

Does Intellectual Capitals Influence Manufacturing Companies Performance in Emerging Economies? A Study of Nigeria

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Abstract

This study was carried out to investigate whether intellectual capital influence financial performance of listed manufacturing firms on Nigerian exchange group for the period 2015 to 2023 financial periods. This is premise on the fact that knowledge assets seem the most important driver of organizational performance; attracting huge investment annually. *Ex Post facto* research design was adopted in the study. Thirty-three (33) quoted manufacturing firms in Nigeria cutting across two sub-sectors on the floor of the Exchange as at 31st December 2023 constituted the population and sample of the study. Return on Equity (ROE) was used as proxy for financial performance, while Human Capital (HC), Relational Capital (RC) and Structural Capital (SC) were proxies for Intellectual Capital. Panel data for the period of the study were mined from annual reports and financial statement of the sampled firms. Hausman test indicated fixed effect regression model as suitable for analysis. Descriptive statistic and Inferential statistics were used for the analysis. Results revealed HC, RC and SC were statistically significance and positive drivers of financial performance of quoted manufacturing firms in emerging economies like Nigeria. It was concluded that intellectual capital influence return on equity and recommended timely investments in training and development of employees, improvements on marketing and value chain activities to create relationship with both internal and external customers for enhanced capacity.

Keywords: Intellectual capital, Human capital, Relational capital, Structural capital, Return on Equity.

1.1 Introduction

Manufacturing firms are the aggregate of entities that provide essentially finished products and services to customers. Most of the manufacturing firms existing in Nigeria economy are quoted but some are not. The quoted manufacturing firms are entities whose equities are listed on the stock market. They are more economical due to the fact that their continual existence is guaranteed as they can source for funds from Wider investors. The anticipation of quoted manufacturing firms in Nigeria is to improve upon their financial performance and returns to investors in different accounting periods. Consequently, Intellectual Capital is one key factor in which managers could focus to improve upon the performance and productivity of the entire organizations.

Intellectual capital is an emerging concept in accounting associated with the level of knowledge acquired by an organization through the development of human resources, investment in marketing to improve customers' relationship with the companies and improving upon organizational culture and database (Anik *et al.*, 2021). It is the total knowledge acquired by an organization through human resources, rational capacity and structural competency (Ahangar, 2020). To improve human capital, managers are required to provide funds for training and development of employees to raise their technical know-how and making them to be acquainted with the required skills needed in organization.

In evaluating the financial performance of companies, different accounting measures are used including stock price of companies. Some of the accounting performance indicators derived from published annual reports are Return on Equity (ROE), Return on Assets (ROA), Return on Capital Employed (ROCE), Earnings per Share (EPS) and among others

In modern firms', intellectual capital has become a potent driver of financial growth and sustainability (Anik *et al.*, 2021); hence, much investment has been devoted into raising intellectual capability attributes such as human capital, relational capital and structural capital to improve upon their intellectual capacities. How this investment has impacted quoted

manufacturing companies' financial performance in Nigeria requires empirical investigation, which are limited in extant literature (Ahangar,2020 and Daat *et al.*, 2021), thus this study seek to ascertain the direction of influence of variables of intellectual capital on financial performance of these category of companies in Nigeria as an emerging economy.

1.2 Study Objective and Hypothesis Development

The main objective of the study was to evaluate the influence intellectual capital has on financial performance of quoted manufacturing firms in Nigeria.

The research hypothesis is formulated in line with the objective as follows:

Ho: Human capital, Relational capital and Structural capital have no significant influence on Return on Equity (ROE) of quoted manufacturing companies in Nigeria.

1.3 significance of the study

The research outcomes would provide insights on the direction of the variables of intellectual capital that influenced financial performance most, so as to drive investment and management policies; addition to extant literature for further researches and academic activities as well as other internal and external stakeholders such as competitors, existing and potential investors and the government and its agencies in their investments and policies decision processes.

The rest of the paper covers review of related literature under various headings, methodology, results, and discussion of findings, conclusion, summary and recommendations.

2.0 Review of Related Literature

2.1 Intellectual capital: this is defined as the sum of knowledge acquired by a company from their investment in different aspect of operations conducted; the unique knowledge of business possessed by a company; fundamental resource of knowledge - based assets an organization held as drivers of its performance (Xu and Zhang,2021; Adegbayibi,2021; Zehri *et al.*, 2012). It is the resource that enhance the efficiency and effectiveness of the physical assets and value-added cycle of any entity. Empirical studies carried out in this area have indicated that there is always a link between the level of knowledge possessed by an entity and the revenue generated regarded as outputs (Klamath, 2015; Muchran, 2020; Etim and Effiong, 2021 and Etim *et al.*, 2022). This same link between Intellectual capital and financial performance of quoted manufacturing firms in Nigeria could be established from this study.

