Journal of Taxation and Economic Development ISSN 1118-6017 Vol. 18, (1), March 2019

EFFECT OF STRUCTURAL CAPITAL ON PERFORMANCE OF LISTED CONSUMER GOODS COMPANIES IN NIGERIA

By

Halimatu S. Abubakar
Department of Accounting,
Faculty of Management Science
Nasarawa State University, Keffi
08072023231; abubakarhalimatu@gmail.com

Musa I. Fodio
Department of Accounting,
Faculty of Management Science
Nasarawa State University, Keffi

Hassan Ibrahim
Department of Accounting,
Faculty of Management Science
Nasarawa State University, Keffi

Abstract
The recognition of the value and influence of intellectual property rights on performance has overtime been overlooked by companies and researchers. This study examined effect of structural capital on the performance of listed consumer goods companies (CGCs) in Nigeria for a period of six (6) years from 2012 to 2017. The dependent variable for this study is performance proxy by value added while the independent variables are structural capital proxy by intellectual property rights. This study carried out descriptive statistics, correlation analysis, panel regression and post diagnostics test to analyze the variables. The regression result revealed that intellectual property rights has positive and significant effect on performance of listed CGCs in Nigeria for the specified period. The study recommends that listed CGCs in Nigeria should increase investment in intangible assets such as computer software, trademarks, and copyrights as this could be used to create revenue for the businesses there by increasing performance. Also, listed CGCs in Nigeriashould ensure separation of the representation of book value for IPR from that of other intangible assets like goodwill in their financial statements.

Key words: Structural Capital, Intellectual Property Rights and Value Added.

INTRODUCTION

Structural capital had developed as a result of earlier assumptions by Stewart (1997) on the difference between company's book value and its stock market value are in the calculated intangible value considered to be company's premium earnings, that is, the earnings greater than those of an average company within the industry. The method values company's intangible assets with a view that the proportion of company's profit that exceeds average yield is explained by intellectual property rights. The method apportions a fixed value to intangible assets like brand equity and proprietary technology that does not change according to the company's market value.

Subsequently, the discounted projected cash-flows methods developed by Nash (1998), Anderson and McLean (2000) and Sullivan (2000) assumed that the value of intellectual property is based on assessment through creation of intellectual capital value chain to establish a link between innovation and value realization by recognizing the elements of the company that create significant value. The value of a company comprises of the value of its intangible assets, net present value of earnings from its intellectual capital, net present value of earnings from a company's complementary business assets and net present value of earnings from its generic structural capital. During the same period, Brookling (1996), Andriessen and Tiessen (2000) and Bontis (2001) developed the monetary value method of intellectual property and assumed approach for estimating intellectual property value as analyzing replacement cost of intangible assets, the market value of intangible assets and profitability for each intangible asset. The method classified intangibles as assets and endowments, skills and tacit knowledge, collective values and norms, technology and explicit knowledge, primary and management processes. The method developed other indicators for intellectual property such as weighted patents based on the patents developed by companies using a series of indices such as number of patents and cost of patents to sales turnover. Hierarchies of weighted indicators like monetary value added and intangible value added were combined to obtain intellectual property value.

Considering previous methods, structural capital was first viewed as intangible assets and afterwards as intellectual property such as patents, brands and technology. However, current methods like returns on assets method developed by Luthy (1998), Lev and Zarowin(1999) and Public (2000a) focused on relating already developed indicators of structural capital with company performance. The method apportions a fixed value to intangible assets like brand equity and proprietary technology that does not change according to the company's market value. The method determines intangible value using average pretax earnings, average year-end tangible assets, company's return on assets (ROA), industry average ROA, excess ROA and company's cost of capital. The company's book value plus intellectual property value is compared with market value to determine economic value.

Following current trends, there is need to examine the implication of structural capital indicators on performance of companies. A number of literature in their study have indicated structural capital as company's culture; orientation to quality; innovation; continuous improvement in work processes; information systems; teamwork (Kamukama, Ahiauzu & Ntayi, 2010); succession training; recruitment programs; reward system; skills and education support; employees influence over decisions; effect of systems and programs on productivity, profitability and market valuation; research leader; latest scientific and technical development; research and development budget; board trust and support of research and development; effect of research and development on productivity, profitability and market valuation; intellectual property rights (IPRs) strategies and procedures; monitors of IPRs portfolio; multiple strategy of licensing IPRs; IPRs considered for value creation; utilization of IPRs to maximum level; high number of IPRs; effect of IPRs on productivity, profitability and market valuation (Sharabati, Jawad & Bontis, 2010; Al-Hawajreh, 2013); knowledge management and organizational process efficiency (Mohammadi, Sherafati & Ismail, 2014).

