnings growth are misleading measures of corporate performance. EVA is claimed to be the concept which gives the true economic profit of the firm and the value created for the shareholders. It is against this, backdrop that this study tends to examine the relationship between intellectual capital (IC) and economic value added (EVA) of quoted service firms in Nigeria.

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.

The divergent views from the reviewed strands of literatures which ranged from positive to negative and to non-significant relationship between intellectual capital and performance led to currency gap in literature which this study tends to bridge. In an attempt to closing the variable gap, this present study focused on Economic value added (EVA) which is a contemporary accounting measurement tool as against prior studies that focused on traditional/conventional accounting tools such as return on investment (ROI), return on assets (ROA), return on equity (ROE), return on sales (ROS) and earnings per share. This study would be extended to 2019 as against prior studies which financial periods ended in 2018, thereby, filling the currency gap, hence the justification for this study. The study ascertain the relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria

Review of Related Literature
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 (Goergen, Chahine, Wood & Brewster, 2016). Intellectual capital is the sum of everything everybody in a company knows that gives it a competitive edge (Matos, Vairinhos & Dameri, 2017). 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 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 (Seleim & Bontis, 2013).

Intellectual property is the value of a company or organization's employee knowledge, skills, business training or any proprietary information that may provide the company with a competitive advantage. 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 (Chen, 2019). Intellectual capital is a business asset, although measuring it is a very subjective task. This asset to a firm is not booked on the statement of financial position as intellectual capital, instead, to the extent possible, it is integrated into intellectual property (as part of intangibles and goodwill on the balance sheet), which in itself is difficult to measure (Martín de Castro, Delgado-Verde, López-Sáez, Navas-López, 2011). Companies spend much time and resources developing management expertise and training their employees in business-specific areas to add to the 'mental capacity,' of their enterprise. This capital employed to enhance intellectual capital provides a return to the company, though difficult to quantify, but something that can contribute toward many years' worth of business value (Khasmafkan-Nezam, Ataffar, Isfhani & Shahin, 2013). Examples of intellectual capital include knowledge that a factory line worker has developed over many

years, a specific way of marketing a product, a method to cut down time on a critical research project or a mysterious, secret formulation (for example, Coca-Cola soft drink). A company can also bolster its intellectual capital by hiring qualified individuals and process experts who contribute to its bottom line. As technology and process improvements become more of a differentiating factor within modern companies, intellectual capital becomes a greater factor in achieving success in a competitive marketplace.

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 organization that enable human capital to function (Khavandkar, Theodorakopoulos, Hart & Preston, 2016). 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 (Brenner & André, 2010). Structural capital is the supportive infrastructure that enables the rest 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 (Adams, 2013).

Structural capital includes all the non-human store houses of knowledge in organizations that include the databases, organizational charts, process manuals, strategies, routines, and anything whose value to the company is higher than its material value. Anghel, Siminica, Cristea, Sichigea and Noja (2019) argue that structural capital is the infrastructure of human capital and includes buildings, hardware, software, processes, patents, and trademarks. Claver-Cortés, Zaragoza-Sáez, Molina-Manchón and Úbeda-García (2018) believe that structural capital can comprise internal factors such as infrastructure, processes, and business culture, and at the same time refers to the ability to renovate and improve.

Structural capital is a strategic asset which is comprised of non human assets such as systems and programs, research and development and intellectual property rights these sub variables helps the organization to achieve its goals and objectives hence improved business performance (Sardo, Serrasqueiro & Alves, 2018). The structural capital is the structure that supports the human capital and includes organizational processes, procedures, technologies, information resources and intellectual property rights (Xu & Wang, 2019). Janoševi, Dženopoljac and Bontis (2013) emphasize that the structural capital is what remains when the employees go home and include database structures, manuals and training materials. Structural capital stems from human capital and is a combination of knowledge and intangible assets derived from the processes within the organization and encompasses elements of efficiency, procedural innovativeness and access to information for codification into knowledge. These processes and structures are needed by the employee in order to be productive (Jordão & De-Almeida, 2017). Thus, organizations that have a strong structural capital will have a supportive culture that permits their employees to try new things, to learn and to practice them. The structural capital includes management relationship, organization structure, development, and the relationship capital refers to the marketing relationship and it is very important for any organization. This capital may enhance organizational effectiveness by transferring knowledge (Nimtrakoon, 2015; Smriti & Das, 2018).

