



Intellectual Capital on Financial Performance of Nigerian Companies

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Abstract: *Intellectual capital efficiency measurement is a major problem facing managers of companies because of its intangible nature; thus, there is difference between book-value and market value of assets of the companies. Hence, this work investigated the intellectual capital (IC) efficiency on companies' performance of 117 quoted firms in Nigeria between 2018 and 2019 periods using Pulic Value Added Intellectual Coefficient (VAIC) Model. Data were sourced through secondary means from audited annual reports of the sample. The data gathered were analyzed with both Pearson correlation and regression analysis to test the study hypotheses. The results of the study revealed that there is positive significant relationship between Human Capital efficiency, Return on Equity and Return on Asset. The study further revealed positive and significant relationship between Structural Capital Efficiency, Return on Equity and Return on Asset. But out of three control variables only sector was significant with structural capital efficiency. The study concluded that intellectual capital efficiencies influence companies' performance of the sampled companies. The study recommended that management of the sampled companies should give priority to policies that will improve employees' capability and organizational structure.*

Keywords: *company performance; intellectual capital; Nigeria; value added*

Introduction

In knowledge-based economy, a company's Intellectual Capital (IC) is important determinant of its success. Intellectual asset is the combination of knowledge-based assets and intangible assets of a company which incorporate its patents, brand names, employee's skills, trade secret, technologies and information about consumers and supplies that has been utilised in order to create wealth and higher value (Stewart, 1997). Several studies have been carried out on the relationship between IC and companies' performance. However, intangible assets utilization level of companies differs because of their industry type and nature. Consequently, intensity and diversity level of intangible/IC assets will result to differences in IC dimensions (Oner, et. al., 2021; Fuad, 2017). Hence, it is reasonable to expect such IC diversity level may affect the association between intellectual capital and company performance (Oner et. al., 2021).

Using data from 117 quoted companies which cut-across eight sectors of Nigerian economy; data were gathered from Nigerian Stock Exchange fact book. This study investigated the effects of IC dimensions

proxies by Value Added Intellectual Coefficient (VAIC) Pulic Model on the financial performance for 2018 and 2019 periods of observation. Structurally, the second section of this work deals with review of literature on both IC and companies' financial performance; the third section covers the methodology; section four presents the data analysis, while section five concludes and provides policy recommendations based on the findings of the study.

Literature Review

Assets are expenses made by companies with the notion to earn future returns (Austin, 2007). Financial items such as receivables and investments which are claims for future benefits are regarded as assets even though they are not physical (Austin, 2007; Edvinsson & Malone, 1997; Lev, 2001). Assets could be classified as tangible or intangible/ intellectual capital. Intellectual asset is defined as non-physical asset (Berry, 2004) such as goodwill, brand and patent; which arise through business acquisition or merger with the emergency of corporate growth in early 1990s. Therefore, intellectual capital includes asset such as human capital (employees' skill, knowledge, capabilities, experience), structural capital

(patent, trademark, copyright, trade secret) and customer capital (company's external networking) (Lev, 2001).

The surge in the knowledge-based economy led to recognition of IC as the most essential asset in any company for sustainability in the capital market (Aboody & Lev, 1998). To this present time, a standardized definition of IC has not been arrived at because it is defined according to its basic parameters (Maditinos, et. al., 2011). Driven by the value individual or group of individual from different disciplines attached to it, different definitions emerged (Bontis, 1998; Edvinsson & Malone, 1997; Guthrie, 2001; Sveiby, 1997; Nazari, 2010). According to Lev (2001), IC/asset is "a claim to future benefit that does not have a physical or financial substance". Some researchers have defined it by its drivers. For instance, (Chan, et. al., (2001) and Stewart, (1998) defined it as human resource, advertising, R&D, and IT. While Pablo (2003) argues that it is the difference between book value and market value. From these definitions, it can be deduced that since company varies in nature definitely their intellectual capital is likely to vary according to each nature, regulatory environment and intensity (Abeyesekera & Guthrie, 2005; Amir & Lev, 1996; Guthrie & Petty, 2000). With these different definitions by scholars, it shows there is no single accepted definition of intellectual capital (Gerpoth et al. 2008). However, there is an agreement to the three dimensions of intellectual capital: "human capital (HC), structural capital (SC) and relational capital (RC)" (Salman, et. al. 2015; Bontis, 2002; Edvinsson & Sullivan, 1996) among others scholars.

