



## **Oil and gas industries financing and financial performance in Nigeria: The case of intelligent capital led model**

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### **Abstract**

This study ascertained the linkage between intelligent capital components and financial performance of oil and gas industries quoted on the Nigerian Stock Exchange over a period of eight (8) years from 2008 to 2015. This study was necessitated by the mixed results on the nexus between intelligent capital and firm's performance. Specifically, the effect of human capital efficiency, social capital efficiency and capital employed efficiency on return on assets, return on equity, net profit margin and gross revenue growth were evaluated. Using annual data from statement of value added section of their annual reports and applying panel estimation technique, we identify a positive insignificant relationship between capital employed efficiency and return on assets, return on equity, net profit margin and gross revenue growth. Social capital employed positively and insignificantly relates with return on assets but negatively associates with return on equity, net profit margin and gross revenue growth. Human capital efficiency positively and insignificantly relates with net profit margin and gross revenue growth but negatively associates with return on assets and return on equity. From the granger causality perspective, we observe the significant effect of human capital efficiency on net profit margin and gross revenue growth; social capital efficiency on return on equity; capital employed efficiency on return on assets. Subsequently, we recommend that oil and gas industries should improve their human capacity development (workforce be up to date with ever changing technology) to enhance productivity. Investment in physical assets via modernized exploration, refining, product storage/delivery facilities will enhance availability and efficiency in delivering of oil and gas services which in turn, lead to increase turnover/rise in revenue.

**Keywords:** intelligent capital, financial performance, oil and gas industries

### **1. Introduction**

Access to capital and its infrastructure are the foremost challenge in Nigeria business environment and other emerging economies. Depriving the oil and gas sector of finance can fundamentally bring grogginess in entire sector resulting in a halt in foreign exchange earnings as Nigeria dependent unambiguously on crude oil export for over 90% of her revenue. This financing gap comes at a great cost to the nation considering out heavy reliance on crude oil export. The Central Bank of Nigeria (CBN) annual report of 2015 shows that industrial sector contribution to real Gross Domestic Product (GDP) is 19.30%. Crude petroleum and natural gas constitutes 49.78% of the industrial sector contribution to GDP compared to manufacturing and solid minerals with a contribution of 49.45% and 0.77% respectively. Even though the government has been pursuing policies towards promotion of agriculture and other non-oil exports consequent to economic recession currently witnessed in the country, oil and gas exploration cannot be ignored. Despite the fact that total credit of deposit money banks in Nigeria have been in the favour of oil and gas sector compared to other sectors of the economy, the high level of interest rate, formalization of demand such as good corporate governance, appropriate documentation and compliance with policies and procedures have remain inhibitive conditions even though oil and gas firms have can effectively meet the collateral requirements. Innovative financing has been termed the best financing

option by academic scholars that would drive any business model owing to macroeconomic uncertainties. Appropriately, intelligent capital led model was introduced by a comcraft group in 1999 to balance the right amount of money with the right amount of insights. Intelligent capital focuses on entrepreneurial solutions by providing individuals (for sole proprietor/ small and medium enterprises) or management (for corporate firms) with relevant skills and advise for collaboration/networking with the confidence to improve value creation of their ventures. In turn, businesses unleashes innovation that helps entrepreneurs focus on delivering value/solution while dealing with experienced capital partners/providers (Kacou, 2011)<sup>[2]</sup>. Regardless of the general acceptance of intelligent capital led model, researchers have empirical evidence that it is difficult to establishing the framework of relationship between capital providers and entrepreneurs especially on ambivalence surrounding capital, lack of trust and zero-some game. Nevertheless, consensus opinion on the deployment of intelligent capital, they said, leads to conglomerates working under the ecosystem, in turn lead to incubation which makes way to making a difference while increasing returns within the bottom of the pyramid (Kacou, 2011)<sup>[2]</sup>.

In the era of knowledge economy, companies not only produce products and services, but are finding ways to create value addition and wealth from their own resources to build sustainable business organizations (Deepa and Subha, 2015).

In Nigeria, the oil and gas firms have been striving to be seen as capable of creating value with deep respect to product delivery and services as this among other requirements is a condition for selection by Nigeria National Petroleum Corporation (NNPC) for joint venture and contract on lifting, refining, importing and storage of petroleum products. Studies in this subject matter in the context of Nigeria are few and focused mainly on the banking sector and human resource accounting disclosure (see Onyekwelu, Okoh & Iyidiobi, 2017; Ekwe, 2014; Leyira, Ofurum & Ihendinihu, 2012) <sup>[20, 8, 15]</sup>. To the best of our knowledge and based on online searches, there is no scholarly article on intelligent capital and financial performance of oil and gas industries in Nigeria. Therefore, in our attempt to fill the gap noticed in literature, this study empirically ascertains the effect of intelligent capital on oil and gas industries quoted on Nigerian Stock Exchange.

The rest of this paper is organised as follows: section two reviewed the relevant conceptual, theoretical and empirical literature. The methodological approach was taken care in section three. Section four presents the data and results of estimations. Conclusion and definitive recommendations were presented in section five.