Economic Value Added (EVA)

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 (Mocciaro, Picone, & Minà, 2012). The goal of EVA is to quantify the charge, or cost, of investing capital into a certain project or firm and to then assess whether it generates enough cash to be considered a good investment. The charge represents the minimum return that investors require to make their investment worthwhile. A positive EVA shows a project is generating returns in excess of the required minimum return. EVA as a performance indicator is very useful. The calculation shows how and where a company created wealth, through the inclusion of statement of financial position items. This forces managers to be aware of assets and expenses when making managerial decisions (Dheeraj, 2019).

EVA = Net Operating Profit After Tax - (Capital Invested x WACC)
As shown in the formula, there are three components necessary to solve EVA: net operating profit after tax (NOPAT), invested capital, and the weighted average cost of capital (WACC)
$WACC = R_D (1- T_c)*(D / V)+ R_E *(E / V)$
Weighted Average Cost of Capital = (Cost of Debt) * (1 – Tax Rate) * (Proportion of debt) + (Cost of Equity) * (Proportion of equity)
Now, understanding the notations of the formula:
- R_D = Cost of Debt
- T_c = Tax Rate
- D = Capital invested in the organization through Debt
- V = Total Value of the firm simply calculated as Debt + Equity
- R_E = Cost of Equity
- E = Capital invested in the organization through Equity

Cost of Debt is multiplied by (1 – Tax Rate) as there is tax saving on interest paid on debt. On the other hand, there is no tax saving on the cost of equity and hence the tax rate is not taken into account.

Structural Capital Efficiency and Economic Value Added
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 (Ozkan, Cakan & Kayacan, 2017). People are the main carriers of knowledge (Hajeb, Moghaddam & Alipour, 2015). Employees are treated as investments, such as investments made in factories and machinery to create value during the industrial economy. Intangible assets, including intellectual capital are sources of economic value and corporate wealth, in addition to the products produced by companies (Inkinen, 2015; Setyawati, Kartini, Rachman & Febrian, 2015). Structural capital is highly trusted in creating greater value for the company (Khalique, Bontis, Bin-Shaari & Isa, 2015). To achieve this state of business, it is only possible that the company increases its competitiveness continuously and upholds the knowledge assets of organizations that shape intellectual capital. Thus, measuring and managing intellectual capital is very important and needed in improving organizational performance and the process of creating dynamic value (Pulic, 2008). Piluso (2013); Wang (2013); Yue (2018) reported a significant positive relationship between Structural Capital Efficiency and market value while Suroso, Widyastuti, Salim and Setyawati (2017) found no

significant relationship between Structural Capital Efficiency and financial performance. Lin, Chen and Zhang (2018) evidenced the existence of an inverse relationship between Structural Capital Efficiency and performance.