Human Capital (HC) is believed by some researchers and practitioners of IC to be a segment of the organization and seen by some as including components related to humans. Some scholars considered it as skill and experience people have from learning, while another group see it as a direct linked to the work (Al-Maani, & Jeradat, 2010). Accordingly, HC is the estimation of worth of the knowledge available to the organization, (Bontis, & Fitz-enz, 2002). From another angle, HC is the knowledge owned by the organization and lives with the employee

(McGregor, Tweed & Pechi, 2004). Organisation of Economic Cooperation Development (1999) believes human capital include skills, knowledge and competencies embodied in individuals and associated with their economy activity. Structural Capital (SC) is the second dimension of IC, which is the system, process, procedure and practice of organizations (Salman et. al. 2015; Ordonez de Pablo, 2004). Maheran and Khairu (2009) viewed this dimension as formulas, systems, policies, patents, information, competitive intelligence created by organization over time. Structural capital is an organizational capital (OECD, 1999; Hall, 1992; Walsh & Ungson, 1991; Itami, 1987).

The third dimension of IC is referred to as Relational Capital (RC) defined by Ahangar (2011) as the relationship with customers, shareholders, suppliers, and strategic partners that organization has built over the years. In addition, O'Regan, O'Donnell and Herman (2001), view relational capital as the external constituencies and structures such as links to customers, suppliers, networks and other stakeholders that belong to an organization.

Many studies have been conducted by different scholars around the globe assessing the influence of IC dimensions on companies' performance of different sectors/industries. There are scholars that employed the resources based theory and Pulic (2000, 2004) VAIC model to explore the influence of IC on performance. For instance, Chen et al. (2005) examined Taiwanese quoted companies using Pulic VAIC model on the market value of the selected companies. Pearson correlation findings reveal that market-to-book value is associated positively with IC components.

Germane to the above study is the work of Chang and Hsieh (2011) that examining Taiwan companies using correlation and regression after calculating the IC efficiency using VAIC model. The result provides that companies' IC efficiencies are negatively impacted financial and market performance. However, relationship exists among dependent variables. Thus, finding provides evidence that industrial capability of Taiwan's high-tech companies are supported by comprehensive infrastructural development.

Shiu (2006) uses VAIC model to evaluate IC efficiency on company performance. Based on one year annual reports of 80 Taiwan listed technologies companies; results revealed positive correlation between IC efficiencies and performance. HC efficiency and CE efficiencies impacted positively on market value and profitability, while SC efficiencies have an inverse impact. The result revealed further that size of a firm has a negative significance over return on equity; VAIC and leverage have an inverse relationship. Uadide and Uwugbe (2011) examined intellectual capital and business performance of 32 public quoted firms in the year 2009 using both Pearson correlation and regression to evaluate relationship between the independent and dependent variables. Regression result revealed significantly positive relationship between intellectual capital efficiencies and business performance.

Suraj and Bontis (2012) assessed the intellectual capital efficiencies on performance telecommunication companies in Nigeria. Survey method of 320 managers from 29 telecommunication companies' data was used. Regression analysis was used with partial least square to examine the study variables. The results showed that HC, SC and customer capital correlated with each other and intellectual capital correlated with business performance. Salman et. al. (2015) evaluated the effect of IC on performance of 20 listed Nigerian banks. Data obtained from the audited reports of the sample were analysed with regression analysis; results showed structural capital and human capital influenced the banks' performance than the physical assets.

Scarfarto et. al. (2016) analysed intellectual capital of agribusiness industry using correlation and multiple regressions analyses. Result shows that relation capital and process capital positively influence performance. The study revealed association among human capital, innovation capital and company performance. Gogan et. al., (2016) explored the effect of intellectual capital on organization performance of four distributing drinking water companies in Romania between 2010 and 2014. The study analysed the data collected with correlation method. The findings

of the study showed that IC positively influenced performance.