Consistently, the indicators specified in the previous paragraph were developed based on data generated through responses from the opinion of employees and managers about the effect of R&D and IPRs on profitability, productivity and market valuation. Expenditure on R&D and IPRs are costs items that are incurred by companies and included in the financial statements while profitability, productivity and market valuation are performance measures that could be ascertained with profit figures, turnover, market value, book value, cost of production, total assets and value of equity to mention a few. These figures are also obtainable from the financial statements and would yield better results than mere opinion. Moreover, opinion about recruitment programs, reward systems and procedures for monitoring intellectual property rights (IPRs) should not be preferred to other measures like R&D budget (Ghaffar & Khan, 2014), R and D intensity, advertising intensity (Tsai, Yen & Wen, 2013) cost of IPRs, stock of intellectual property rights and average life of IPRs in the study of IC and performance, since most performance measure are presumed to be profit related. The effect of the expenses (viewed as capital) related to R and D and IPRs on performance should be the concern to companies. In that case, expenses on structural capital should not be taken as synonyms for carrying amount or book value of structural capital, because expenses are events that should be settled within reporting period usually twelve (12) months and is not subjected to any form of capitalization nor is it required for determination of net worth of businesses during purchase consideration among companies. Whereas, the book value of structural capital is that which is capitalized (value is subject to adjustments on cost through amortization) overtime usually within useful life of the intellectual property and constitutes part of net assets of companies.

Nonetheless, company performance measures often used by existing literatures are returns on equity, returns on assets, earnings per share (Ghaffar & Khan, 2014), market capitalization, productivity and profitability (Sharabati et al, 2010; Tsai et al, 2013). Returns on asset and returns on equity are proportions of profit out of total assets and shareholders' equity determined to show what is realized from the usage of assets and to ascertain shareholders wealth. Productivity is ascertained for management use and decision making while market valuation is used for purchase consideration during merger and acquisitions. These measures do not capture the characteristics of the value added as a measure of performance. Value added is the actual amount realized after the deduction of input (bought-in-materials) from output (total revenue). The amount realized is then distributed to employees, providers of finance (interest holders), government (tax) and for growth and expansion of businesses. The value added considers both management and shareholders holdings as well as other stakeholders' interest. Value added measures how efficient companies are in creating value and is composed of retained earnings, salaries, depreciation, interest, dividends and taxes. Value added proportions to sales, production cost, employees, total assets, equity capital and earnings are also forms of company performance that can be computed.

Haven considered measurability issues in the indicators for structural capital and company performance, there is need to raise questions: What are possible modification or alternative indicators for structural capital and performanceξ What is the effect of structural capital on performance of listed (CGCs) consumer goods companies in Nigeriaξ

The objective of this study is to determine the effect of structural capital on the performance of listed consumer goods and industrial goods in Nigeria. However, the hypothesis is stated below:

$H_0$1: Structural capital has no significant effect on the performance of consumer goods and industrial goods listed in Nigeria.

Structural Capital

Structural Capital is defined as average length of time for product design, research and development invested in product design, number of multi-functional project teams, product life-cycle trend, revenue generated per research and development expense, number of new product introductions, number of software licenses, ratio of research and development expense to administrative expense, ratio of information system expense to total revenue, volume of information systems use, number of times corporate database is accessed, patents or copyrights per employee and computer links to corporate database (Miller, DuPont, Fera, Jeffrey, Mahon, Payer & Starr, 1999). Structural capital refers to corporate culture, organizational learning, operation process and information system (*Chen, Zhu & Xie*, 2004). Structural capital is the a non-human asset which remains in factory or office when employees leave at the end of the day which includes: organizational ability, processes, procedures, rules, regulations, data bases, patents, trademarks and copyrights which are company's property that can be traded, reproduced and serve as supportive infrastructure that can be shared within the organization so that human capital can function properly (Ahangar, 2011; Rehman, Asghar & Rehman, 2013).Structural capital can be defined as the sum of capitals stemming from internal processes, relations, communication, systems and programs, research and development and intellectual property rights (Pena, Ruiz & Navarro, 2012; Al-Hawajreh, 2013). Structural capital is everything in an organization that supports employees (human capital) in their work.