Empirical Review

Sumedrea (2013) analyzed the structure of the intellectual capital and its influence on the economic performances based on the VAIC model. The study covered the period 2008-2011 in Brazil. The results were obtained by applying Panel least square regression models and suggest that, in crisis time, the development of companies is influenced by the human and the structural capital, while profitability (profit after tax) is additionally linked to the financial capital through the value added intellectual capital coefficient. Ashrafipour and Mojtahedi (2013) explored the relationship between intellectual capital and market value added in 150 Malaysian firms during the years 2000-2011. Intellectual capital was considered as an independent variable which was decomposed into human, relational and structural capital. Multiple regressions were used to predict the impact of intellectual capital on market value added. The finding of the study showed that there was a positive relation between intellectual capital and market value added. Arabi and Federica, Vincenzo, Domenico and Ida (2015) explored the impact of intellectual capital efficiency (ICE) on firm performance. The study covered a time period of five years and specifically the sporting seasons from 2007/2008 up to 2011/2012 in Brazil. The empirical findings of the study provided tentative evidence that ICE, especially as far as relational capital is concerned, is positively associated with on-pitch performance of professional football businesses. Anuonye (2016) evaluated the effect of IC on value creation of insurance firms in Nigeria using their ROA. Ex post facto research design was adopted in the selection of data. Primary and secondary data were employed. Regression was used for data analyses at 5% level of significance. Primary data result indicated that human capital and relational capital had statistically non-significant effects on return on assets of the firms whereas structural capital had a significant effect on ROA. Iwan and Azhar (2016) investigated the effect of intellectual capital on financial performance of banking sector on the Island of Java, Indonesia with data processing techniques using multiple regression. The research method used purposive sampling with a sample number 615. The data were analyzed using E-views 7. The results showed that the value added (VA) capital employee variables significantly influenced toward financial performance and VA human capital variables and variable structural capital VA have significant effect on toward financial performance. The overall test results produced an adjusted R2 indicated that the intellectual capital variables significantly influenced financial performance. Onyekwelu and Ubesie (2016) examined the effect of Intellectual Capital(IC) on corporate valuation of firms quoted in Nigeria. The study adopted the Value Added Intellectual Coefficient (VAIC) Model as developed by Pulic (1998) to examine the effect of Intellectual Capital on firms' values. Multiple Regression and Correlation Analysis were used on the data at 5% level of significance. E-View Statistical Tool version 8.0 was used in the analysis. The results reveal that Human Capital Efficiency has a positive and significant effect on Market/Book Value. SCE has a negative and insignificant effect on M/BV; CEE has negative and significant effect on M/BV; positive and insignificant effect on EPS. Onyekwelu, Okoh and Iyidiobi (2017) appraised the effect of intellectual capital on financial performance of firms in Nigeria using the banking industry for the period of 10 years (2004-2013). The study used the Value Added Intellectual Coefficient (VAIC) to ascertain the extent that intellectual capital indices affect financial performance of three banks. Data were generated from annual reports and accounts of these banks as well as data from the publications of the Nigerian stock exchange (NSE) and analyzed using regression tool. The study used Return on Asset (ROA) to measure financial performance. The study indicated that IC has a positive and significant effect on