Fuad (2017) evaluated the effect of board diversities of 62 knowledge intensive quoted Indonesian companies between 2012 and 2015 using regression analysis. The result shows effectiveness of board meetings moderates the effect of gender diversity thus influences the IC companies' IC performance. While educational diversity negatively influenced the IC performance. Nassar (2018) assessed the effect of IC on firm performance in Turkey using 27 samples; from 2004 to 2015. Result of the regression showed that capital employed, structural capital and human capital have positive and significant association with firm performance. Another study conducted by Tran and Vo (2018) on intellectual capital efficiency was based on Thai quoted banks. Data analysed revealed that capital employed efficiency (CEE) was the most significant component that influenced bank performance. Ousama, et. al., (2020) examined Islamic banks in Gulf Cooperation Council Countries and the findings shows IC components positively influenced banks' financial performance.

Alfiero et. al., (2021) assessed the IC performance of healthcare sectors of 16 regions in Italy in 2016. The data collected were analysed with slack based model. The result shows that intellectual capital components influenced performance of the selected healthcare sector. Another recent work is the study of Oner, et. al., (2021) which assessed the intellectual capital and firm performance of emerging countries and found out that IC components are significantly impacted financial performance of technological intensive companies.

There are other studies that have not found IC efficiencies related with company performance. For example, study of Firer and Williams (2003) examined 75 technological public listed companies in South Africa for only one (1) year. The study investigated intellectual capital influence on corporate performance. Data were sourced through audited annual accounts of sampled companies. The result of regression analysis revealed that none of the intellectual capital value added indicators are statistically related with corporate performance. The same result was

found by Maditinos et. al., 2011; while Chang and Hsieh (2011) found IC efficiencies to be negatively impacted companies' performance. In conclusion, there are inconsistencies in the results as shown by studies reviewed, hence, further study on this topic is necessary.

The theory that underpinned this study is resource-based theory. According to resource-based theory, company strategic assets is the combination of both tangible and intangibles assets acquired by such company which give it competitive hedge over its' competitors. This theory believes that intellectual capital is strategic asset because it links IC components with company's performance (Riahi-Belkani, 2003; Seethamraju, 2000, Barney, 1991). Thus, companies are differentiated by exclusively non-substitutes resources (Barney, 1991; Nelson & Winter, 1982). The variation in companies' resources and capabilities dictate strategies developed, thus, accounting for performance differences across firm (Oner, et. al., 2021; Alfiero, et. al., 2021). Hence, the study hypotheses were based on the resource-based theory as submitted by different studies supporting the positive impact of IC components (HCE and SCE) on financial performance also physical asset (CEE) impacted financial performance (Calisir et al. 2011; Scarfarto et., al. 2016; Nassar, 2018; Ousama et. al. 2020, Oner, et. al., 2021). Thus, the following hypotheses were formed for this study.

- H_{1a}: Human Capital Efficiency (HCE) will positively influence companies' financial performance (ROE and ROA) Ceteris Paribus.
- H_{1b}: Structural Capital Efficiency (SCE) will positively influence companies' financial performance (ROE and ROA) Ceteris Paribus.
- H_{1c}: Capital Employed Efficiency (SCE) will positively influence companies' financial performance (ROE and ROA) Ceteris Paribus.

Method

This study make use of secondary data sourced from 2018 and 2019 audited annual reports of 117 companies which represents 8 sectors of the Nigerian economy. This study

employed VAIC model of Pulic to examine the IC efficiencies of IC components, while Pearson correlation and regression analysis were used to test the study hypotheses. The sample for this study was drawn from the public listed companies in Nigeria excluding financial institution because of their capital structure. Pulic VAIC for valuing IC and Regression model for this study are shown below. To determine the value efficiency of intellectual capital drivers/components, this study makes use of Pulic (2000, 2004) framework called VAIC model. This model was employed to determine the value added (VA) of each components (Human capital and Structural capital) which is called IC efficiency. The VAIC must be calculated first to determine IC efficiency before assessing its contribution to company performance. Pulic VAIC is a composite sum of two indicators. These are: "Capital Employed Efficiency (CEE)" which is an indicator of VA efficiency of capital employed, and "Intellectual Capital Efficiency (ICE)" which is an indicator of VA efficiency of company's intellectual capital resource. ICE is subdivided in to two. That is Human Capital Efficiency (HCE) and Structural Capital Efficiency (SCE). Therefore, VAICTM is calculated as:

$$VAIC^{TM} = CEE + HCE + SCE$$

$$VAIC^{TM} = CEE+HCE+SCE \dots\dots\dots(1)$$

Where:

- HCE = Human capital efficiency
- SCE = Structural capital efficiency
- CEE = Capital employed efficiency
- HCE = VA/HC.....(2)
- VA = Value added, which represents the value added created by a company.

