Intellectual Capital Efficiency and Corporate Sustainability Growth: The Nigerian Evidence

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Abstract: The study examined the relationship between intellectual capital efficiency and corporate sustainability growth. Intellectual capital efficiency was proxy using human capital efficiency, relational capital efficiency and structural capital efficiency while corporate sustainability growth was measured using corporate sustainability growth rate (CSGR). Ex post facto design was adopted and data for this study was collected from the annual reports and accounts of the 45 manufacturing firms listed on the floors of Nigerian Exchange Group for the period of 2015-2022. Panel Least squares model was used in the data analysis and the results of the study show a significant and positive association between human capital efficiency, relational capital efficiency, structural capital efficiency and sustainability growth of manufacturing firms in Nigeria at 1% -5% significant level. The study therefore concludes that intellectual capital efficiency ensures corporate sustainability growth. Thus, the study recommends that manufacturing firms in Nigeria should develop a means to improve their human capital efficiency as any negative changes in human capital efficiency will impact the sustainable growth of the firm. They should also invest heavily in relational and structural capital as it can improve their competitiveness, reputation and bottom line.

Keyword: Intellectual Capital Efficiency; Human Capital Efficiency; Relational Capital Efficiency; Structural Capital Efficiency; Corporate Sustainability Growth

1. INTRODUCTION

The focus of investment and global reporting is shifting from traditional corporate reporting, which primarily considers financial capital to integrated reporting that includes financial, productive, intellectual, human, social, relational and natural capital. The Organization for Economic Co-operation and Development claims that

investments are gradually shifting from physical assets to intangible assets (OECD, 2015). Intellectual capital is the knowledge that can be converted into values and the aggregation of all the knowledge and skills of employees that help an organization to achieve competitive advantage. Intellectual capital represents the body of knowledge at a given point in time accumulated through knowledge flow activities (Ewereoke, 2017). The widespread acceptance of intellectual capital as a source of competitive advantage has led to the development of appropriate methods to measure it, since conventional financial reporting is unable to capture all aspects of it (Campisi & Costa, 2008).

There are mixed and conflicting results on the relevance and relationship between intellectual capital and organizational performance. While some studies on the relationship between intellectual capital and financial performance in developed countries agree that intellectual capital has a significant and positive association with the financial performance of organizations, thus giving organizations a competitive advantage over others (Avci & Nassar, 2017; Nadeem, 2016; Kamath, 2017; Nassar, 2018; Xu & Wang, 2018; Tutun & Som, 2019).

The studies above were conducted in advanced economies. In view of the significant contribution of economically emerging countries to the overall development of the world economy, it is imperative to conduct an empirical study on developing or emerging economies such as Nigeria where, despite the shift towards intensive intellectual capital economy, Nigeria firms have continued to use traditional accounting that focuses more on the physical assets in the financial reporting and only few studies were spotted like Ewereoke (2017), Onyekwelu, Okoh and Iyidiobi (2017), Lambe, Ame and Dzugwahi (2022), Haruna (2022) to have investigated the relationship between intellectual capital and firm performance, while Ekwe (2013) emphasized on the relationship between intellectual capital and revenue growth.

From the above analysis, it emerged that most of the studies conducted in Nigeria limited intellectual capital to corporate performance, predominantly using traditional accounting performance measures that could not provide a comprehensive view of the corporate financial performance. Hence the need for the present study to examine the relationship between intellectual capital efficiency and corporate sustainability growth using manufacturing firms in Nigeria as a reference point. Thus, the following hypotheses were formulated to achieve the purpose of this study.

H_{01}: Human capital efficiency has no significant relationship with corporate sustainability growth

H_{02}: There is no significant relationship between relational capital efficiency and corporate sustainability growth

H_{03}: Structural capital efficiency has no significant relationship with corporate sustainability growth

2.   CONCEPTUAL REVIEW

2.1. Intellectual Capital

The shift from the traditional economy (land, labor and finance) to the knowledge-intensive economy over the past two centuries has led the service-based industries take the largest share of the value-added process, especially in developed societies. Intellectual capital (IC) is widely recognized as the innate trait that a company normally acquires which propels it along the wheel of value creation and value sustainability (Onyekwelu, Okoh & Iyidiobi, 2017). Edvinsson and Malone (1997) defined Intellectual Capital (IC) as the possession of knowledge, information technology customer relationships, applied experience and professional skills that give a company a competitive advantage in the marketplace.