## 2. Review of related literature

### 2.1.1 Conceptual Clarification

Intelligent capital is a financial capital delivered concomitantly with the right amount of insight covering all the spectrum of business. Intelligent capital centres on solution as opposed to exists that focus on payment of principal and interest as at when due. Hence, intelligent capital sees itself as a partner to entrepreneur in the fulfilment of their mission. Put differently, intelligent capital is the capital that has the right balance of money and insight to avoid the survival trap. To this effect, operation of entrepreneur translates into observable attributes which include: focus on skills to drive business, strengthening of business model, foster a greater action-orientation to create value for adopting this model, oriented towards results by delivering greater financial returns but also tremendous societal impact and appreciate the importance of time. A pragmatic relationship must exist between the entrepreneurs to time which seeks patience. To keep intelligent capital, an entrepreneur should have the right mind-set not to be ambivalence about capital, lack of trust on the providers and zero sum game of not seeing them as value creators. To avoid graduating into love-hate relationship between them and their capital partners, all mind-set should be embodied on upgrading their business. Engaging a capital provider starts by diagnosing their mind-set towards available resources, be it debt or equity to avoid a mismatch of term between assets and financing (Kacou, 2011) <sup>[2]</sup>. From Marr (2008), identifying intellectual capital within an organization is the first step to managing intelligent capital; tools for assessing the strategic value of intellectual capital by visually mapping how it helps organizations to accomplish their strategic objectives is the second step; step three deals with discussion on how to measure intellectual capital and provides tools and techniques to do so; the fourth step outlines how to use the resultant information to better manage intellectual capital in organizations while the fifth step discusses the

reporting and disclosure of intellectual capital and provides guidance on how to prepare such reports. A good example of an intelligent capital organization that combines business development services and financial capital in Africa is Raizcorp in South Africa. The Raizcorp model was born out of the opportunity mind-set that translated to helping without boundaries to assist entrepreneurs grow their business, adopting informed and coherent business logic, accomplished opportunity for incubators, supported entrepreneurs and challenging them to think differently about their business. Rather than injecting money, Raizcorp adopted the right insights, attaching its profit to the success of their clients. All of these are opposite to exist capital that are only interested and focused on money and the calculation of the interest payment and time to liquidate the loan and exit. Deposit money banks in Nigeria and other intelligent capital providers lack the Archimedean mind-set to think of making opportunity from the estimated impossibility of their clients not paying up their loan as at when due.

### 2.1.2 Intelligent capital providers

Capital providers look beyond money to discussing actualizing how they can partner with firms to create value. A truly capital partner intrinsically should be able to make value creation. What normally run on the mind of a true intelligent capital provider include: how to support a business to enhance value creation, how to upgrade a business finance model, how to avoid triggering a defensive reaction from entrepreneurs and managers, how to grow sceptical when money becomes the scape goat and how to deploy additional capital for business survival. An intelligent capital partner does not see business constraints as an enemy rather as an innovation challenge to be addressed. Hence, they make entrepreneurs shift in attitude, that is, from the mind-set that money is not everything a business is (successful business need a lot more than just money). Accordingly, intelligent capital provider jolts entrepreneurs to put proper on skills, planning and innovative thinking. They learn to match capital extended to the type of opportunity at hand. Furthermore, intelligent capital providers are committed to appreciating available and make sure that business does not overcapitalize or create a financing mismatch. They also identify ways to bridge the gaps that are non-financial in nature. Embracing resource-oriented thinking, intelligent capital providers drive the entrepreneurs within the framework of integrated stakeholders to such public sector, major client to transform their business models to unleash the power of intelligent capital. This they do under four principles. The first principle focus on outcome anchoring on the business strategy that reveilles the tension between goals and resources. The second principle is concerned with creativity via practically aligning resources with desired outcome and trade off in a way to help optimize firms operations. The third principle is networking while practicing to appreciate the role of non-financial resources. In this regard, networking seeks to plug in their ecosystems to fund creative solutions to their challenges. Networking motivates entrepreneurs to begin collaborating with core stakeholders and other business. Rather than focusing on getting money that is hard to come by, entrepreneurs can get some fraction of what they ask for it is assistance that is not

necessarily a cheque for a specific amount. Applied to all stakeholders, this consideration can have a great impact on business. The fourth principle is trust that would in reality, practically manage resources effectively. With these principles applied in their operation and assets strategically, their businesses would be transformed through intelligent capital (Roger, 2005) [22].

### 2.1.3 Exit Capital

A number of finances are available to entrepreneurs/firm's management ranging from personal savings, funds from friends and relatives, intelligent capital partners, development partners, profit retention, institutional investors, lease: both operational and capital lease, invoice discounting and factoring, trade credit, microfinance banks, government agencies, foundation finance companies and deposit money firms loans, etc. a world of difference exist between the innovative capital and exit capital. According to Anyanwu (2011) [3], exist capital is that source of capital from deposit money banks, microfinance banks and finance companies licensed to carry on the business of providing financial services to individuals, entrepreneurs, industries as well as commercial or agriculture as defined by the Central Bank of Nigeria (CBN) guideline of 2014. For instance, the guideline stipulated that under the Small and Medium Enterprises Development Fund (SMEDF), deposit money banks in Nigeria were directed to lend to SMEs and monitor and ensure proper utilization of such funds in the face of macroeconomic instability. However, Eluhaiwe (2016) [10] observed that deposit money banks are insensitive and do not take time to understand the entrepreneurs as they use the same template for which they use for large and multinational companies in assessing financing proposals of SMEs. In Nigeria, deposit money banks are just interested in deposit mobilization to increase wealth of shareholder at detriment of financing viable productive activities which will enhance economic growth and development.

### 2.2 Theoretical Foundation

This study of oil and gas financing and financial performance using intelligent capital led model is anchored on the anticipated income theory propounded by H. V. Prochnos in 1944. The theory argues that deposit money banks provision of financial services/credit should not focus on security, but on the anticipated earnings of the borrower. This theory is superior to the real bill doctrine theory that considers the objectives of the borrower of capital along the lines of liquidity, safety and profitability. Liquidity according to the real bill theory doctrine assures the borrower the capacity of repaying the bank loan as at when due without any default. The safety principles hinges on the bank credit processing not based on security but also on the borrowers assessment under other conditions and the profitability anchoring on effective deployment and management of the resources around risk and return criteria. All these graduates into creating excess reserves that qualifies the borrower to secure long term income. By extension, the anticipated income theory considers the future streams of funds generated by the business properties run within the fuel competitive ecosystem that is supportive intertwined factors ranging from infrastructures,

operating on a level playing field, with their rights protected and finally overcome dependence on government to policy frameworks and other insights (Nimtrakoon, 2015) [19]. Following Kacou (2011) [2], anticipated theory is an approach of resource-oriented thinking that addresses the possible redeployment of available resources to meet their vision. Resource-oriented thinking allows for a breakthrough by allowing entrepreneurs to redeploy existing resources in a creative fashion to achieve their vision. The resource-oriented thinkers enable entrepreneurs to unleash the power of intelligent capital hence, intelligent capital partners align incentives to transform business model.