Nonetheless, structural capital is an organization's ability to meet the company's routine processes and structures that support employee's efforts to produce optimal intellectual performance and overall business performance. Structural capital includes construction of company's culture and operational systems; employee identification with company perspective; clarification of relationship among authority, responsibility and benefit; validity of enterprise controlling system; construction and utilization of inner information net and company repository; business process period; product quality level; corporate operating efficiency; mutual support and cooperation between employees; availability of enterprise information and share of knowledge; corporate mission and vision; manufacturing processes, management philosophy and all forms of intellectual property (hardware, software, trademarks, patents, formulas, management style, company reputation, image) owned by companies and remains with it even when the worker leaves the organization. From the review of prevailing literature there three major indicators of structural capital namely: corporate culture/systems/procedures, intellectual property rights and research and development. For the purpose of this study, intellectual property rights would be discussed in details in the following paragraph.

Intellectual Property Rights

Intellectual property rights (IPRs) refers to creations of the intellect for which a monopoly is assigned to designated owners by law. IPRs are proxy by index construction

which includes stock of different types of IPRs. This involves the use of flows of IP applications in terms of average life of IPRs and number of new applications of each IPR (Griffiths, Jensen & Webster, 2005). Intellectual property rights (IPRs) are the protections granted to the creators of IP, and include trademarks, copyright, patents, industrial design rights, internet domain names and in some jurisdictions trade secrets (Castro, Lopez, Saez & Salazar, 2006). Patents are rights granted by a government to an inventor to manufacture, use and sell an invention for limited period of time. Patents of companies can be measured by number of patents registered and average quantity of patents of employees. Copyrights are legal rights given to an originator to print or publish a book, perform or record a play, film or photograph within specified jurisdiction. Trademarks are legally registered symbols, graphics, logos or words legally registered and used to represent a company or product. Artistic works including music and literature, as well as discoveries, inventions, words, phrases, symbols, and designs can all be protected as intellectual property. Intellectual property rights are licenses granted for use of intellectual property. IP like software packages are renewable and can be upgraded to current versions for speedy and better features. There are cost implications associated to obtaining licenses for the usage, upgrade and sale of intellectual property. For instance, consumer goods companies engage in transaction with their customers and suppliers through protected e-transactions (electronic transactions) platforms specially designed for the companies. This platform is used by the companies to make payments to suppliers and receipts from customers and a remittance and pin code is generated for the transaction. The implication is that the companies need to determine the cost of license granted for usage of package (IP), cost of maintenance of IP (cost of upgrade). Where it is a patent right there is need for the companies to also determine residual values for IP for purpose like disposal of the IP. Finally, companies need to examine how these costs affect the performance.

Performance

A measure of performance that is usually avoided by researchers in the assessment of company performance is value added. Value added is used as a measure of efficiency that represents the wealth created through the company's production process or provision of services. Value added measures the difference between sales and the cost of materials and services incurred to generate the sales (Deep & Narwal, 2014; Kamath, 2015). The resulting wealth is generated by the combined efforts of those who work in the organization (employees) and those who provide the capital (employers and investors). Value added is thus distributed as wages to employees, depreciation for reinvestment in machinery and equipment, interest to lenders of money, dividends to investors and profits to the organization. Value added for a firm is the sum of interest expense, depreciation expenses, dividends, corporate taxes, equity of minority shareholders and profit retained for the year. Value added can be calculated using either the Subtraction Method or the Addition Method. The Subtraction Method emphasizes the creation of value added (Value added = Sales – Cost of purchased goods and services). It measures the difference between sales and the cost of goods and services purchased to generate the sales. The Addition method emphasizes the distribution of value added to those who have contributed to the creation of value added (Value added = Labour cost to employees + Interest to lenders of money + Depreciation for reinvestment in machinery and equipment + Profits retained by the organization + other distributed costs e.g. tax).

However, for quantitative assessment of firm performance, value added common indicators are: the total amount of computed value added, value added to sales ratio, value added to number of employees, operating profit to value added and value added to fixed assets to measure effectiveness and proportions of value added to various components of financial statements.