2.1.1 Components of Intellectual Capital

2.1.1.1. Human Capital

Human capital is understood to mean employee values that create potential and are reflected in the knowledge, skills, competencies, abilities, experience and talents of employees and managers in an organization. Also, Stiles and Kulvisaechana (2003) submitted that the concept of human capital is based on the fact that there is no substitute for knowledge and learning, innovation and creativity, competences and skills that are relentlessly pursued and applied to business's environmental context. Human capital captures the knowledge, experience, professional skills and ability to innovate employees within an organization. Human capital consists of the skills, competences and abilities of individuals and groups (Stewart, 1997, cited in Onyekwelu et al., 2017).

2.1.1.2. Relational Capital

Relational capital (RC) is defined as external connections to the organization's suppliers and customers that enable it to buy and sell goods and services in an efficient and effective manner (Sumedrea, 2013). According to Xu and Wang (2018), relational capital represents an organization's ability to positively interact with members of the business community to foster the potential for wealth creation through the enhancement of human and structural capital. Banimadh, Mohammadrezaei, and Mohammadrezaei (2012) stated that RC is the knowledge embedded in relationships with customers, suppliers, industry bodies, or other stakeholders that affect the life of an organization.

2.1.1.3. Structural Capital

Structural capital is the ability of an organization to perform the routines and structures of the organization that support the efforts of employees to achieve optimal intellectual

performance as well as overall business performance, for example: the operating systems, organizational culture, manufacturing processes, management philosophy and all forms of intellectual performance of the company real estate is owned by the company (Aluwong, 2022). According to Ahmed and Tamanna (2023), it is an infrastructure that supports employees to perform optimally, including the organization's ability to reach the market, software, hardware, databases, patents, organizational structure, trademarks and all capabilities of organizations supporting employee productivity.

2.1.2. Corporate Sustainability Growth (CSG)

Tutun and Som (2019) view corporate sustainability growth as an affordable growth that could be profitably maintained for future benefit. The concept of corporate sustainability growth was popularized by Higgins' remarkable study in 1977, in which he first proposed the use of a sustainable growth rate model to explain the practical limits to growing firms. The concept of the corporate sustainable growth rate explains if sales growth is consistent with the realities of the firm and the financial market (Van Horne & Wachowicz, 2015). Omaliko and Okpala (2022) reported that corporate sustainability is all about financial performance information and non-financial information that includes social and environmental activities that enable companies to grow sustainably and friendly.

Omaliko and Onyeogubalu (2021) submitted that to be sustainable, organizations must concede the following:
  (i) Responsible for their social, environmental and economic impact.
  (ii) Being transparent in decisions and activities affecting its responsibilities.
  (iii) Respond to the interests of its stakeholders.
  (iv) Accept the fact that the rule of law is mandatory

The company with a growth rate which deviates from sustainable growth will eventually fall into the dilemma of unsustainable growth (Buffa, Franch & Rizio, 2018). For the purpose of this study, corporate sustainability growth was measured as return on equity multiplied by retention ratio. This is expressed as ROE(1-DPR).

2.2. Theoretical Framework

2.2.1. Resource-Based Theory

Resource-based theory posits that a company's image and reputation aims to maintain competitive advantage through effective and efficient use and control of both tangible and intangible resources (Baye, Douanla, & Fonkem, 2014). The notion of value creation is considered a valid measure for conceptualizing corporate performance. Morris,

Kuratko, Allen, Ireland and Schindehutte (2010) established the resource-based theory in a resource portfolio. Thus, the study conceptualized the resource-based theory of enterprise resources in a situation where the quality and the availability of the number of resources in a portfolio is the prime factor in determining organizational performance. In this study, the resource-based theory is the solid foundation for explaining the intellectual capital resources that influence corporate sustainability growth in Nigeria.

2.3. Empirical Review

Haruna (2022) determined the effect of intellectual capital on the performance of multinational companies in Nigeria. The longitudinal research design used and the data collected from the 24 sampled multinational companies were used for the ten-year period; 2010-2019. Data for the study were analyzed using panel regression using STATA 16 software. The result showed that capital employed efficiency has positive and significant impact on the performance of multinational companies in Nigeria. Also, structural capital efficiency and human capital efficiency have no impact on the performance of multinational companies in Nigeria. The study recommends that companies should invest in revenue-generating activities as this significantly improves the performance of the companies. They should also pay attention to human capital and infrastructure development as it impacts the performance of companies in Nigeria.