banks' financial performance but some were not significant. Ezenyilimba, Ezejiofor, and Afodigbueokwu (2019) looked into whether using Total Quality Management approaches resulted in better quality output and cheaper costs. Questionnaires were used to collect data, which was then tabulated using the Statistical Package for Social Science (SPSS) version 20.0. The results reveal that implementing Total Quality Management principles has aided in producing higher quality output while lowering costs. Mačerinskienė & Aleknavičiūtė (2017) examined various scientific approaches of the national intellectual capital and its impact on the economic growth; also to offer a measurement model of the national intellectual capital influence on economic growth; and lastly to evaluate the specific European Union countries' intellectual capital's effect on their economic growth. The study used econometric analysis by employing factor value computation method using the standardized regression coefficients; the SAW method; expert evaluation, cluster analysis; correlation and regression analyses. The analysis of intellectual capital components' influence on economic growth rate of 25 European Union countries showed that only human capital and the level of economic development have statistically significant influence. Nwaiwu and Aliyu (2018) empirically examined the relationship between intellectual capital reporting and measures of financial performance of quoted banks in Nigeria from 2010.-2016. The study adopted ex-post facto research design. The study employed OLS regression tool to analyze the data with the aid of SPSS version 23 and Eview version 9. The findings of the study revealed mixed results as some elements of intellectual capital reporting were not significantly related to revenue growth and return on investment. The study concluded that intellectual capital has not fully related to the financial performance of quoted commercial banks in Nigeria. Ezejiofor, Nwakoby, and Okoye (2015) investigated the impact of human resource management on business performance. The data was collected and evaluated using a five-point Liker's scale in a survey study design. The idea was tested using simple regression analysis. Human Resource Management has an effect on the functioning of a company organization, according to the study. This has to do with competent management as a motivator, as well as training and growth. Iveta and Nicoletta (2018) explored the effect of human capital on return on investment. The study used quantitative research, namely a questionnaire method, which showed that enterprises in Slovakia do not largely invest in the development of their employees. Most companies invested in the development of employees by providing work-related training courses or by offering lectures, workshops and seminars. Ibrahim and Ogwuche (2018) examined the impact of intellectual capital on market performance in Nigeria over the time of 2009-2017. The study also performed preliminary preregression analysis such as descriptive statistics, correlation matrix and normality test. The results from analysis showed that out of the three VAIC components used only capital employed had positive effect on market performance. Yilmaz and Acar (2018) examined the effects of intellectual capital and its components on companies' market value and financial performance in Turkey. The financial and market data of production companies listed in Borsa Istanbul 100 index (BIST-100) for the periods 2011-2014 were used as dataset. The results suggested multi factor models were more powerful than single factor model in explaining the market performance and financial performance. Saudah, Mike and Richard (2019) examined the impact of IC on management accounting practices, specifically, performance measurement and corporate performance in Nigeria. The study explored both the role of management accounting information and that of the management accountant. Results suggested some evolution in performance measurement approaches due to the impact of IC and they also indicated that IC does influence corporate performance. William, Gaetano, and Giuseppe (2019) examined the effect of Intellectual Capital (IC) on financial performance of Italian listed firms. In the study, the Valued Added Intellectual Coefficient (VAIC) was employed as a measure of IC to investigate the relationship between IC, firms'

financial performance and market value. The empirical investigation was developed by using data drawn from a sample of 135 Italian listed companies for the period from 2008 to 2017 and performing Ordinary Least Squares (OLS) regression models. The findings suggested that, when taken in its aggregated form, IC exerted a positive impact on firms' financial performance measured as firms' profitability and growth in revenues as well as on market value. The adoption of Human Resource Accounting on the Profitability of Corporate Organizations was studied by Ezejiofor, John-Akamelu, and Iyidiobi (2017). This study used an exploratory research design and time series data. The study's data came from a group of ten (10) Nigerian commercial banks. With the help of SPSS version 20.0, the data was analyzed and assessed using the t-test statistical tool. The study discovered that a raise in staff compensation has a beneficial impact on organizational profitability, as well as that the amount of staff increment has an impact on organizational profitability. Saiful and Asfarawenti (2019) examined the influence of intellectual capital (IC) on bank performance measured by ROA, ROE and NIM. The study explored purposive sampling methods. 10 Islamic banks and 30 Conventional banks were selected as a sample for the study for the period 2012-2016. The study found that IC had positive effect on bank performance that measured by ROA, ROE and NIM. The study showed that HCE and CEE had positive effect on bank performance that measured by ROA, ROE and NIM. Meanwhile, SCE positively affect the bank performance that was measured by ROA only. Xu and Liu (2019) explored the value creation effect of intellectual capital on corporate performance of energy companies. The listed renewable energy companies were selected from 2010 to 2016. The study conducted an empirical research based on the Ohlson model and used quantile regression to analyze the impact of value-added intellectual coefficient (VAIC) on sustainable performance at different life cycle stages. The results confirmed that increasing the VAIC created value for enterprises. The study also concluded that value-added human capital coefficient (VAHU) and value-added capital assets coefficient (VACA) were the most important component of intellectual capitals to economic sustainable performance at the growth stage, maturation stage, and decline stage. Xu and Wang (2019) analyzed the relationship between intellectual capital (IC) and performance of the textile industry in China and South Korea during 2012–2017, and measured the contribution of IC sub-components to companies' performance. The fixed effect regression results showed that the aggregate IC positively affects earnings, profitability, and productivity of textile companies in China and South Korea. 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.