### 2.3 Related empirical studies on intelligent capital and firm's performance

Empirical literature on intelligent capital and financial performance are few especially for emerging economies. In measuring the value creation efficiency of intellectual capital by using Ante Pulic's Value added intellectual capital VAIC™ method on two major Indian industries which are heavily reliant on intellectual capital: banking and information technology industry from 2000 to 2010, Deepa and Subha (2015) provided evidence that the business performance is not only a result of heavy top line and bottom line figures, but many factors which are intangible via intelligent capital can impact corporate performance in a big way. In examining the role of intelligent capital in value creation of firms, Chang and Hsieh (2011) [4] considered R&D investment and its impacts on the companies' operating, financial, and market performance by utilizing a modified Value Added Intellectual Coefficient (VAIC™) analysis. Three hundred and sixty seven (367) Taiwan semiconductor was studied relying on secondary data from annual reports of these companies from 2000 to 2008. The Pearson correlation and linear multiple regression results showed that a company's intelligent capital in general has a negative impact on its financial and market performance. Furthermore, the relationship between innovation capital which captured by R&D expenditure efficiency and companies' operating, financial and market performance is significant. The findings of Chang and Hsieh (2011) [4] was a clear contradiction to Deepa and Subha (2015) on the positive impact of intelligent capital on performance of firms. The difference in empirical findings may be attributed to different business environment of these firms coupled macroeconomic policies and firm's specific factors. In Indonesia, using audited financial statements of the Indonesian publicly-listed consumer goods companies, Feimianti and Anantadjaya (2014) [11] ascertained the relationship between intellectual capital towards companies' performances Indonesia with regard to accounting and market values. The analysis revealed that intelligent capital has positive correlations towards accounting value (insignificant) and market value (very significant). This is an indication that intelligent capital is very important to stimulate companies' value in the market. On the analysis of components of intelligent capital Feimianti and Anantadjaya (2014) [11] observed that Value Added Human Capital (VAHC) has the biggest contribution compared to Structural Capital Value Added (STVA) and Value Added Capital Employed (VACA) components of intelligent capital. This signifies that the success of a firms is dependent on

quality of employees.

In Cheng, Lin, Hsiao and Lin (2006)<sup>[5]</sup>, applying Tobit model by adopting financial data to determine value drivers, revealed that innovation capital, customer capital and human capital are significant positive drive factors for firms to create more intellectual capital and hence more intangible value. To a large extent, the effect of process capital exerts on intellectual capital was moderating; organizations with greater process capital must raise customer capital to enhance intellectual value. In the Nigeria banking industry, using data from the published annual financial statements of the three banks, Onyekwelu, Okoh and Iyidiobi (2017)<sup>[20]</sup> argue that banks are statistically different in both the intellectual capital and its financial performance indicators, banks with high intellectual capital also show high financial performance. The assertion of Onyekwelu, Okoh and Iyidiobi (2017)<sup>[20]</sup> validated Ekwe (2014)<sup>[8]</sup> findings on intelligent capital and deposit money banks financial performance in Nigeria. Similarly, above authors view on intelligent capital and bank performance was a further affirmation of AL-Shubiri (2011) who emphatically established that market value of commercial banks quoted on Amman Stock Exchange (ASE) is positively and significantly related with intelligent capital. On intelligent capital component surrogates, AL-Shubiri (2011) argues that Jordanian financial sectors banks market value have been created more by structural employed rather human, capital and value added intellectual coefficient efficiency. In another dimension, Alshubiri (2013)<sup>[1]</sup> using correlation analysis for eleven (11) industrial sectors listed of Amman Stock Exchange from 2005 to 2011, indicated there is a very high positive significant relationship between human capital component of intelligent capital and corporate financial performance related to return on equity, profit before tax, log of sales, log of assets, dividend per share and interest coverage ratio but no significant relationship between human capital and working capital turnover. Analysing the financial statements of thirty (30) firms from across various manufacturing and service sectors in Indian stock exchange for a period from 2008-2009 to 2012-2013, intelligent capital influenced market value and financial performance of firms (Kamath, 2015)<sup>[13]</sup>.

Besides, the nexus between intelligent capital and financial performance have been studied by different scholars with mixed results. Take for consideration, Fathi, Farahmand and Khorasani (2013)<sup>[9]</sup>, using a panel consisting of 49 Iranian companies listed in the Tehran Stock Exchange (TSE) from 2001 to 2010, studied the relationship between intellectual capital and financial performance. Results showed a significant positive relationship between intellectual capital and value added efficiency of structural capital component with the three financial performance return on assets, return on equity and growth revenue; a significant positive relationship between value added efficiency of capital employed and value added efficiency of human capital with two return on assets and return on equity. Surprisingly, the authors found no significant relationship between value added efficiency of capital employed and value added efficiency of human capital with growth revenue.