Lambe, Ame and Dzugwahi (2022) examined the relationship between natural and intellectual capital and financial performance of listed multinational companies in Nigeria. The study period was ten (10) years; from 2012 to 2021 and the data used for the study was sourced from the published financial reports of the companies and the Nigerian Exchange Group (NGX). Twenty-four (24) publicly traded MNEs make up the population and nineteen (19) of them were selected as a sample based on a study filter. Ex post facto research design was adopted, and the study is based on resource-based theory and dissemination innovation theory. Multiple regression was used for data analysis. The outcome of the study showed that intellectual capital has a significant and positive impact on the financial performance of listed multinational companies in Nigeria. On the other hand, natural capital has a positive but insignificant impact on financial performance. The study concludes that intellectual capital ensures financial performance.

Chechet, Ayuba, Ahmad, Ishola, and Olaranrewaju (2020) examined the impact of intellectual capital on the financial performance of listed Nigerian deposit money banks for the period ended 2013 to 2017. Secondary data was collected from the audited financial reports of the financial institutions. Twelve banks were selected as study samples and the study population includes all 14 of those indicated. Using a multiple regression analysis, the four hypotheses were evaluated at the significance level of 5%.

The results of the study show that intellectual capital and human resources are crucial for the profitability and competitiveness of NDMBs.

Oyedokum and Saidu (2018) examined how intellectual capital affected the financial performance of publicly traded Nigerian oil marketing companies. The study covered a 10-year period from 2007 to 2016. Market-to-book ratio, intellectual value-added coefficient and Tobin's Q monetary model were used to measure intellectual capital, while return on investment was used to measure financial capital performance (ROA). Data was collected from the companies' published financial accounts using the ex post facto research design. The impact of intellectual capital on financial performance was assessed using multiple regression analysis. The results of the study showed that intellectual capital only marginally affected financial performance.

Duru, Okpe and Nwosu (2018) examined the impact of intellectual capital on the financial performance of banks in Nigeria. Specifically, the study looked at the following: to examine the effect of human capital on the return on assets; evaluate the effect of structural capital on the return on assets; and to determine the impact of capital employed on the return on assets employed by banks in Nigeria. The study, which applied the ex post facto research design, used data from four deposit banks in Nigeria for the periods 2011 to 2015. Descriptive statistics were used for the pre-test analysis and a regression analysis for the hypothesis test. The study found that human capital efficiency has insignificant and positive effect on ROA; structural capital efficiency has insignificant and positive impact on return on assets; and capital employed has a negative and insignificant impact on the return on assets in the Nigerian banking sector.

Onyekwelu, Okoh and Iyidiobi (2017) used the Value Added Intellectual Coefficient (VAIC) to determine the extent to which intellectual capital indices affect the financial performance of three banks. The data was collected from the financial statements of the 3 banks. the data was analyzed using a regression model. The study shows that IC has a positive and significant impact on banks' financial performance. The results also showed that banks differ statistically in terms of both intellectual capital and financial performance indicators. It also shows that the banks with high IC also have high financial performance. The study recommends that banks in Nigeria should invest vigorously in developing their human capital, as this is a key factor in business performance. They should also provide the necessary infrastructure to create human capital in the system.

A study by Oneyekwelu and Ubesie (2013) on pharmaceutical companies in Nigeria analyzed the impact of intellectual capital on company valuation from 2004 to 2013 in terms of market to book ratio (MV/BV) and earnings per share (EPS) in line with Pulic VAIC, the results show that human capital efficiency has a positive and significant impact on market/book value. Structural capital has a negative and insignificant impact on earnings per share.

3. METHODOLOGY

An *ex post facto* design was used in the study based on the fact that the data for the study was secondary which already existed and cannot be controlled. The population of the study consists of 66 manufacturing companies listed on Nigerian Exchange Group (NGX) as at December 31, 2022, covering the period 2015-2022. A sample of forty-five (45) publicly traded manufacturing companies that regularly published their financial statements was used. On this basis, a total of 45 companies made up our sample size with 360 observations. The data was collected from the annual accounts and reports of the sampled companies. Panel least square regression model was used to examine the relationship between intellectual capital efficiency and corporate sustainability growth.

3.1. Measurement and Operationalization of Variables

Table 1: Variable Measurements

Variable	*Measurement*
Dependent	
Corporate Sustainability Growth	ROE(1-DPR)
Independent	
Human Capital Efficiency	VA/HC
Relational Capital Efficiency	RC/VA
Structural Capital Efficiency	SC/VA

Source: Empirical Survey (2023)

3.2. Model Specification and Justification

The researcher designed a model in line with the previous studies to examine the relationship between intellectual capital efficiency and corporate sustainability growth. The functional model for the study is shown below as thus:

$$CSG = F(HCE, RCE, SCE)$$

The explicit form of the regression designed for the study is expressed as thus:

$$\text{Model: } CSG_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 RCE_{it} + \beta_3 SCE_{it} + \mu$$