The value of a company for this study is given below:

$$VA= OI + E + D + A$$

Where:

- OI = Operating Income,
- E = Employee costs,
- D = Depreciation
- A = Amortization

HC = human capital which is the total company investment on employee (salaries and wages, training and development cost, welfare package and compensation cost.

$$SCE = SC/VA.....(3)$$

Where:

SC = structural capital of a company represented as VA-HC.

$$CEE = VA/CE.....(4)$$

Where:

CE = Book value of total net tangible assets.

This model has been used by several researchers such as Makki et. al., (2009); Calisir, et al. (2010); Cheng, Hsiao, & Lin, (2010); Salman, et. al., (2015); Oner, et. al., (2021). Makki et al. (2009) submits that there is need for more studies using VAIC method of valuing IC efficiency. In other to test the study hypotheses in examining the influence of ICE on financial performance of selected companies, physical asset efficiency and control variables the following regression models were developed.

Model 1

For the first dependent variable (Return on Equity), below is the equation:

$$Y_{1it} = \alpha + \beta_1 X_1 HCE_{it} + \beta_2 X_2 SCE_{it} + \beta_3 X_3 CEE_{it} + \beta_4 X_4 Size_{it} + \beta_5 X_5 LEV_{it} + \beta_6 X_6 Sec_{it} + V_{it}.....(1)$$

Where Y_{1it} = financial performance taken as Return on Equity (ROE).

X_1 = HCE_{it} (human capital efficiency)

X_2 = SCE_{it} (structural capital efficiency)

X_3 = CEE_{it} (capital employed efficiency)

X_4 = Size_{it} (natural logarithm of total asset) control variable 1

X_5 = LEV_{it} (debt ratio to asset employed) control variable 2

X_6 = Sec_{it} (Total IC assets) control variable 3

Model 2

For the second dependent variable (Return on Asset), below is the equation:

$$Y_{1it} = \alpha + \beta_1 X_1 HCE_{it} + \beta_2 X_2 SCE_{it} + \beta_3 X_3 CEE_{it} + \beta_4 X_4 Size_{it} + \beta_5 X_5 LEV_{it} + \beta_6 X_6 Sec_{it} + V_{it}.....(2)$$

Where Y_{1it} = financial performance taken as Return on Equity (ROA).

X_1 = HCE_{it} (human capital efficiency)

X_2 = SCE_{it} (structural capital efficiency)

X_3 = CEE_{it} (capital employed efficiency)

X_4 = Size_{it} (natural logarithm of total asset) control variable 1

X_5 = LEV_{it} (debt ratio to asset employed) control variable 2

X_6 = Sec_{it} (Total IC assets) control variable 3

Variables measurements

Return on Assets (ROA) and Return on Equity (ROE) are used as dependent variables in this study. ROA is measured as “the net income divided by total assets” of the company for the year, while ROE is measured as “the net income divided by total equity” of the company.

For independent variables, VAIC is the combination of both HCE, SCE and CEE. The measurements of these efficiencies are shown in page in six above to avoid repetition. For control variables, size is measured as natural logarithm of total assets of the company for the year of observations, Leverage is the total debt divided by total assets of the company and sector is proxy as total IC assets of the company. Before evaluating the intellectual capital efficiency, preliminaries tests (normality test and correlation) were run on the data to test for the possibility of the presence of multicollinearity, and heteroskedasticity before the models were regressed. Table 1 presents variables measurement and their definitions.

Result

Descriptive Statistics

The descriptive statistics of all the variables used in the models for the two years observation were show in Table 1.