In a topic of this magnitude, regardless of the business environment and macroeconomic uncertainties, some

researchers will agree while a lot will still refute, variety of opinion may arise but it is worthy to note that a good intelligent capital partnership will have positive effect on performance compared to exist capital no matter how such intelligent capital is procured. In as much as intelligent capital is the case, they may be no effect on performance but literally, such case may be due micro fundamentals in the firms such corporate governance, debt structure and risk of bankruptcy among others. Yusuf (2015)<sup>[23]</sup>, specifically for the banking sector, discovered that efficient utilisation of human capital does not have any significant impact on the return of equity of banks and size of a bank expressed through assets quality has no significant impact on its return on equity, while the return on equity of banks cannot be predicted by human capital efficiency and size of the banks. That notwithstanding, Larsson and Morling (2015)<sup>[14]</sup>, Ranani and Bijani (2014)<sup>[21]</sup>, Maditinos, Chatzoudes, Tsairidis and Theriou (2011)<sup>[16]</sup>, Claudiu-Marian (2011)<sup>[6]</sup>, Moradi, Saeedi, Hajizadeh, and Mohammadi (2013)<sup>[18]</sup> all have evaluated that intelligent capital significantly and positively affect financial performance. From their assertion, it would be logical to deduce that investors increase their return by appropriate intelligent capital investment via value added capital employed, value added human capital and value added structural capital.

### 3. Methodology and Data Collection

#### 3.1 Collection of Data

Data sourced for the concerned variables to realize the objective of this study were annual data from annual report and account of eight (8) oil and gas industries out of the twelve (12) firms quoted on oil and gas sector of the Nigerian Stock Exchange over a period of eight (8) years from 2008 to 2015. These data transformed to appropriate measurement include operating income, net income, shareholders' fund, operating expenses, total assets, total liabilities, salaries, wages and all incentives for the company during the period under review.

#### 3.2 Methodology

The study relying on time series data, the variables were first subjected to panel stationarity check through Levin, Lin and Chu (LLC) Test and Breitung panel unit root tests to ensure they are devoid of stationarity defects that would render the results spurious. The stationarity test was performed at level and first difference at intercept, trend intercept and none. Auto-Regressive Distributed Lag (ARDL) model was adopted in assessing the long run association. This is due to the mixed of integration of the variables.

#### 3.3 Variable Description and Measurement

The dependent variables in the study are Return on Assets (ROA), Return on Equity (ROE), Gross Revenue Growth (GRG) and Net Profit Margin (NPM). The independent variable is Value Added Intelligent Coefficient (VAIC<sup>TM</sup>) developed by Pulic (1999) and comprised of Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE). To eliminate possible effect of bias in the regression model and following Kamath (2015)<sup>[13]</sup>, Firm's size (FMS) and Debt Structure (DS) were

included as control variables that might deter performance.

**ROA is return on assets:** It measures the overall effectiveness of management in generating profits with its available assets and calculated by dividing the firms' operating profit (earnings before interest and taxes) by total assets.

**ROE is return on equity:** This entails the return earned on the ordinary shareholders' investment in the firm and arrived at by dividing profit before interest and tax by owner's capital.

**NPM is net profit margin:** In this scenario, profit for the period is measured against sales for the current period. Net profit margin is calculated as profit after tax divided by turnover or net sales.

**GRV is gross revenue growth:** This is growth rate of total revenue of a firm before any deduction or allowances, as for rent, cost of goods sold, taxes, etc.

**DS is debt structure:** It measures the proportion of total assets financed by a firm's creditors. Debt structure was computed by dividing total debt by total assets.

**FMS is firm size:** Firm size in the context of this study is the natural logarithm of firm's total assets.

**HCE is human capital efficiency:** This refers to the magnitude of value added by virtue of one unit investment in employees. Put differently, it is the ratio of value added to human capital investment.

**SCE is Structural Capital Efficiency:** Value created by a unit input in structural capital reveals the structural capital efficiency, and expressed as a ratio of structural capital to value added.

**CEE is Capital Employed Efficiency:** Following Chang and Hsieh (2011) [4], capital employed efficiency ascertains the efficiency of firms use of financial and physical capital into account in order to have a full insight into the totality of value created by effective utilization of a firm's resources.

### 3.4 Empirical Model Specification

The focus of this study is to ascertain the effect of intelligent capital to sustainable financial performance of oil and gas industries in Nigeria. Kamath (2015) [13], Deepa and Subha (2015), Cheng and Hsieh (2011) [4] and Feimianti and Anantadjaya (2014) [11] argue that intelligent capital and performance nexus equation can be adopted and operationalized by decomposition of intelligent capital to human capital efficiency, structural capital efficiency and capital employed efficiency equations. Theoretically therefore, outlined model signposts that:

$$FP = f(HCE + SCE + CEE) \quad 1$$

When we controlled for firms' size and debt structure based on the peculiarity of our business environment as well as

incorporating the surrogates of financial performance of oil and gas industries, equation (1) then denotes that:

$$ROA = f(HCE + SCE + CEE + FMS + DS) \quad 2$$

$$ROE = f(HCE + SCE + CEE + FMS + DS) \quad 3$$

$$NPM = f(HCE + SCE + CEE + FMS + DS) \quad 4$$

$$GRG = f(HCE + SCE + CEE + FMS + DS) \quad 5$$

Transforming equations (2) - (5) based on basic econometric postulation indicate that:

#### Model 1

$$ROA_t = \beta_0 + \beta_1 HCE_t + \beta_2 SCE_t + \beta_3 CEE_t + \beta_4 FMS_t + \beta_5 DS_t + \varepsilon_t \quad 6$$

#### Model 2

$$ROE_t = \beta_0 + \beta_1 HCE_t + \beta_2 SCE_t + \beta_3 CEE_t + \beta_4 FMS_t + \beta_5 DS_t + \varepsilon_t \quad 7$$

#### Model 3

$$NPM_t = \beta_0 + \beta_1 HCE_t + \beta_2 SCE_t + \beta_3 CEE_t + \beta_4 FMS_t + \beta_5 DS_t + \varepsilon_t \quad 8$$

#### Model 4

$$GRG_t = \beta_0 + \beta_1 HCE_t + \beta_2 SCE_t + \beta_3 CEE_t + \beta_4 FMS_t + \beta_5 DS_t + \varepsilon_t \quad 9$$

**Where:** *ROA* is return on assets; *ROE* is return on equity; *NPM* is net profit margin; *GRG* is gross revenue growth; *HCE* is human capital efficiency; *SCE* is structural capital efficiency; *CEE* is capital employed efficiency; *FMS* is firms' size; *DS* is debt structure;  $\beta_1$  is the constant coefficient;  $\beta_1$ - $\beta_5$  are the coefficient of the independent and control variables, and  $\varepsilon_t$  the error term.