EMPIRICAL REVIEW

Kamukama et al (2010) explored the extent to which structural capital explained financial performance of sixty five (65) micro-finance firms in Uganda. Structural capital was represented as company's culture, orientation to quality, innovation, continuous improvement, information systems and teamwork while financial performance was indicated as portfolio at risk (PAR), net profit ratio, loan loss recovery ratio, repayment rate, yield on portfolio and returns on asset (ROA). Five (5) point Likert scale was used to convert responses generated from questionnaire administered to employees of the micro-finance institutions into quantitative data. Normality test and Pearson's bi-variate correlation co-efficient was carried out. Cronbach's alpha test of reliability and validity was carried out to test for the consistency among questions which shows an alpha of 75% signifying reliability of questions in the questionnaire. Hierarchical regression was used to analyze variables because of its capacity to indicate precisely what happens to the model as different predictor variables are introduced. Multicolinearity test which resulted to a mean VIF of less than 10. The study found SC was a strong predictors of financial performance. The problem with hierarchical regression lies with the choice of what variable to add when including a new model with the aim of improving R2 to determine the fitness of the model. The researcher adds variable to a new model at his/her own discretion and as such causing biasness in the selection of variables. There would be biasness in the responses obtained from the use of employee perception to measure the operational items developed for SC because of the different roles they play as employees in the firms.

Likewise, Sharabati et al (2010) examined the association of structural capital with performance of fifteen (15) pharmaceutical companies registered with the Jordanian Association of Pharmaceutical Manufacturers (JAPM) in 2007. Structural capital was specified as systems and programmes, research and development (R and D), intellectual proprietary rights (IPRs) while business performance was expressed as productivity, profitability and market valuation. A survey unit of analysis was composed of two hundred (200) top and middle managers drawn from the 15 JAPM firms. One hundred and forty (140) were returned as response which represents the sample and one hundred and thirty-two (132) were used for analysis because eight (8) of the surveys were incomplete. Kolmogorov-Smirnov (K-S) test, Cronbach's alpha test and factor analysis (Pearson's principal component analysis) were used to test for normality, reliability and validity of data and measures respectively. The Pearson's bi-variate correlation coefficient was used to test the association between the dependent and the independent variables and ANOVA test was used to analyze respondents' characteristics related to gender, age, education, experience, department and sector. Other analyses carried out are multi-collinearity, multiple regression analysis and partial least squares (PLS-Graph). Results revealed that there is a significant relationship between structural capital variables and business performance variables. Also, structural capital has a strong and positive influence on business performance.

However, Sharabati et al (2010) regressed questionnaire responses for intellectual capital variables with quantitative data obtained from annual reports for productivity, profitability and market valuation. Questionnaire responses for independent variable should not be regressed with quantitative data for dependent variable because of the difference in the periods from which data is obtained, only if questionnaire responses is generated for equal number of years from which quantitative data is drawn.

Similarly, Al-Hawajreh (2013) measured effect of structural capital and business performance of fifteen (15) Pharmaceutical manufacturing companies in Jordan. The dependent variable is business performance proxy by productivity, profitability and market valuation while the independent variable is structural capital proxy by systems and programmes (S and P), research and development (R and D) and intellectual property rights (IPRs). Questionnaires containing ten (10) business performance (BP) indicators and thirty (30) structural capital indicators were administered to two hundred (200) managers of selected pharmaceutical manufacturing companies out of which one hundred and thirty-two (132) responses were obtained. Five (5) point Likert scales were used to tap all managers' perception about the variables. S and P indicators were succession training, culture atmosphere, recruitment programs, reward system, skills & education support, employees influence over decisions, not bureaucratic nightmare, S and P affect productivity, S and P affect profitability and S and P affect market valuation. R and D indicators were research leader, work processes development, development and re-organizing, latest scientific and technical development, innovation's systems & programs, R and D budget, board trust and support R and D, R and D affect productivity, R and D affect profitability and R and D affect market valuation. IPRs indicators were IPRs strategies and procedures, monitors IPRs portfolio, multiple strategy of licensing IPRs, encourage and reward creation, IPRs considered for value creation, utilization of IPRs to maximum level, high number of IPRs, IPRs affect productivity, IPRs affect profitability and IPRs affect market valuation. BP indicators were industry leadership, future outlook, overall response to competition, success rate in new launches, Overall BP and success, employee productivity, process (transaction) productivity, sales growth, profit growth and company market valuation. Kolmogorov test, Cronbach's alpha test of reliability and Pearson's principal component factor analysis were used to test for normality, reliability and validity of models and measures. Mean, standard deviation, one-sample t-test and multiple regression analysis were used to assess relationship between variables. Results showed positive significant relationship exist between structural capital and business performance which indicated that structural capital can clearly explain productivity and profitability more than market valuation. S and P, R and D positively and directly affect business performance while IPRs negatively affect business performance.