Table 1 shows that HCE ratio of value created by employees; SCE reveals the value created by structural capital; and CEE presents companies’ physical capital employed ratio efficiency in creating value answering the hypotheses tested. Hence, it can be concluded that intellectual capital efficiencies influenced companies’ performance. The descriptive results indicate that the mean value of HCE shows that the sampled companies’ HC is more effective in creating value than structural capital and capital employed throughout the two years of observations. The result revealed further the efficient utilization of assets

Table 1. Descriptive Statistics of Variables (IC Efficiency, Control and Company Performance)

Variables	2018				2019			
	Min	Max	Mean	SD	Min	Max	Mean	SD
HCE	0.20	5.23	2.91	2.55	4.00	28.23	10.19	1.59
SCE	0.08	3.31	0.88	0.56	4.52	29.35	5.87	1.31
CCE	0.02	6.74	1.06	1.04	4.07	31.03	7.33	1,67
SIZE	4.00	6.89	5.39	0.75	3.69	16.11	13.10	1.10
LEV	0.05	7.59	1.24	1.12	0.01	5.797	1.37	1.47
SEC	2.23	6.33	6.75	4.91	4.34	33.42	9.80	1.63
ROE	0.20	8.32	2.49	1.57	4.61	29.21	9.40	1.71
ROA	4.36	5.31	1.12	2.33	4.13	30.00	11.33	1.02

n=117

Source: Author's (2021)

(measure as size) as the mean value increased tremendously from 5.39 (in 2018) to 13.10 (in 2019). So also, sector (measured as total IC) is maximally utilized as its mean value increased from 6.33 (in 2018) to 9.80 (in 2019). Finally, the company performance measures ROE and ROA are sound as their mean values improved on yearly basis. The next table 2 shows the correlation result testing for multicollinearity among the variables.

Multicollinearity Test

The correlation results revealed that the three components of VAIC used in this study to measure IC efficiency pointed to the fact that there is no collinearity among the variables as the Pearson correlation (r) between HCE and SCE; HCE and CEE; HCE and ROE; HCE and ROA; are statistically significant at $r = 0.698$, ($p < 0.05$), $r = 0.477$, ($p < 0.05$), $r = 0.706$, ($p < 0.05$), $r = 0.44$, ($p < 0.05$), and $r = 0.551$, ($p < 0.05$). A strong correlation exists between HCE and ROE ($r = 0.706$, $p < 0.05$). The results also show SCE has a strong correlation with sector with $r = 0.657$, ($p < 0.05$). To further

confirm this, Durbin Watson test was conducted with regression. Durbin Watson value should be close to 2. The result of Durbin Watson in this study ranges from 1.59 to 2.214, therefore, suggesting absence of non-autocorrelation among the variables which can be seen in the regression results as presented in Table 3 and Table 4.

Table 3 and 4 show that HCE was significant and positively related to ROE and ROA as the t-value were 4.87 and 3.93, 6.65 and 4.27, P-value $0.000 < 0.05\%$ significant level in the year 2018 and 2019 respectively. Also, SCE has positive and significant relationship with ROE and ROA with t-values of 5.13 and 5.77; 7.60 and 3.89, P-value of $0.000 < 0.05$ significant levels for 2018 and 2019 respectively. However, out of the three control variables, only sector was significantly related to all the two company performance measures, the other two control variables (size and leverage) were insignificantly.

Complimenting these results are R², F statistics and Durbin Watson values.

Table 2. Pearson Correlation

	THCE	TSCE	TCEE	TSIZE	TLEV	TSEC	TROE	TROA
THCE								
TSCE	.0.698**							
TCEE	.0.477**	.0.440**						
TSIZE	.0.196*	.0.197*	.0.031					
TLEV	.0.035	.0.183*	-0.117	-0.132				
TSEC	0.384**	0.657**	0.342**	0.262**	0.185*			
TROE	.0.706**	.0.506**	.0.212*	-0.040	.0.068	0.508**		
TROA	.0.551**	.0.380**	.0.289**	-0.008	-0.14	.0.460**	0.363**	

** Significant at the 0.05 level (2-tailed)

*Significant at the 0.01 level (2 tailed).