For the purpose of this study, Intellectual capital variables examined are Human, Relational and Structural capitals.

Human Capital: These are benefits organization derived from the cost and investments expended on human assets to improve upon this skills, knowledge and capabilities of employees (Rashid *et al.*, 2020; Rufus *et al.*, 2022). These investments include but not limited to wages and salaries, training and development, non-financial incentive, on- the-job and out-the-job activities and welfare costs. The effectiveness of human capital should bring about tremendous growth in organizational productivity (Etim *et al.*, 2024).

Relational capital: These are the benefits derived by firms from investments made to create relationship that could help to advertise a product or services provided by the entity to various markets (Iswatia and Anshori, 2007; Dogan and Kevser, 2020). They are investments and costs meant to establish sound linkage between the company and it customers to broaden the market share and base.

Structural Capital: This is connected to the internal processes of a company. It is the investment of a company to improve the infrastructure that supports internal operations of the he entity. The capital includes both tangible and intangible resources such as equipment, property, plants and motor vehicles, organizational culture, procedures and processes, methods

and systems meant to enhance high quality product and services, and therefore high productivity and overall performance.

The measurement of this dimensions of Intellectual capital for the purpose of this research is the annual or yearly financial commitments either on short-term or long-term bases. A further description of the measurement and description is at the section on methodology of the study.

2.1.2. Overview of financial performance

Financial performance is a concept used to express either in qualitative or quantitative terms the achievement recorded by an entity in terms of sales(turnover), revenues generated, profit recorded, returns on investments, or any measure thought suitable to assess improvement of organization activity. When assessed from accounting perspective, some variables used include profitability, liquidity, leverage or capital structure, investment, working capital and efficiency ratios.

Also, found in accounting and finance literature in the measurement of financial performance are ratios which are Gross profit ratio, Operating profit ratio, profit before tax ratio, net profit ratio, Return on Assets (ROA), Return on Equity (ROE), Return on Capital Employed (ROCE)

For the purpose of this study, we made use of Return on Equity (ROE) as a proxy for financial performance and included two other attributes that influence financial performance company size and leverage.

2.1.3 Theoretical review

The theoretical underpinning this study anchored on is the Human Capital Theory, developed by Becker in 1964. This theory was postulated because of the role of human capital in the success of organization. He posited that the human capital theory is connected to the level of knowledge possessed by employees in organization through adequate training programs attained. This theory is relevant to this study because Intellectual capital, structural capital and human capital components are enhanced by level of training, development and skills of the human resource assets of an organization.

2.2 Empirical reviews

Selected previous studies relating to the present study are reviewed in a summarized format and disclosed in the Table 1.

Table 1 summary of empirical studies reviewed

S/N	Author(s) and Year	Topic/Main Objective	Methodology	Major Findings
1	xu and liu (2020)	The impact of intellectual Capital on firm performance: A modified and extended VAIC model	Panel data regression analysis <i>ex post Facto</i> research design	Physical capital had no significance influence on the performance of the Firm studied
2	Adegbayibi (2021)	intellectual capital and firms performance measures of listed non-financial companies in Nigeria Quantitative research design involving obtained from published annual financials and panel data	regression analysis.	Results showed HCE, SCE and CEE had positive and significant influence on ROA of the sampled companies.
3	Anik <i>et al.</i> (2021)	The effect of intellectual capital on good corporate governance on financial	Critical path analysis using data obtained from published annual	Results reviewed financial performance of sampled banking