The indicators of whether S and P, R and D and IPRs affects productivity, profitability and market valuation of the pharmaceutical companies require empirical analysis and not an expression of perception in a questionnaire administered to managers. Also, where there are quantifiable figures about a variable existing in the published reports of a company, the use of individual opinion from questionnaire would be a weak measurement for such variable. In essence variables like employee productivity, sales growth, profit growth and market valuation could be sourced from the financial statements of the companies and so, questionnaire facts for these variables would be a weak source compared to evidence from published reports. Employee productivity

could be expressed as efficiency and effectiveness of employee in the generation of value added (value added to number of employees), marketing strategy or sales per employee (sales to number of employees) and average remuneration per employee (labour cost to number of employees). Sales growth and market valuation could be defined as changes in sales from period to period and market value to book value respectively while profit growth could be defined as profit margin (operating profit to sales).

On the contrary, Tsai, Yu and Wen (2013), examined implication of R and D intensity (R and D expenditure/sales), advertising intensity (advertising expenditure/sales) on company performance measured by Tobin's Q ratio and quarterly stock returns rate. Control variables used were market to book value ratio and debt ratio. The descriptive statistics, correlation analysis and panel regression were used to analyze data and variables. The study found that R and D intensity and advertising intensity were significantly related to Tobin's Q and stock return rates companies. The study did not conduct the normality test to be able detect whether there are abnormalities in the data set. However, the study used expenses incurred on structural capital indicators as against responses from questionnaires as used by Al-Hawajreh (2013).

Equally, Ghaffar and Khan (2014) studied research and development (R and D) effect on performance of eight (8) pharmaceutical companies listed on the Karachi Stock Exchange for a period of six years (6) from 2007 to 2012. Research and development expressed as budget on research and development while performance (FP) was proxy by ROA, ROE and EPS. Correlation and regression analysis were used to analyze variables. The study found that research and development budget had weak correlation with ROA and strong correlation with ROE and EPS, R and D budget had significant positive effect on performance of the companies. The study used the aggregate value of ROA, ROE and EPS as FP and regressed with R and D budget in the model specified which is entirely wrong. The study failed to show result of the R-square (R2) for us to detect whether model was of good fit.

Likewise, Mohammadi et al (2014) established the implication of structural capital on financial performance of companies in Iran using seventy-nine (79) questionnaires containing latent variables and administered to managers of knowledge-intensive small and medium enterprises (SMEs). Three latent variables: knowledge management, organizational culture and organizational process efficiency proxy structural capital. On the other hand, financial performance was expressed as variables included in the latent variables for structural capital. The study could have developed separate latent variables for performance instead of including them in that of structural capital. Cronbach's alpha, the visual partial least square regression and structural modeling was carried out to analyze relationship between variables and results showed structural capital significant influence on organization's financial performance.

Microeconomic Theory of Intellectual Property Rights

The basic reasoning for intellectual property rights (IPR) is that the public good character of technological knowledge requires artificial incentives for innovators in the form of temporary monopoly rights on innovations (Thumm, 2000). According to economic theory IPR increase expected profits for the innovator and make him/her to

invest more in research and development (R and D) in order to raise the innovation rate (innovation effect). The classical welfare analysis of intellectual property rights refers to monopoly theory and takes into consideration monopolistic pricing. The intellectual property right holder sells less quantity of the innovative good for a higher price, implementing a dead weight loss compared to the competitive market situation. Nevertheless, there are dynamic benefits of allowing proprietization of ideas via IPR. Consider a new production innovation that result from a company's R and D expenditures. If the idea behind the innovation leaks out, rival company can adopt the innovation and produce at the same marginal cost as the original company, but without having incurred the costs of R and D that led to the innovation. Since this puts the original innovator at a competitive disadvantage, it follows that if the companies cannot either keep the innovative idea secret, or obtain intellectual property protection for the idea that allows it to recover its investment costs, it won't undertake the R and D. Clarke (2011) identified the various costs associated with IPR as transfer cost, rent-seeking cost, fixed cost and cost-benefit trade off.