The divergent views from the reviewed strands of literatures which ranged from positive to negative and to non-significant relationship between intellectual capital and performance led to variable gap. In an attempt to closing the variable gap, this present study would focus on Economic value added (EVA) which is a contemporary accounting measurement tool as against prior studies that focused on traditional/conventional accounting tools such as return on investment (ROI), return on assets (ROA), return on equity (ROE), return on sales (ROS) and earnings per share. The methodological/statistical tool gap was closed by employing multicollinearity and heteroscedasticity tests which previous studies failed to employ. This study was extended to 2019 as against prior studies which financial periods ended in 2018, thereby, filling the currency gap, hence the justification for this study.

Methodology
The research design that was employed in this study is the *ex-post facto* research design. An *Ex-post Facto* research determines the cause-effect relationship among variables.

Population and Sample Size
The populations of this study consist of the eighty two (82) service firms listed on the Nigeria stock exchange as at 31st December, 2019.

This study adopted purposive sampling technique. The sample comprised firms that meet 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. The reason for the choice of this time frame is the availability of published annual report and accounts of the sample organizations and to have a fairly, reasonably, reliably and up-to-date available financial panel data.

Model Specification
The model for this study was adapted from Pulic (2000):
$$ROA = \beta_o + \beta_1 CEE + \beta_2 SCE + \beta_3 HCE + \varepsilon$$
Where:
ROA = Return on Assets
CEE = Capital Employed Efficiency
SCE = Structural Capital Efficiency
HCE_{it} = Human capital efficiency of firm
The specific model constructs would be:
$$EVA_{it} = \beta_0 + \beta_1 SCE_{it} + \beta_2 LEV_{it} + \beta_3 FSZ_{it} + \varepsilon_{it} \qquad - \qquad - \qquad \mathbf{i}$$
Where:
ε_{it} is the error term capturing other explanatory variables of the firm not explicitly included in the model.
β_o is the intercept of the regression.
β_1, is the coefficients of the regression (Intellectual Capital)
EVA_{it} = Economic Value Added of firm i in period t
SCE_{it} = Structural Capital efficiency of firm i in period t
LEV_{it} = Leverage of firm i in period t
FSZ_{it} = Firm Size of firm i in period t
i = individual firms
t = time periods

Method of Data Analysis
The analyses applied the data collected from publications of the Nigerian stock exchange (NSE) and the annual report and accounts of the sample quoted companies. Both the dependent and independent variables were computed from the data extracted from publication of the Nigeria stock exchange (NSE), the annual report and accounts of the selected quoted companies and ratios were computed from the figures as reported in the annual reports.

Descriptive statistics was used to summarize the mean, median, standard deviation, skewness, kurtosis, maximum and minimum of the study variables.

Decision Rule
Accept the alternative (H_1) hypothesis, if the P-value of the test is less than 0.05. Otherwise reject.

Data Analysis
Table 1 Descriptive Statistics of Study Variables

	EVA	SCE	LEV	FSZ
Mean	0.1150	0.5700	4.9330	10.8610
Median	0.1100	0.5850	4.7000	10.8000
Maximum	0.1300	0.9000	10.5800	12.0200
Minimum	0.1000	0.1800	1.4600	9.9300
Std. Dev.	0.0097	0.2643	2.8716	0.7689
Skewness	0.3828	0.2074	0.8672	0.1953
Kurtosis	2.1626	1.8272	2.7516	1.6403
Jarque-Bera	15.9500	89.7731	7.5457	14.2339
Probability	0.0003	0.0000	0. 0229	0.0005
Sum	1.1500	5.7000	49.3300	58.6100
Sum Sq. Dev.	0.0009	0.6286	74.2168	5.3215
Observations	510	510	510	510

Source: E-Views 10.0 Descriptive Output, 2020

Interpretation
This study considered descriptive statistics (mean, standard deviation, minimum and maximum) for the panels for 150 observations (that is, 51 firms x 10 years). Table 1 depicts EVA of an average of 0.1150 with a minimum of 0.1000 and a maximum of 0.1300 and at a standard deviation of 0.0097. On the average, SCE stood at 57%, the minimum SCE stood at 18% while the maximum SCE stood at 90% of the firms under study.