		performance and corporate value a case study in Indonesia	reports of banking companies in IDX	entities with significantly influenced by intellectual capital.
4	Daat <i>et al.</i> (2021)	The role of intellectual Capital on financial performance of SMEs.	Survey research design using questionnaire to gather data from sample population and analysed using percentages.	The results showed that the component of human capital and relational capital significantly influenced the financial performance of SMEs.
5	Gallegos <i>et al.</i> (2021)	The impact of intellectual Capital on financial performance in Argentina, Chile and Peru Juan.	<i>Ex post facto</i> research using audited annual report of selected companies analysed	Finding show that the component of intellectual capital had a positive and substantial influence on financial performance
6	HesAiati (2021)	Influence of intellectual Capital on organizational performance	Secondary data extracted from the audited annual report of the firms in bottom City data collected with analyzed using multiple regression technique.	The result showed that structural customer human and technological had significant influence on organizational performance of the firms
7	Hu and Zhang (2021)	Does intellectual capital measurement matter in financial performance and investigation of Chinese agricultural listed companies	Quantitative study using panel data extracted from published annual reports and financial statement of agricultural entities in China data were analyzed using multiple regression technique.	Result reviewed intellectual capital hard significant influence on financial performance of listed agricultural entities in China
8	Xu and Zhang (2021)	Exploring the nonlinear effect of intellectual Capital on financial performance evidence from listed shipping companies in China	Secondary data extracted from published annual financial statement analyzed using multiple regression technique value added intellectual coefficient model.	From the analysis the result showed a negative relationship of intellectual Capital on financial performance.
9	Zhang <i>et al.</i> (2021)	Intellectual capital and financial performance	Secondary data study with data collected	Results indicated a significant influence on

		comparison with financial and pharmaceutical industries in Vietnam	from the audited annual reports analyze using multiple regression technique	human capital efficiency on return on assets and return on equity of the entities
10	Irmansyah and Andesto (2022)	The effect of intellectual Capital on financial performance case study pharmaceutical industry in IDX	Time series study involving extraction of data from published financial statement and analyzed using regression technique	Results indicated that human capital efficiency had a substantial influence on return on assets.
11	Rufus <i>et al</i> (2022)	Intellectual capital organizational performance of the financial sector:evidence from Nigeria	Expost Facto Research design using thirty-five (35)financial companies and analyze using regression method.	intellectual capital has significant impact on organizational performance of sampled banks.
12	Shubita (2022)	Intellectual capital components and industrial firms performance	seventy-seven(77) listed firms in Jordan with sampled and data obtained from audited financial reports we analyzed using panel regression technique	Findings review that the component of intellectual capital hat positive influence on return on equity

Source: Researchers' Compilation (2024)

2.3 Gap in the Empirical Literature

From the previous studies reviewed for this study, it was observed that studies on Intellectual capital and financial performance of listed manufacturing firms in Nigeria were limited. Preceding studies conducted in this area of interest were carried out in different sectors and countries other than Nigeria. This study, therefore, focused on the manufacturing sector of an emerging economy; the Nigerian economy.

3.0 Methodology

Ex-post facto research design involving time series data gathered from thirty-three (33) manufacturing companies listed on the floor of the Nigerian Exchange Group (NXG) 2015 to 2023 December (Nine Years) were used. The companies cover both industrial and consumer goods entities. Census sampling method was used involving all the listed manufacturing firms over the period of the study.

3.1 Theoretical Specification of model

The components of intellectual capital are unbounded into Human capital (Hc), Relational capital (Rc) and Structural capital (Sc) with two control variables; company size and leverage and the financial performance variable – Return on Equity (ROE) shown as theoretical conceptual model as follows:

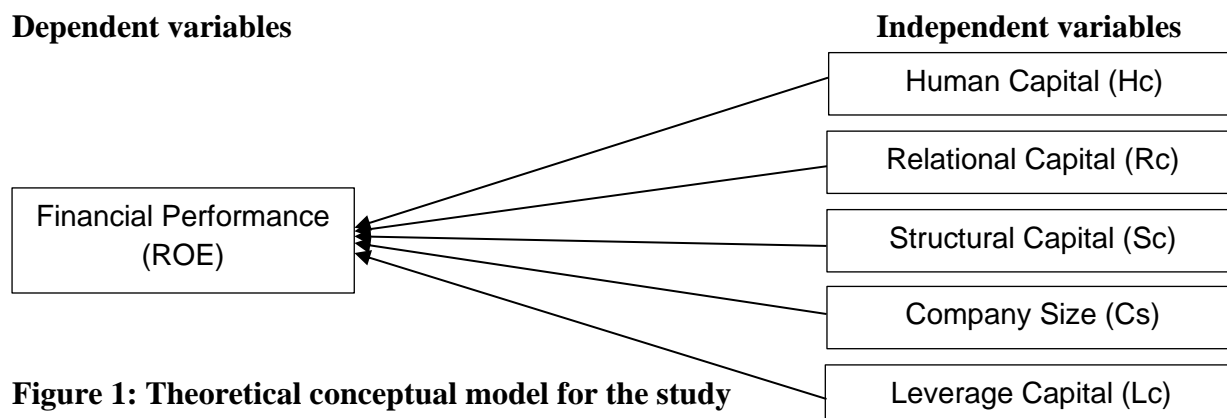


Figure 1: Theoretical conceptual model for the study
 Source: Researchers’ conceptualization (2024).