Transfer costs exist with intellectual property such that transactions costs associated with transfer of intellectual property (or the determination of illegal use of intellectual property) can be substantial because of the problem of identifying which particular idea is actually protected. There are rent-seeking costs associated with the granting of IPR conferred by patents called "patent race". The costs of protecting intellectual property can be quite large and hence are a key consideration in forming intellectual property policy. Consider a production innovation which the innovating company is able to keep secret and hence exploit for its own benefit. However, it would be more beneficial if the innovation were adopted by the whole industry, rather than just by a single innovative company. This cost is the basis for the requirement of disclosure in patent law. The importance of the costs of protecting intellectual property are also magnified significantly if the underlying fixed cost of innovation is large, while the marginal cost of using the innovative idea is small or zero. If companies can absent the ability to exclude non-payers from using an innovative idea, companies would not incur the fixed cost of innovating unless they can simultaneously protect the innovation. If fixed costs are large, firms may end up investing substantial resources in protecting trade secrets or otherwise discouraging imitators.

The costs associated with granting IPR dictate that if the laws governing the granting of these rights are meant to promote economic efficiency, they should contain provisions which minimize the associated costs.

The microeconomic theory of IPR shows quantitative measurement by way of costs related to intellectual property rights which existing literatures such as Sharabati et al, 2010; Kamukama et al, 2010 and Tsai et al, 2013 on IPR have ignored in their review. Instead, the literatures explored individual perceptions about IPR. This study would explore and identify the book value of IPR included in the intangible assets of listed CGCs in Nigeria. The book value of IPR would be considered because it is the capitalized amount of IPR. In other words, the carrying amount for IPR after adjusting for transfer cost, rent-seeking cost, fixed cost and cost-benefit trade off as prescribed by the micro-economic theory. The book value also recognizes the useful life of the IPR in the computation of its value.

METHODOLOGY

This study employs the ex-post facto research design to establish the relationship between structural capital and the performance of consumer goods companies listed in Nigeria. The dependent variable for this study is company performance indicated as efficiency and proxy by value added. The independent variable is structural capital expressed as intellectual property rights (IPRs) while control variable for this study is company size proxy by total assets of the companies. There are twenty-two (22) consumer goods \companies listed on the Nigerian stock exchange and fourteen (14) were selected as sample size based on purposive sampling technique. Data was sourced from the published annual reports of the selected companies and for the period specified. Panel data involving data required for variables for the thirteen (13) consumer goods companies and for a period of six (6) years from 2012 to 2017, put together to make up seventy-eight (78) observations.

This study would carry out descriptive statistics, normality test, correlation analysis, panel regression and post regression diagnostic test on variables with the aid of statistical package STATA version 13. The descriptive statistics would detect whether there are errors in the data set by determining mean, maximum and minimum values for each of the variable measures. The normality test would determine whether there are outliers in the data set, that is, deviations from the average using Jaque-Berra statistics. Pearson correlation analysis would tests association among the variables, while panel regression would examine the relationship between the dependent and independent variables. Panel regression tests for fixed effect model and random effect model. Thereafter, Hausman specification test would determine whether the fixed effect or random effect is most appropriate for the study.

Model Specification:

$$VA_{it} = \alpha + \beta_1 IPR_{it} + + \beta_2 FSIZE_{it} + \varepsilon_{it} \quad (1)$$

Indicators for Variables	Measurements
VA_{it}	Value added per annum = sum of dividends paid, interest paid, retained earnings, taxes paid and wages & salaries paid by the firms at the end of every trading period for each of the thirteen companies selected and for each period of the six years selected.
IPR_{it}	Value of intellectual property rights per annum = the carrying amount for copyrights, patents, trademarks and designs acquired by the firms every trading period for each of the thirteen companies selected and for each period of the six years selected.
$FSIZE_{it}$	Company size = total assets as at the end of every trading period for each of the thirteen companies selected and for each period of the six years selected.
it = The sub-script for each indicator in models (1), *i* represents the companies while *t* represents the period of the study.	
b_0 = constant b_1, and b_2 are coefficients for the independent variables. e_{it} = error term	

DATA PRESENTATION AND ANALYSIS

Data for the variables IPR, FSIZE and VA were presented using nominal scale. All variables are in billion naira but the size of the absolute values were reduced to nine (9) decimal places to avoid taking natural log and other forms of scaling. Moreover, there are negative values in the data set that would not allow for natural log, whereas, absolute values better describes the data and identify the behavioural pattern of variables. The data set for each variable is panel data which is a combination of cross sectional data (number of companies) represented by thirteen (13) companies and time series data (number of periods) represented by six (6) years 2012 to 2017. However, seventy-eight (78) observations was expected for each variables from the data combination but some of the variables have missing values not obtainable from the financial reports where data was pooled. Nonetheless, IPR had fifty-eight (58) observations, VA had seventy-five (75) observations while FSIZE with seventy−eight (78) observations. See appendix for table of data.