Test of Hypothesis
Ho₁: There is no significant relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria
H₁: There is significant relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria

Table 2: Heteroskedasticity Test between SCE and EVA

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.889705	Prob. F(3,6)	0.4984
Obs*R-squared	3.078879	Prob. Chi-Square(3)	0.3796
Scaled explained SS	0.677303	Prob. Chi-Square(3)	0.8785

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/29/20   Time: 07:55
Sample: 2010 2019
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000632	0.000445	1.419880	0.2055
SCE	0.000192	0.000133	1.442211	0.1993
LEV	-9.13E-06	8.81E-06	-1.036666	0.3399
FSZ	-5.84E-05	4.47E-05	-1.308449	0.2386

R-squared	0.307888	Mean dependent var	6.12E-05
Adjusted R-squared	-0.038168	S.D. dependent var	7.13E-05
S.E. of regression	7.27E-05	Akaike info criterion	-15.93171
Sum squared resid	3.17E-08	Schwarz criterion	-15.81068
Log likelihood	83.65857	Hannan-Quinn criter.	-16.06449
F-statistic	0.889705	Durbin-Watson stat	1.302767
Prob(F-statistic)	0.498358		

Source: E-Views 10.0 Regression Output, 2020

Heteroscedasticity is present if the test statistic has a p-value below an appropriate threshold of 5% ($p < 0.05$) then the null hypothesis of homoskedasticity is rejected and heteroskedasticity assumed. With a p-value of 0.498358 in table 2, we fail to reject the null hypothesis (that variance of residuals is constant) and therefore infer that their residuals are homoscedastic, thus, the problem of heteroscedsticity is solved.

Table 3: Panel Least Square (PLS) Regression Analysis testing the relationship between SCE and EVA

Dependent Variable: EVA
Method: Panel Least Squares
Date: 11/26/20   Time: 15:01
Sample: 2010 2019
Periods included: 10
Cross-sections included: 51
Total panel (balanced) observations: 510

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.427100	0.092583	4.613152	0.0000
SCE	0.004028	0.009202	3.507890	0.0005
LEV	-0.001328	0.003319	-0.400115	0.6892
FSZ	-0.021531	0.009511	-2.263860	0.0240

R-squared	0.432895	Mean dependent var	0.206362
Adjusted R-squared	0.407043	S.D. dependent var	0.228340
S.E. of regression	0.227534	Akaike info criterion	-0.115221
Sum squared resid	26.19653	Schwarz criterion	-0.082009
Log likelihood	33.38123	Hannan-Quinn criter.	-0.102200
F-statistic	7.284332	Durbin-Watson stat	1.992999
Prob(F-statistic)	0.000053		

Source: E-Views 10.0 Regression Output, 2020

Interpretation of Regression Result
Table 3 provides results of PLS regression model, estimated using EVA
$EVA = 0.427100 + 0.004028SCE - 0.001328LEV - 0.021531FSZ$

The result implies that one unit increase in SCE will cause EVA to increase by 0.004028 units, while a unit increase in LEV and FSZ will lead to 0.001328 units and 0.021531 units respectively in EVA. The regression result shows that parameter estimate for SCE (β_1=0.004028; P-value = 0.0005<0.05) is found to have significant positive relationship with EVA at 5% level of significance. LEV (β_2=-0.001328; P-value = 0.6892>0.05) on the other hand, is found to have non-significant negative relationship with EVA at 5% level of significance. Similarly, an inverse and significant relationship exists between FSZ (β_3=-0.021531; P-value = 0.0240<0.05) and EVA of sample service firms in Nigeria. Adjusted R-squared of 0.407043 is an indication that 40.7% variation in EVA of quoted sample firms in Nigeria is explained by joint influence of SCE, LEV and FSZ while the remaining 59.3% is caused by other factors not included in the study model. The F-statistic equal to 7.284332 with its associated Prob (F-statistic) = 0.000053, significant at 5% level is an evidence that the model is very much adequate to explain the relationship between the SCE and EVA.