## 4. Results and Discussion

### 4.1 Descriptive Properties

Table 1 summarizes the descriptive data of the variables: return on assets, return on equity, net profit margin, gross profit growth, human capital efficiency, social capital efficiency, capital employed efficiency, firm's size and debt structure. The result shows that firms' size expressed by natural log of total assets has the highest mean of 47.42 while net profit margin with the lowest mean of -0.16. High standard deviation is related to debt structure 90.00 and value linked to return on assets 0.16 but high minimum is associated to firm's size 33.01 and low value related to gross in growth revenue - 6492.52. Lastly, high maximum value is connected to gross revenue growth 243.19 and low value related to return on assets. It is observed that the mean value of firms' assets was great in comparison to other variables. This is attributed to the fact that oil and gas industries have fixed assets that are great in value for oil exploration, refining, storage and distribution. The data are leptokurtic in nature as evidenced by Kurtosis values which are greater than the benchmark of three (3) for all the variables. In terms of normality distribution of variables, the Jarque-Bera statistics reveal that all the data were normally distributed.

**Table 1:** Data Descriptive Properties

	Mean	Median	Maximum	Minimum	Std. Dev	Skewness	Kurtosis	J.Bera	P-val.	Obs.
ROA	0.1462	0.110180	0.668260	-0.269350	0.169880	0.691694	3.74823	6.5963	0.0369	64
ROE	0.1908	0.154070	0.973570	-3.387500	0.583387	-3.711578	23.6195	1280.7	0.0000	64
NPM	-0.1660	0.021960	1.007340	-7.590200	1.13547	-5.461346	33.52944	2803.6	0.0000	64
GRG	20.6192	21.9751	243.18845	-6492.518	1245830	-3.947117	21.5499	1083.8	0.0000	64
HCE	4.62574	4.03381	36.43101	-45.17128	10.2510	-0.711840	13.0475	274.62	0.0000	64
SCE	0.51905	0.80933	1.497550	-4.061370	1.11544	-3.343807	12.8227	376.56	0.0000	64
CEE	0.24582	0.23873	1.386230	-1.196390	0.33983	-0.421771	8.66582	87.501	0.0000	64
FMS	47.42377	26.81107	20.13E+08	33.01144	44.23593	1.596448	5.61220	45.381	0.0000	64
DS	11.2556	0.470640	72.005.00	0.025670	90.0056	7.811266	62.0158	9938.5	0.0000	64

Source: Data output via E-views 9.0

**4.2 Residual Diagnostics**

The estimated equations were residually diagnostics for serial correlation, heteroskedasticity and Ramsey specification. The insignificant p-values at 5% level of significance of the test statistics for serial correlation (Table 2), heteroskedasticity (Table 3) and Ramsey specification test (Table 4) show that the equations passed the residual diagnostic tests.

**Table 2:** Breusch-Godfrey Serial Correlation Test

Models	Test Statistic	P-value
Model 1/Equ. 6	0.00033	0.98542
Model 2/Equ. 7	1.96717	0.07798
Model 3/Equ. 8	0.19234	0.66263
Model 4/Equ. 9	2.26023	0.11376

Source: Data output via Gretl

**Table 3:** White Test for Heteroskedasticity

Models	Test Statistic	P-value
Model 1/Equ. 6	7.05620	0.102551
Model 2/Equ. 7	12.8945	0.229631
Model 3/Equ. 8	14.4745	0.152427
Model 4/Equ. 9	12.7228	0.361790

Source: Data output via E-views Gretl

**Table 4:** Ramsey Specification

Models	Test Statistic	P-value
Model 1/Equ. 6	1.13087	0.330011
Model 2/Equ. 7	1.40963	0.252764
Model 3/Equ. 8	1.18271	0.281000
Model 4/Equ. 9	1.09870	0.100102

Source: Data output via Gretl

**4.3 Data Correlation Analysis**

The association between the dependent and explanatory variables are presented in Table 5. Return on assets, return on equity, net profit margin and gross revenue growth positively associate with human capital efficiency and capital employed efficiency but negatively correlated with social capital efficiency. Intelligent capital surrogates: human capital efficiency, social capital efficiency and capital employed efficiency were positively associated with each other but link was observed highest (0.46) between human capital efficiency and social capital efficiency. This however, does not translate to issue of multicollinearity between variables.

**Table 5:** Correlation Matrix

	ROA	ROE	NPM	GRG	HCE	SCE	CEE	FMS	DS
ROA	1.000	0.28313	0.17078	0.27078	0.03674	-0.12119	0.31463	-0.28659	0.03419
ROE	0.28313	1.00000	0.08903	0.01541	0.16046	-0.09111	0.42208	-0.09192	0.09312
NPM	0.17078	0.08903	1.00000	0.87497	0.56032	-0.08884	0.52078	-0.11269	0.02252
GRG	0.27078	0.01541	0.87497	1.00000	0.64598	-0.04755	0.53606	0.04697	0.02052
HCE	0.03674	0.16046	0.56032	0.64598	1.00000	0.10755	0.46288	0.28537	-0.02309
SCE	-0.12119	-0.09111	-0.08884	-0.04755	0.10755	1.00000	0.10123	0.09505	0.01353
CEE	0.31463	0.42208	0.52078	0.53606	0.46288	0.10123	1.00000	-0.29733	0.04680
FMS	-0.28659	-0.09192	-0.11269	0.04697	0.28537	0.09505	-0.29733	1.00000	-0.07516
DS	0.03419	0.09312	0.02252	0.02052	-0.02309	0.01353	0.04680	-0.07516	1.00000

Source: Data output via E-views 9.0

**4.4 Panel Stationarity Test**

The Levin, Lin and Chu (LLC) and Argumented Dickey-Fuller (ADF) Fisher unit root test was performed at level form which was decomposed to individual intercept, trend intercept

and none test equations. The panel unit root in Table 6 and 7 show that all the variables are stationary and does not possess any stationary defect that might inhibit the result of the analysis.