3.2 Measurement and Description of Variables

The variables used for the study as shown on the theoretical model are described as follows on Table 2.

Table 2: Measurement and Description of Variables

S/N	Variable	Abbreviation	Measurement	Apriori Expectations
i	Financial performance	ROE	Profit for the year / Total Equity (Ekwe, 2012; Yilmaz and Acar, 2018)	
ii	Human Capital	Hc	Revenue – Total costs + Cost incurred in Human Capital (Sardo and Serrasqueiro, 2017) costs incurred on Human capital	+
iii	Relational capital	Rc	Revenue – Total costs + Costs incurred on Human capital / Total selling and Distribution costs (Oyedukun and Saidu, 2018; Xu and Zhang, 2021)	+
iv	Structural capital	Sc	Revenue – Total Costs / Revenue _ Total costs + Cost incurred in Human capital (Ozkan et. Al., 2016; Gallegos <i>et al.</i> , 2021)	+
v	Company Size	Cs	Logarithm of total assets accumulated by listed manufacturing companies in Nigeria (Ozkan <i>et al.</i> , 2017; Daat <i>et al.</i> , 2021)	+
vi	Leverage	Lv	Total Debts or Liabilities / Total assets of listed manufacturing companies in Nigeria (Gadzo and Asiamah, 2018; Abubakat and Garba, 2019)	-

Source: Researchers’ Compilation (2024).

3.3 Empirical Specification of Models

The empirical model is developed from the theoretical/conceptual model presented in 3.1 and 3.2. the essence of the control variables (company size and leverage) is to minimize the level of spuriousness in the results of this study. The empirical model is stated as:

$$ROE_{ij} = \beta_0 + \beta_1 Hc_{ij} + \beta_2 Rc_{ij} + \beta_3 Sc_{ij} + \beta_4 Cs_{ij} + \beta_5 Lv_{ij} + e_i \dots \dots \dots \text{Equation 1}$$

Where;

i = Number of companies; j = Number of years; β_0 = Intercept of ROE; $\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 = Coefficient of each of the independent variables, e_i = Random error terms

3.4 Method of Data Analysis

The data collected for the study are subjected to various tests which include: multicollinearity, first-order auto correlation, unit root, cointegration and Hausman. Ordinary Least Squares (OLS) regression to derive descriptive and inferential statistics was used to examine the nature of the data, involving panel regression approach.

4.0 Results and Discussion of Findings

The results of the data analysis are presented and discussed in this section of the paper.

4.1 Descriptive Statistics

For the purpose of describing the structure and nature of the data used, the descriptive statistics for each of the variables were computed and presented on Table 3.

Table3: Descriptive Statistics of variables

Statistics	LV	CS	HC	RC	SC	ROE
Mean	0.563226	7.452932	2.596073	18.13995	0.632483	0.133654
Median	0.559500	7.584500	1.781000	3.863500	0.55300	0.104500
Maximum	2.230000	9.412000	22.63500	655.2390	66.05200	4.368000
Minimum	-2.662000	5.239000	-8.546000	-235.8360	-10.95400	-3.723000
Std. Dev.	0.388648	0.978127	3.590711	66.72414	4.692767	0.564302
Skewness	-1.958179	-0.315778	2.329633	5.824332	11.49763	0.984518
Kurtosis	26.11958	2.233817	11.97248	49.52391	163.5946	28.238316
Jarque-Bera	5361.064	9.612520	996.5883	22426.62	256614.2	6270.372
Probability	0.00000	0.008178	0.00000	0.00000	0.00000	0.00000
Sum	131.7950	1743.986	607.4810	4244.749	148.0010	31.27500
Sum Sq. Dev	35.19398	222.9186	3004.166	1037.342	5131.141	74.19575
Observations	234	234	234	234	234	234

Source: Researchers' Computation (2024)

From the results, the mean (average) value for all the variables were positive with relational capital (Rc) having the highest value of 18.13995 and ROE with the least value of 0.133654. The Median values were all positive with company size (Cs) having the highest value of 7.584500 and ROE the least of 0.1045. The maximum values also had positive values for all variables, while five (5) of the variables out of seven (7) showed negative minimum values. The standard deviation of the variables should less variations or fluctuations from the mean value for all variables except relational capital (Rc) with standard deviation value of 66.72444 explaining a wide fluctuation of this variable from the mean. The Skewness values shows LV and Cs Skewed to the left-hand side, while Hc, Rc, Sc and ROE skewed to the right-hand side of the standard normal curve.