Decision
Consequent on the P-value = 0.000053 which is less than the nominal value of 5%. This study upholds that there is a significant positive relationship between Structural Capital Efficiency and Economic Value Added of quoted service firms in Nigeria at 5% level of significance.

Table 4: Pairwise Granger Causality Test showing the Causality between SCE and EVA

Pairwise Granger Causality Tests
Date: 11/26/20   Time: 15:05
Sample: 2010 2019
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
SCE does not Granger Cause EVA	408	7.80702	0.0005
EVA does not Granger Cause SCE		0.61474	0.5413

Source: E-Views 10.0 Causality Output, 2020

Interpretation of Diagnostic Test

Table 4 shows that a unidirectional causality runs from SCE to EVA at a P-value of 0.0005 which is statistically significant at 5% level. Consequently, the null hypothesis is rejected for the alternative which states that SCE has a significant positive relationship with Economic Value Added of quoted service firms in Nigeria at 5% level of significance.

Table 5 Fixed Effect Model (FEM) testing the effect of SCE on EVA

Dependent Variable: EVA
Method: Panel Least Squares
Date: 11/26/20   Time: 15:02
Sample: 2010 2019
Periods included: 10
Cross-sections included: 51
Total panel (balanced) observations: 510

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.366322	0.129105	-2.837403	0.0048
SCE	0.003493	0.007274	6.480210	0.0000
LEV	0.003618	0.004266	0.848088	0.3968
FSZ	0.056982	0.012942	4.402990	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.496536	Mean dependent var	0.206362
Adjusted R-squared	0.438019	S.D. dependent var	0.228340
S.E. of regression	0.171176	Akaike info criterion	-0.592406
Sum squared resid	13.36131	Schwarz criterion	-0.144057
Log likelihood	205.0635	Hannan-Quinn criter.	-0.416623
F-statistic	8.485375	Durbin-Watson stat	1.166550
Prob(F-statistic)	0.000000		

Source: E-Views 10.0 Regression Output, 2020

Discussion of Finding

This study ascertained the nexus between intellectual capital and economic value added of quoted service firms in Nigeria for a ten year period covering from 2010-2019. The independent variable (intellectual capital) was proxied by human capital efficiency, structural capital efficiency, capital employed efficiency and value-added intellectual coefficients while economic value added served as the dependent variable of the study.

The regression result shows that parameter estimate for SCE (β_1=0.004028; P-value = 0.0005<0.05) is found to have significant positive relationship with EVA at 5% level of significance. LEV (β_2=-0.001328; P-value = 0.6892>0.05) on the other hand, is found to have non-significant negative relationship with EVA at 5% level of significance. Similarly, an inverse and significant relationship exists between FSZ (β_3=-0.021531; P-value = 0.0240<0.05) and EVA of sample service firms in Nigeria. Adjusted R-squared of 0.407043 is an indication that 40.7% variation in EVA of quoted sample firms in Nigeria is explained by joint influence of SCE, LEV and FSZ while the remaining 59.3% is caused by other factors not included in the study model. The F-statistic equal to 7.284332 with its associated Prob(F-statistic) = 0.000053, significant at 5% level is an evidence that the model is very much adequate to explain the relationship between the SCE and EVA. The results of this study are in congruence with the results of Filippo, Nicola & Michele (2019); Gallardo-Vázquez, Valdez-Juárez and Lizcano-Álvarez (2019); Firmansari, Muhammad and Alwan (2019).

On the premise of these study findings, the study recommended that the positive relationship between Structural Capital Efficiency and Economic Value Added, firms should continue to invest in information technology, databases, training and development to spur performance.

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