**Table 6:** LLC Unit Root Test Result

Variables	Intercept	Trend and Intercept	None	Remark
ROA	-20.2454 (0.00)*	-33.6045 (0.00)*	-8.04378 (0.00)*	Stationary
ROE	-21.5014 (0.00)*	-41.6055 (0.00)*	-4.57693 (0.00)*	Stationary
NPM	-49.1504 (0.00)*	-17.6497 (0.00)*	-3.18224 (0.00)*	Stationary

GRG	-12.5183 (0.00)*	-8.89600 (0.00)*	-2.60580 (0.02)**	Stationary
HCE	-5.41981 (0.00)*	-15.2079 (0.00)*	-2.01771 (0.03)**	Stationary
SCE	-12.6678 (0.00)*	-15.2079 (0.00)*	-2.44122 (0.02)**	Stationary
CEE	-6.07685 (0.00)*	-11.8838 (0.00)*	-2.19862 (0.02)**	Stationary
FMS	-27.0341 (0.00)*	-55.3360 (0.00)*	-2.83281(0.02)**	Stationary
DS	-31.5067 (0.00)*	-30.6517 (0.00)*	-1.10562 (0.02)**	Stationary

Source: Data output via E-views 9.0. Note: \* and \*\* denote significant at 1% and 5% respectively

Table 7: ADF Fisher Unit Root Test Result

Variables	Intercept	Trend and Intercept	None	Remark
ROA	-4.46473 (0.00)*	-3.57857 (0.00)*	-4.36761 (0.0)*	Stationary
ROE	-2.65122 (0.00)*	-2.45894 (0.00)*	-4.63661 (0.00)*	Stationary
NPM	-0.90781 (0.18)	-0.59353 (0.27)	-1.96346 (0.02)*	Stationary
GRG	-1.93966 (0.02)**	-1.51626 (0.06)	-1.06532 (0.04)**	Stationary
HCE	-0.10373 (0.45)	-1.57703 (0.05)**	-1.22332 (0.04)**	Stationary
SCE	-0.89547 (0.18)	-1.30822 (0.09)	-1.53290 (0.05)**	Stationary
CEE	0.76449 (0.77)	-0.17848 (0.42)	-2.55112 (0.05)**	Stationary
FMS	-0.26521 (0.39)	-0.43489 (0.33)	-2.32659 (0.00)*	Stationary
DS	-2.29960 (0.01)*	-1.67762 (0.04)**	-1.66991 (0.02)**	Stationary

Source: Data output via E-views 9.0. Note: \* and \*\* denote significant at 1% and 5% respectively

### 4.5 Panel Regression Estimation

The multiple regression estimate was performed in pooled Ordinary Least Square (OLS), fixed and random effect. The fixed and random effect resulted in the weaknesses associated with the pooled OLS estimation. To choose between the fixed and random effect, the hausman chi square test was conducted and the appropriate result applied in the interpretation of the result. Table 8, 9, 10 and 11 reveal the panel multiple regression output for the models as outlined in section three. The result in Table 8 depicts the preference of the random effect estimation in which human capital efficiency is insignificantly and negatively related with return on assets while social capital efficiency and capital employed efficiency positively are related with return on assets, however, the

relationship between capital employed efficiency and return on assets is significant. From the coefficient constant, holding intelligent capital variables: human capital efficiency, social capital efficiency and capital employed efficiency constant return on assets will stand at 0.11%. A unit rise in human capital efficiency results in 0.001% depreciation in return on assets while a percentage increase in social capital efficiency and capital employed efficiency increase return on assets by 0.005% and 0.184% respectively. Intelligent capital explained only 11.81% variation in return on assets which is insignificant judging from the p-value of the f-statistic. The Durbin Watson approximate value of 1.7 (very close to the bench mark of 2.0) entails no autocorrelation in the model, a further affirmation of the serial correlation test in Table 2.

Table 8: Return on Assets and Intelligent Capital

Variables	Pooled OLS		Fixed Effect		Random Effect	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	0.113268	0.0084	0.116805	0.0093	0.113268	0.0103
HCE	-0.001660	0.4907	-0.001276	0.6310	-0.001660	0.5031
SCE	0.005606	0.7645	0.006602	0.7410	0.005606	0.7710
CEE	0.184583	0.0161	0.162653	0.0419	0.184583	0.0192
FMS	-4.08E-10	0.4228	-4.34E-10	0.4205	-4.08E-10	0.4361
DS	3.23E-07	0.8695	1.13E-06	0.5981	3.23E-07	0.8732
Adjusted R-squared	0.118052		0.065511		0.118052	
F-statistic	2.226988		1.321310		2.226988	
Prob(F-statistic)	0.055968		0.242126		0.055968	
Durbin-Watson stat	1.698057		1.649331		1.698057	
Hausman Specification Test						
	Chi-Sq. Statistic		3.245044			
	Probability		0.777500			

Source: Data output via E-views 9.0.

Note: Periods included: 7, Cross-sections included: 8, Total Number of Observations: 56.