Descriptive Statistics and Normality Test

Variables	Minimum	Maximum	Prob>chi2 Skewness/Kurtosis
VA	−1.111131	127.9538	0.0000
IPR	0.001508	1.962124	0.0007
FSIZE	10.13941	482.6033	0.0000

The above table represents the descriptive statistics of the observations in the data set. The minimum values for VA, IPR and FSIZE are respectively −1.111131 (N−1,111,131,000), 0.001508 (N1,508,000) and 10.13941 (N10,139,410,000) recorded by Dangote Flour Mills and Vitafoam, between 2012 and 2015 period of reporting. Principally, Dangote Flour Mills recorded the minimum values for VA in the year 2015 as a result of increased accumulated loss (retained loss) from N10,524,972,000 in 2014 to N23,052,118,000 in 2015. Both retained profit and retained loss form part of value added. Therefore, retained profit would increase VA while retained loss would decrease VA. Nonetheless, Vitafoam recorded the minimum values for IPR and FSIZE due to restatement of the 2012 value of intangible assets (intellectual property rights) in 2014 and decrease in the value of some items that make up total assets (company size) such as investment property (from N12,642,000 in 2012 to N11,992,000 in 2013), available for sale in financial assets (from N18,644,000 in 2012 to N17,151,000 in 2013), inventories (from N5,171,676,000 in 2012 to N4,333,528,000 in 2013) and cash and bank (from N393,407,000 in 2012 to N268,211,000 in 2013).

The maximum values for the variables are VA 127.9538 (N127,953,800,000), IPR 1.962124 (N1,962,124,000) and FSIZE 482.6033 (N482,603,300,000) respectively recorded by Nigerian Breweries, Unilever and Flour Mills between 2012 and 2017.

The joint probability for the combination of skewness and kurtosis test for normality for all the variables is less than 10% which is significant, thus, the null hypothesis is rejected. This indicates that the data for IPR, FSIZE and VA are not normally distributed. This is probably because the number of observations for the variables are not the same (each variable with different number of observations).

Regression Analysis

Structural Capital and Performance (IPR, FSIZE and VA)

Variables	Correlation				
	VA		IPR		
IPR	0.203		-		
FSIZE	0.864		0.183		
Mean VIF	1.03				
Test	Constant	Coefficients		R^2	Prob > F
		β_1	β_2		Prob > chi2
Ordinary Least Square Regression (OLS)	0.514	3.459	0.251	0.749	0.000
P > |t| - OLS	0.898	0.512	0.000	-	-
Heteroscedasticity Prob > chi2	-	-	-	-	0.000
Robust Regression (RR)	2.727	3.115	0.155	-	0.000
P > |t| - RR	0.003	0.008	0.000	-	-
Hausman Specification	-	-	-	-	0.0984
Random Effect Regression (REM)	13.751	-2.188	0.158	0.740	0.0000
P > |t| - REM	0.025	0.611	0.000	-	-
Linear Regression FGLS	0.481	4.567	0.227	-	0.0000
P > |z| - FGLS	0.140	0.000	0.000	-	-
Panels-FGLS:	Heteroskedastic				
Autocorrelation-FGLS:	0.3116				

The table above shows the results from test for correlation, hausman specification, fixed effect regression model, feasible generalized least square (FGLS) regression and panel corrected standard errors (PCSEs) regression for the variables IPR, FSIZE and VA.

The result from correlation showed that VA has positive and strong correlation of 0.86 (86%) with FSIZE but a positive and weak correlation of 0.20 (20%) with IPR. IPR has positive and weak correlation of 0.18 (18%) with FSIZE. However, multicollinearity test on the variables reveals that mean of variance inflation factor (Mean VIF) of 1.03 is less than 10. This indicates there is no problem of multicollinearity (variables are not highly correlated) and no need to drop any variable.

In addition, from the table, the regression equation for OLS is expressed based on the constant value and coefficients:

$$VA_{it} = 0.514 + 3.459IPR_{it} + 0.251FSIZE_{it} + \varepsilon_{it}$$

The regression result showed IPR has a positive coefficient of 3.459 with p-value of 0.512 (51.2%) more than 5% significant level. This indicates IPR has positive and insignificant effect on VA, thus, the null hypothesis (H0) is accepted. FSIZE has a positive coefficient of 0.251 with p-value of 0.000 (0%) less than 5% significant level. This depicts FSIZE has positive and significant effect on VA, hence, the null hypothesis (H0) is rejected. The coefficient of determination (R2) of 0.749 showed 74.9% variations in VA is explained by IPR and FSIZE put together while the remaining 25.1% is explained by other factors (error term) not included in the regression equation. The probability of F-statistics is 0.000 (0%) less than 5% test criteria, consequently the model is of best fit and capable of explaining the effect of IPR and FSIZE on VA.