Where:

CSG = Corporate Sustainability Growth

HCE = Human Capital Efficiency

RCE = Relational Capital Efficiency

SCE = Structural Capital Efficiency

μ = error term

Decision Rule: accept Ho if P-value > 5% significant level otherwise reject Ho

4. DATA ANALYSIS AND RESULTS

Table 2: Descriptive Statistics

	CSG	HCE	RCE	SCE
Mean	3.22	3.26	2.67	2.05
Median	0.07	2.78	2.10	1.90
Maximum	6.99	4.01	3.10	3.13
Minimum	-0.35	0.09	0.19	0.09
Std. Dev.	3.88	0.68	0.67	0.58
Skewness	-10.44	0.43	0.61	0.24
Kurtosis	12.96	2.26	2.07	2.44
Jarque-Bera	18.79	19.32	35.36	8.12
Probability	0.46	0.39	0.25	0.60
Sum	79.61	1173.90	960.70	739.28
Sum Sq. Dev.	5394.10	165.60	160.98	119.19
Observations	**360**	**360**	**360**	360

Source: E-View 12 Computational Results (2023)

Table 2 above shows that corporate sustainability growth (CSG) value for the sampled firms' was 3.22. This implies that corporate sustainability is determined by firms' intellectual capital efficiency. The maximum value for the study was 6.99 while the minimum value was -0.35. The variations in minimum and maximum CSG value for the sampled firms justify the need for this study, as the study assumes that corporate sustainability growth is a determinant of intellectual capital efficiency.

The average value of human capital efficiency (HCE) for the sampled firms was 3.26. This means that firms with HCE value of 3.26 and above have human capital efficiency at a risk level of 0.68%. The maximum and minimum values for the study were 4.01 and 0.09 respectively. The variation in minimum and maximum HCE values between the sampled firms justifies the need for this study, as the study assumes that firms with such variability have sustainable growth.

The average relational capital efficiency (RCE) value for the sampled firms was 2.67. This means that firms with RCE values of 2.67 and above have relational capital efficiency. The maximum and minimum values for the study were 3.10 and 0.19 respectively. The variation in the minimum and maximum RCE values between the sampled firms justifies the need for this study, as the study assumes that firms with such variability are more sustainable.

The mean value of structural capital efficiency (SCE) for the sampled firms was 2.05. This implies that firms with SCE of 2.05 and above have structural capital efficiency at a degree risk of 0.58%. The maximum and minimum values for the study were 3.13 and 0.09 respectively. The variation in minimum and maximum SCE values between

the sampled firms justifies the need for this study, as the study assumes that firms with such variability have sustainability growth.

Finally, in Table 2 above, the Jarque-Bera (JB) test for normality shows that the data are normally distributed at 5% significant level. This means the data is free of unknown outliers. Therefore, panel least squares regression estimates can be used to estimate the analysis.

Table 3: Correlation Matrix

Variables	CSG	HCE	RCE	SCE
CSG	1.00			
HCE	0.06	1.00		
RCE	0.01	0.54	1.00	
SCE	0.03	0.05	0.52	1.00

Source: Result Output from E-Views 12 (2023).

Table 3 above shows the relationship between the independent and dependent variables used in the model. The results of the study show that all independent variables are positively related to the dependent variable (corporate sustainability growth) and with each other. The values on the diagonal are all 1, indicating that each variable is perfectly correlated with itself. When testing for multi-collinearity, we found that no two exogenous variables were perfectly correlated. This implies that there is no multi-collinearity in our model.

4.1. Test of Hypothesis

Table 4: Panel Least Squares Result on the Relationship between Intellectual Capital Efficiency and Corporate Sustainability Growth

Dependent Variable: CSG
Method: Panel Least Squares
Date: 06/05/23 Time: 18:36
Sample: 2015 2022
Periods included: 8
Cross-sections included: 45
Total panel (balanced) observations: 360

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HCE	0.436362	0.079770	5.470252	0.0033
RCE	0.178734	0.051723	3.455600	0.0137
SCE	0.915394	0.141591	6.465058	0.0000
C	1.404033	0.215909	6.502899	0.0000

R-squared	0.411683	Mean dependent var	22.11330
Adjusted R-squared	0.400733	S.D. dependent var	3.876253
S.E. of regression	3.884533	Akaike info criterion	5.562932
Sum squared resid	5371.897	Schwarz criterion	5.606111
Log likelihood	-977.3277	Hannan-Quinn criter.	5.580100
F-statistic	7.490402	Durbin-Watson stat	1.953843
Prob(F-statistic)	0.000000		

Source: Result Output from E-Views 12 (2023).