Source: Author's Computation, (2021)

Table 3. Regression results of the two models (ROE and ROA) (2018)

Variables	Coefficient (Model 1)	T	Coefficient (Model 2)	T
Constant	7.896	6.99	-8.471	-5.36
HCE	0.460	4.87	0.453	3.93
SCE	0.635	5.13	0.561	5.77
CEE	0.422	2.48	0.211	3.33
SIZE	0.008	1.03	0.001	1.51
LEV	0.021	0.75	0.050	0.84
SEC	0.119	3.67	0.206	4.49
Sig	0.000***		0.000***	
R ²	0.654%		0.767%	
Durbin	1.794		1.853	
Watson				
F	22.707		9.398	
n = 117				

*p<0.05, ***p<0.001

Source: Author's computation, (2021)

Although, there is no specified acceptable R² that determines the fitness of the model according to Latin, Douglas and Green, (2003); however, they suggest R² values ranging from 0.1 and 0.5. In this study, the R² values range from 0.62 to 0.78 which are greater than 0.10, hence, the assumption of fitness of the model is achieved. In addition, the independent variables explained from 62% to 78% of the variation of the dependent variable. F statistics results range from 8.144 to 22.707, while the Durbin Watson range from 1.77 to 2.00. This indicates that the statistical tool (regression model) is good enough to analyse the data for this study.

Discussions

This study achieved the stated objectives by examined the influence of IC efficiency on financial performance of 117 listed companies

in Nigeria. The results of this research supported all the hypotheses. The results were arrived at after controlling for independent variables with size, leverage and sector to reduce the effect of individual company's distinct characteristics.

The findings of this study showing positive relationship exists between human capital and (ROE, and ROA) financial performance for the two years of observation as presented in both table 3 and 4 above. Meaning that all the indicators used in measuring human capital and company performance are suitable for this study and the investments of the sampled companies in human capital are commensurate and adequate to add value to these companies in line with the theories used in this study. Pulic (2004) argued that HC is the

Table 4. Regression results of the two models (ROE and ROA) (2019)

Variables	Coefficient (Model 1)	t	Coefficient (Model 2)	t
Constant	14.136	8.73	-12.216	-.634
HCE	0.615	6.65	0.265	4.27
SCE	0.861	7.60	0.316	3.89
CEE	0.244	3.90	0.290	3.76
SIZE	0.182	0.64	0.002	0.86
LEV	0.086	0.52	0.020	0.69
SEC	0.201	2.76	0.261	4.53
Sig	0.000***		0.000***	
R ²	0.618%		0.785%	
Durbin Watson	1.775		2.002	
F	8.466		4.144	
n = 117				

Source: Author's computation, (2021)

back bone of structural capital and company performance. This result is also in line with some previous studies such as Salman et. al. (2015); Tran & Vo (2018); Oner et. al., (2021). The implication of this result is that, the higher the investment in human resource, the higher the return. Also, the investment in human capital in sampled companies is worthwhile and effectively utilized because there is an increase in the value efficiency of HC between 2018 and 2019.

The findings also reveal the SC potentiality in creating value to the company as it is positive and significant with the company performance. The submission is in line with previous studies like Scarfarto et. al. (2016); Nassar (2018); Ousama et. al. (2020). This is a good pointer to sampled companies that investments in structural capital items are worthwhile. Thus, it is important that Nigerian companies should lay emphasis on policy that will promote and improve the structure. This study suggests that all the policies recommended may be universally implemented as this study cut-across 8 sectors in Nigerian economy. The study also provides support for positive relationship between capital employed (physical asset) and financial performance which is in line with Makki et al. (2009); Nassar (2018) Fuad (2017) studies. Out of the three control variables only sector is positive significantly relates with structural capital. This finding is consistent with the studies of Chang and Hsein (2011); Oner et. al., (2020).

Conclusion

This study concludes that IC efficiencies are related to financial performance for the sampled companies for the two years observations. In the light of this, the study recommends that the management of the sampled companies should implement policies that will upgrade employees' skills and competences by introducing in-training programme, and work-related programme. Also, the companies should strive to invest more on Research and Development (R & D) to boost their structural capital value creation. Similarly, the companies should also increase their investment in physical assets as both intellectual capital assets and physical assets have potential power to influence companies' financial performance. This study only focused

on 117 quoted non-financial companies; hence, future study can dwell on financial institution and cover more than two accounting years to examine more trend of value-added power of intellectual capital efficiency.

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