The Kurtosis are high above the standard value of 3.0 used to assess the Preakness of the normal curve, implying that the variables studied were highly leptokurtic in nature. The Jarque-Bera-values compared with its probability value of 0.0000 suggested the rejection of the null hypothesis and acceptance of the alternative hypothesis for the variables. The observations 234 was obtained by multiplying the number of companies with the with the numbers of the study.

4.2 Multi-collinearity Test

To test for existence of multi-collinearity in the independent variables, the correlation coefficient between two pairs of independent variables were computed as presented on Table 4

Table 4: Correlation Matrix for Variables

Correlation	Cs	Hc	Lv	Rc	ROE
Cs	1.000000				
Hc	0.409493	1.000000			
Lv	-0.149030	-0.140834	1.000000		
Rc	-0.061284	0.070356	-0.063729	1.000000	
ROE	0.117882	0.518108	0.044466	0.576709	1.000000
Sc	0.095935	-0.002729	0.068469	-0.022604	0.39902

Probability	Cs	Hc	Lv	Rc	ROE
Cs	---				
Hc	0.0000	---			
Lv	0.0226	0.0313	---		
Rc	0.3507	0.2838	0.3317	---	
ROE	0.0719	0.001	0.4985	0.0098	---
Sc	0.1435	0.9669	0.2970	0.7309	0.0102

Observations	Cs	Hc	Lv	Rc	ROE
Cs	234				
Hc	234	234			
Lv	234	234	234		
Rc	234	234	234	234	
ROE	234	234	234	234	234
Sc	234	234	234	234	234

Source: Researchers' Computation (2024)

Multi-collinearity exists in a dataset of independent variables when the correlation coefficient between pairs of independent variables is 0.8(80%) above. From the above results, there was no multi-collinearity in all the independent variable as the coefficients were less than 0.8 between all the variable studied.

4.3 Variance inflation factor (VIF)

This is carried out to further test for existence of multi-collinearity between the independent variables in a multiple linear regression model, and to ascertain the level of effectiveness of the relationship among independent variables. The result for this steady is shown on Tables 5.

Variable	Variance coefficient	Uncentered VIF	Centered VIF
C	0.099752	74.20809	NA
Hc	0.000128	1.867632	1.224709
Rc	3.09E-07	1.094958	1.019298
Sc	6.24E-05	1.036655	1.243309
Cs	0.001754	73.73746	1.243309
Lv	0.009311	3.239172	1.041809

The value of VIF that is equal to greater or than ten (10) for an independent variable is often regarded as a variable of high level of association with other independent variable when compared together. From the result, the centered VIF indicated values for all independent variables of less than ten(10), which implied that there was no multicollinearity in the variables of interest.

4.4 Unit root test

The unit root test is carried out to show the stationarity of the time series data. The result is presented in Table 6.

Table 6: Unit Root Test

Method	Statistic	Prob.**	Cross-sections	Obs.
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 5				
Newey-West automatic bandwidth selection and Bartlett kernel				
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-35.2562	0.0000	6	1375
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-34.3456	0.0000	6	1375
ADF – Fisher Chi-square	555.642	0.0000	6	1375
PP – Fisher Chi-square	209.525	0.0000	6	1392

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Researchers' Computation (2024)

From Table 6, it was observed that there was no unit root in all variables of the study used. So, the data were said to be stationary for the fact that both the probability value for ADF- Fisher Chi-square and PP-Fisher Chi-square were less than error level of 5% (p-value<0.05).

4.5 Regression Analysis

For the purpose of evaluating the multiple linear regression model, and to test the hypothesis regression analysis was conducted and result presented in this section. The hypothesis of the steady was stated as;

H₀: Human capital, relational capital and structural capital have no significant influence on Return on Equity (ROE) of quoted manufacturing companies in Nigeria.

The assessment of the panel regression approach showed clearly that the fixed effects linear regression was suitable in the study using correlated Hausman test. This was due to the fact that the p-value of the chi-square computed was less than 0.05(5%) (p<0.05). The regression analysis was conducted to test the model and the results is presented on Table7.