The R-squared for the model, shown in Table 4 above, was 0.41%, indicating that the variables included in the model accounted for 41% of the change in the dependent variable of corporate sustainability growth (CSG), while about 59% was unaccounted for. The F-statistic value of 7.490 and its P-value of 0.0000 indicate that the panel least-squares model is statistically significant at 1% level. This implies that the regression model is valid and appropriate for the study.

Autocorrelation Test: The DW statistic is 1.953843, which is approximately 2, which agrees with Durbin Watson's rule of thumb. This means that the data are free of autocorrelation and suitable for the interpretation of the result. The Schwarz Criterion and the Akika Info Criterion of 5.606111 and 5.562932, respectively; further strengthen the reliability of our result as it confirms the goodness of fit of the model.

In addition, the specific results for each explanatory variable from the panel least squares model as shown in Table 4 are provided below as follows:

4.2. Discussion of Findings

H_{01}: Human capital efficiency has no significant relationship with corporate sustainability growth

This hypothesis was tested and the result of the panel's least squares model as shown in Table 4 shows that the relationship between human capital efficiency (HCE) and corporate sustainability growth (CSG) is positive and significant, with a P-value of 0.0033 for the model, which is below the 5% level of significance adopted. The result of the positive coefficient of 0.436 for the model also implies that an increase in human capital increases the corporate sustainability growth by 43.6%. We therefore accepted the alternate hypothesis, which states that human capital efficiency is significantly related to corporate sustainability growth. This finding is consistent with the findings of Lambe, Ame, and Dzugwahi (2022), who found that human capital efficiency ensures firm performance. Contrary to this, Oyedokum and Saidu (2018) and Haruna (2022) found that human capital efficiency has no impact on the performance of multinational companies.

H$_{02}$: There is no significant relationship between relational capital efficiency and corporate sustainability growth

This hypothesis was tested and the result of the panel least squares model as shown in Table 4, shows that the relationship between relational capital efficiency (RCE) and corporate sustainability growth (CSG) is positive and significant, with a P- value of 0.0137 for the model which is less than 5% significant level adopted. In addition, the positive coefficient of 0.178 for the model suggests that relational capital efficiency ensures the corporate sustainability growth by 17.8%. We therefore accepted the alternate hypothesis, which states that there is a significant relationship between relational capital efficiency and corporate sustainability growth. This result agrees with the a priori expectations of Onyekwelu, Okoh, and Iyidiobi (2017), who reported that relational capital efficiency has significant implications for firm performance.

H$_{03}$: Structural capital efficiency has no significant relationship with corporate sustainability growth

This hypothesis was tested and the result of the panel's least squares model as shown in Table 4, shows that the relationship between the structural capital efficiency (SCE) and corporate sustainability growth is positive and significant, with a P-value of 0 .0000 for the model, which is below the 5% level of significance adopted. Furthermore, the positive coefficient of 0.915 for the model shows that an increase in structural capital increases the corporate sustainability by 91.5%. We therefore accepted the alternate hypothesis, which states that structural capital efficiency has significant relationship with corporate sustainability growth. The finding is in consonance with the findings of Onyekwelu, Okoh and Iyidiobi (2017), Chechet, Ayuba, Ahmad, Ishola and Olaranrewaju (2020) who found that structural capital ensures firm performance. In disagreement, the study of Oneyekwelu and Ubesie (2013), Duru, Okpe and Nwosu (2018) and Haruna (2022) found that structural capital efficiency has no impact on the performance of firms in Nigeria.

5.   CONCLUSION

The study concludes that intellectual capital efficiency has significant effect on sustainability growth of manufacturing firms in Nigeria. Thus, intellectual capital efficiency ensures corporate sustainability.

5.1. Recommendation

1.   Manufacturing firms in Nigeria should develop a means to improve their human capital as it has positive and significant impact on corporate sustainability growth. They should look for ways to improve the efficiency of the human capital at their

disposal. This is because any negative changes in human capital efficiency impacts corporate performance.

2. Manufacturing firms should also invest heavily on relational capital as it improves corporate reputation, competitiveness and bottom line.

3. Since positive and significant relationship was found between structural capital efficiency and corporate sustainability growth, manufacturing firms should invest more in structural capital in order to increase profitability

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Conflict of Interest

Authors have declared that no competing interests exist.

Authors Contribution

Kelvin Mordi made a significant contribution through the problem identification. Also, Amara Uzodimma did the review of the related literature. Every other aspect of the work was handled by Dr Omaliko Emeka the corresponding author.

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