From Table 4.9, relying on the random effect estimation, social capital efficiency and human capital efficiency have negative insignificant relationship with return on equity while capital employed efficiency has positive and significant relationship with return on equity. From the constant coefficient, return on assets depicts -0.0075% when intelligent

capital is kept constant. Increasing human capital efficiency by a unit results to 0.0026% decrease in return on assets while a percentage appreciation in social capital employed reduces return on equity by a magnitude of 0.0072%. A unit in capital employed efficiency raises the return on equity by 0.63%. Adjusted R-square shows that 24.47% changes in return on

equity was significantly (p-value of f-statistic less than 0.005) determined by joint fluctuation in intelligent capital variables

controlled by size of the firma and debt structure. The Durbin Watson value of 2.0 reveals no autocorrelation in the model.

**Table 9:** Return on Equity and Intelligent Capital

Variables	Pooled OLS		Fixed Effect		Random Effect	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-0.075421	0.5918	-0.085496	0.5408	-0.075421	0.5883
HCE	-0.002687	0.7656	-0.001416	0.8829	-0.002687	0.7635
SCE	-0.007172	0.9161	0.015115	0.8268	-0.007172	0.9153
CEE	0.636885	0.0291	0.710893	0.0182	0.636885	0.0277
FMS	8.12E-10	0.6722	2.70E-10	0.8896	8.12E-10	0.6692
DS	2.59E-06	0.7243	-7.83E-07	0.9203	2.59E-06	0.7218
Adjusted R-squared	0.244670		0.258873		0.244670	
F-statistic	3.969314		2.600942		3.969314	
Prob(F-statistic)	0.002588		0.010719		0.002588	
Durbin-Watson stat	2.082410		2.069056		2.082410	
Hausman Specification Test						
	Chi-Sq. Statistic		6.939019			
	Probability		0.326500			

Source: Data output via E-views 9.0.

Note: Periods included: 7, Cross-sections included: 8, Total Number of Observations: 56

The hausman test in Table 10 discloses the appropriateness of the random effect estimation. As can be seen from Table 10, human capital efficiency and capital employed efficiency have positive and significant relationship with net profit margin while social capital employed is negatively and insignificantly related with net profit margin. A unit increase in human capital efficiency and capital employed efficiency lead to significant 0.045% and 0.573% upsurge in net profit margin respectively. On the other hand, net profit margin will decline by 0.103% following a unit increase in social capital

employed. If the intelligent capital coupled with control variables via size of firms and debt structure are kept constant, net profit margin will be on the down side by a magnitude of 0.11%. We observe from the intelligent capital amidst control variables explained 83.85% variation in net profit margin which is significant at 1% level of significance. Although the Durbin Watson value of 1.49 is not quite close to 2.0, we then relied vehemently on the serial correlation test in Table 2 which absolved the model of any autocorrelation issue.

**Table 10:** Net Profit Margin and Intelligent Capital

Variables	Pooled OLS		Fixed Effect		Random Effect	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-0.224594	0.0975	-0.225906	0.1088	-0.224594	0.1095
HCE	0.045186	0.0000	0.047764	0.0000	0.045186	0.0000
SCE	-0.102751	0.1080	-0.108194	0.1140	-0.102751	0.1206
CEE	0.573111	0.0263	0.510075	0.0629	0.573111	0.0317
FMS	-3.80E-09	0.0375	-3.60E-09	0.0636	-3.80E-09	0.0444
DS	-5.40E-08	0.9938	-1.25E-06	0.8688	-5.40E-08	0.9940
Adjusted R-squared	0.838512		0.826597		0.838512	
F-statistic	48.59710		22.84839		48.59710	
Prob(F-statistic)	0.000000		0.000000		0.000000	
Durbin-Watson stat	1.493654		1.514942		1.493654	
Hausman Specification Test						
	Chi-Sq. Statistic		2.633133			
	Probability		0.8533			

Source: Data output via E-views 9.0

Note: Periods included: 7, Cross-sections included: 8, Total Number of Observations: 56

Table 11 favoured the random effect estimation which shows that human capital efficiency and capital employed efficiency have significant positive relationship with gross revenue growth while social capital employed efficiency has insignificant negative relationship with gross revenue growth. The constant of the coefficient is a revelation that gross revenue will be down by 25325018 million assuming intelligent capital control with firm specific factors: firms' size and debt structure are held constant. A unit increase in human capital

employed and capital employed efficiency increase gross revenue by 569229.2 million and 7434276 million respectively while gross revenue will depreciate by 468502 million assuming there a unit rise in social capital employed. As shown by the adjusted R-squared, 62.64% changes in gross revenue growth was significantly (p-values of 0.000 less than 0.05) explained by intelligent as controlled by firms size and debt structure. Durbin Watson value of 1.75 is also close to 2.0 suggesting the variables are not serially correlated.

**Table 11:** Gross Revenue Growth and Intelligent Capital

Variables	Pooled OLS		Fixed Effect		Random Effect	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	-2535018.	0.2562	-2492151.	0.2784	-2535018.	0.2688
HCE	569229.2	0.0002	620302.2	0.0003	569229.2	0.0003
SCE	-468502.0	0.6575	-489112.9	0.6642	-468502.0	0.6660
CEE	7434276.	0.0848	6158682.	0.1746	7434276.	0.0931
FMS	-0.020295	0.5024	-0.019561	0.5426	-0.020295	0.5136
DS	1.521031	0.9894	9.426156	0.9397	1.521031	0.9897
Adjusted R-squared	0.626394		0.605887		0.626394	
F-statistic	16.36900		8.046164		16.36900	
Prob(F-statistic)	0.000000		0.000000		0.000000	
Durbin-Watson stat	1.759036		1.773519		1.759036	
Hausman Specification Test						
	Chi-Sq. Statistic		3.450373			
	Probability		0.750600			

Source: Data output via E-views 9.0

Note: Periods included: 7, Cross-sections included: 8, Total Number of Observations: 56

**4.6 Intelligent capital effect on financial performance estimation**

The effect of intelligent capital on financial performance was actualized via the granger causality test and the result depicted in Table 12. As can be seen from Table 12, capital employed efficiency has significant effect on return on equity. Nevertheless, rather than human capital efficiency having significant effect on return on assets, human capital efficiency

was significantly affected by return on assets. Social capital efficiency has significant effect on return on equity. Human capital efficiency significantly affects net profit margin and gross revenue growth on one hand, while on the other hand, net profit margin and gross revenue growth exert significant influence on human capital efficiency. In other words, there is a bidirectional relationship between human capital efficiency, net profit margin and gross revenue growth.