Table 7: Fixed Effect Linear Regression Result

Variable	Coefficient	St. Error	t-statistic	Prob.
C	1.798551	1.090028	1.650005	0.1005
Hc	0.378241	2.740341	2.740341	0.0005
Rc	0.363702	2.134239	2.134239	0.0003
Sc	0.412665	3.571103	3.671103	0.0006
Cs	0.227885	1.549156	1.549156	0.1229
Lv	0.027351	0.245387	0.245387	0.8064
Effects Specification				
Cross-section fixed	(dummy variables)			
r-squared	0.266105			
Adjusted R-squared	0.247647			
f-statistic	7.453539	Durbin-Watson stat.		2.066429
Prob (F-statistic)	0.000122			

Source: Researchers' Computation (2024)

From Table 7, Hc, Rc and Sc had positive and significant effect on ROE (P-value < 0.05); Cs and Lv indicated positive but insignificant influence on ROE (P-value > 0.05). R² indicated that 26.61% variations in the financial performance (ROE) was caused by the effect of independent variables. Adjusted R² showed that 24.765% variation in the ROE was attributed to the influence of intellectual capital components. F-ratio of 7.45354 compared with the probability value of 0.00012 indicated that the influence of the independent variables (Hc, Rc, and Sc) on the dependent variable (ROE) was significant. A percentage increase in Human capital brought about 37.82% increase in ROE; a percentage increase in Relational capital brought about 36.37% increase in ROE; a percentage increase in structural capital brought about 41.27% increase in ROE; a percentage increase in company size brought about 2.79% increase in ROE, and a percentage increase in Leverage brought about 2.74% increase in ROE. The Durbin-Watson (DW) statistic of 2.06643 indicated the absence of first order autocorrelation in the model. The null hypothesis, which was stated as human capital, relational capital and structural capital have no significant influence on return on equity of quoted manufacturing companies in Nigeria, was rejected and the alternative accepted, on the basis of Adjusted R² (24.765%), and F-ratio (7.45354) (P<0.05).

4.6 Discussion of the Findings

Intellectual capital components (Human, Relational and Structural) had significant influence on financial performance (ROE) of quoted manufacturing companies in Nigeria. The extent of significance of intellectual capitals of the companies studied was tested by the p-value of the F-statistic which indicated that the computed Adjusted R² was significant by explaining the entire model. For this reason, it was observed that intellectual capital exerted significant influence on financial performance of quoted manufacturing companies in Nigeria. When the variables of intellectual capital are influenced positively by way of investments, it would trigger positive influence on financial performance of the companies. When optimal investment is made in training and development programmes of employees, marketing and distribution activities, the workforce capacities and proficiency and customers or buyers patronage would improve. The study findings are in line with the study of Amin *et al.* (2014) who examined intellectual capital and financial performance of pharmaceutical firms in Pakistan, Rufus *et al.* (2022) who investigated intellectual capital and organizational performance of the Nigerian financial sector.

5.0 Conclusion and Recommendations

The purpose of this study was to ascertain whether intellectual capital influence financial performance of listed manufacturing companies in Nigeria. Human, Relational and Structural capitals were proxies for intellectual capital while financial performance was proxy by Return on Equity (ROE). Two control variables companies' size (CS) and leverage (LV) were used as control variables in the model. Panel regression approach was used for data treatment obtained from annual reports and financial statements of listed manufacturing companies in Nigeria for the period 2015 -2013.

From the findings it was concluded that intellectual capital had positive and significant effect on financial performance of quoted manufacturing companies in Nigeria, and does influence manufacturing companies' operations. Hence, the following recommendations are proffered:

- i. More investment should be made on training and development programmes for employees both in-house, academic and professional
- ii. Marketing and distribution policy should be enhanced and in line with contemporary developments in business ecosystem

- iii. Investment in structural assets to enhance productive capacity should be fostered and broaden particularly from ICT perspectives.

5.1 Contribution to knowledge

The breakdown of Intellectual capital into three (3) components (HC RC and SC) and examining their influence on financial performance is novel and addition to existing literature as most previous studies often concentrate on human capital only. Also, extending the research interest to manufacturing sectors as well as the conceptual model added to the extant Literature in Accounting, Economics, Finance and Management were this research interest domicile.

5.2 Suggestion for further research

Best on the scope of the study, other researchers can look at the following areas of interest:

- i. Intellectual capital and stock prices of listed manufacturing companies.
- ii. Intellectual capital and financial performance in the financial service sector.
- iii. Intellectual capital and financial performance in the real and construction sector.

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