**Table 12:** Effect of Intelligent Capital on Financial Performance of Oil and Gas Firms

Null Hypothesis:	Obs	F-Statistic	Prob.	Remarks
HCE does not Granger Cause ROA	56	0.07297	0.7881	No Causality
ROA does not Granger Cause HCE		0.34495	0.5595	No Causality
SCE does not Granger Cause ROA	56	1.51211	0.2242	No Causality
ROA does not Granger Cause SCE		4.30108	0.0430	Causality
CEE does not Granger Cause ROA	56	8.30788	0.0057	Causality
ROA does not Granger Cause CEE		1.89513	0.1744	No Causality
HCE does not Granger Cause ROE	56	0.00445	0.9471	No Causality
ROE does not Granger Cause HCE		0.53114	0.4693	No Causality
SCE does not Granger Cause ROE	56	9.81424	0.0028	Causality
ROE does not Granger Cause SCE		2.19331	0.1445	No Causality
CEE does not Granger Cause ROE	56	0.93665	0.3375	No Causality
ROE does not Granger Cause CEE		0.34922	0.5571	No Causality
HCE does not Granger Cause NPM	56	6.39758	0.0144	Causality
NPM does not Granger Cause HCE		12.1714	0.0010	Causality
SCE does not Granger Cause NPM	56	0.12398	0.7262	No Causality
NPM does not Granger Cause SCE		0.06427	0.8008	No Causality
CEE does not Granger Cause NPM	56	0.99127	0.3240	No Causality
NPM does not Granger Cause CEE		2.15179	0.1483	No Causality
HCE does not Granger Cause GRG	56	8.80062	0.0045	Causality
GRG does not Granger Cause HCE		22.4860	0.0000	Causality
SCE does not Granger Cause GRG	56	0.02525	0.8744	No Causality
GRG does not Granger Cause SCE		1.10424	0.2981	No Causality
CEE does not Granger Cause GRG	56	1.31112	0.2573	No Causality
GRG does not Granger Cause CEE		0.09270	0.7620	No Causality

Source: Data output via E-views 9.0

**4.7 Discussion of Findings**

From Tables 8-11, the relationship between intelligent capital components and financial performance variables are mixed. Human capital efficiency has negative relationship with return on assets (Table 8) and return on equity (Table 9) which is against our a priori but a positive relationship with net profit

margin and gross revenue growth (Table 10 and 11). Table 12 also shows that human capital efficiency has significant effect on with net profit margin and gross revenue growth. This is an indication that human capital efficiency enhances oil and gas industries net profit margin and revenue from sales owing to their intellectual ability to bring innovation to management,

strategies and developed products brand/quality services that moves people to patronise more products/services. Comparing the findings of Kamath (2015) <sup>[13]</sup> and Chang and Hsieh (2011) <sup>[4]</sup>, this results supports that investment in human capital development enhances profitability with respect to profit margin and gross revenue growth. However, previous findings of Fathi, Farahmand and Khorasani (2013) <sup>[9]</sup> and Maditinos, Chatzoudes, Tsanridis and Theriou (2011) <sup>[16]</sup> on the negative effect/relationship between intelligent capital, and net profit margin and gross revenue growth; Feimianti and Anantadjaya (2014) <sup>[11]</sup>, Onyekwelu, Okoh and Iyidiobi (2017) <sup>[20]</sup> and Claudia-Marian (2011) on positive effect/relationship between intelligent capital, and return on equity were all refuted. Social capital and capital employed efficiency having significant effect on return on assets and return on equity (Table 12) implies that equity capital deployed in acquisition of physical assets will improve the wealth of shareholders and the returns per unit value of asset. The positive relationship between capital employed efficiency and all the financial performance measurements bring to the light financial performance could be spurred by effective and efficient investment in physical assets. Though, it may create additional expenditure for the industry but this could be easily overturn by the profit from operation/utilization of such physical assets. This is consistent with earlier studies by Chang, Lin, Hsiao and Lin (2006) <sup>[5]</sup>, Deepa and Subha (2015), Larson and Morling (2015) <sup>[14]</sup> and Moradi, Saeedi, Hajizadeh and Mohammadi (2013) <sup>[18]</sup>.

## 5. Conclusion and Recommendations

The effect on intelligent capital and performance cannot be ignored as it has received considerable attention by scholars. In this study, we determined the effect of intelligent capital components on financial performance of oil and gas industries in Nigeria from 2008 to 2015. Data analysis with the aid of granger causality technique amidst peculiarity of our business environment, we envisioned within the period reviewed, the significant effect of human capital efficiency on net profit margin and gross revenue growth, capital efficiency on return on assets and social capital efficiency on return on equity. Insofar as the oil and gas industries may want some restructuring in human resource management due to fall in oil prices coupled with current economic recession in the country as a means for reduction in cost, this study shows that investment in human capital development (technocrats in exploration, and refining among others) will ultimately lead to upsurge in net profit margin and gross revenue. In the same vain, all financial performance variables applied in this research are being positively influenced by deployment of capital in physical assets (capital employed efficiency) only. Subsequently, we recommend that oil and gas industries should improve their human capacity development (workforce be up to date on ever changing technology) to enhance productivity. Investment in physical assets via modernized exploration, refining, product storage/delivery facilities will enhance availability and efficiency in delivering of oil and gas services which in turn, lead to increase turnover/rise in revenue.

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