Nonetheless, the probability of Breusch-Pagan / Cook-Weisberg test for Heteroskedasticity is 0.000 (0%) less than 10%, thus, significant. This implies the problem of Heteroskedasticity (regression not homogenous) in the regression and the need for a robust regression.

Furthermore, the equation for robust regression is stated as follow:

$$VA_{it} = 2.727 + 3.115IPR_{it} + 0.155FSIZE_{it} + \varepsilon_{it}$$

Consequently, there are changes in the coefficients and p-values of predictor variables in robust regression different from ordinary least square regression and with different results. Robust regression showed IPR has a positive coefficient of 3.115 with p-value of 0.008 (0.8%) less than 5% significant level. This indicates IPR has positive and significant effect on VA, thus, the null hypothesis (H0) is rejected. FSIZE has a positive coefficient of 0.155 with p-value of 0.000 (0%) less than 5% significant level. This depicts FSIZE has positive and significant effect on VA, hence, the null hypothesis (H0) is rejected.

However, the equation for fixed effect regression based on constant value and coefficient is stated as follow:

$$VA_{it} = 13.751 - 2.188IPR_{it} + 0.158FSIZE_{it} + \varepsilon_{it}$$

The probability of Hausman specification test is 0.098 (9.8%) less than 5% test criteria. This implies random effect model is more appropriate than fixed effect model and the null hypothesis (H0: p-value > 5%) is accepted. The regression result showed IPR has a negative coefficient of -2.188 with p-value of 0.025 (2.5%) less than 5% significant level. This indicates IPR has negative and significant effect on VA, thus, the null hypothesis (H0) is rejected. FSIZE has a positive coefficient of 0.158 with p-value of 0.000 (0%) less than 5% significant level. This depicts FSIZE has positive and significant effect on VA, hence, the null hypothesis (H0) is rejected. The coefficient of determination (R2) of 0.74 showed 74% variations in VA is explained by IPR and FSIZE put together while the remaining 26% is explained by other factors (error term) not included in the regression equation. The probability of F-statistics is 0.000 (0%) less than 5% test criteria, consequently the model is of best fit and capable of explaining the effect of IPR and FSIZE on VA.

Furthermore, to eliminate heteroskedasticity and autocorrelation, FGLS regression was carried out. Though, time period (T) is less than the number of cross-sections (N) which means PCSEs regression is more appropriate but random effect model (REM) does not support PCSEs (the REM is a generalized least square regression). The equation for FGLS regression is stated as follow:

$$VA_{it} = 0.481 + 4.567IPR_{it} + 0.227FSIZE_{it} + \varepsilon_{it}$$

FGLS regression showed IPR has a positive coefficient of 4.567 with p-value of 0.000 (0%) less than 5% significant level. This indicates IPR has positive and significant effect on VA, thus, the null hypothesis (H0) is rejected. FSIZE has a positive coefficient of 0.227 with p-value of 0.000 (0%) less than 5% significant level. This depicts FSIZE has positive and significant effect on VA, hence, the null hypothesis (H0) is rejected.

Lastly, comparing regression coefficients and p-values obtained from OLS, robust regression, fixed effect model and FGLS established for IPR and FSIZE on VA. OLS showed IPR has positive and insignificant effect on VA while FSIZE has positive and

significant effect on VA. The random effect model found IPR has negative and insignificant effect on VA while FSIZE have positive and significant effect on VA. Robust regression and FGLS revealed IPR and FSIZE has positive and significant effect on VA.

DISCUSSION OF FINDINGS

This study found that intellectual property rights has positive and significant effect on value added of listed CGCs in Nigeria. This signifies value added would increase as intellectual property rights increase. Also, intellectual property rights have substantial influence on value added. Amount invested on intellectual property rights such as computer software, trademarks and copyrights regarded as intangible assets are capitalized based on amortization and impairment to determine its book value called carrying amount and this forms part of net worth of the business during negotiation for merger and acquisition. Increase in investment in intellectual property rights could create wealth in many ways for businesses. For instance, computer software could be sold at the end of its useful life to generate realizable value and could be rented out to generate rental income. Computer software is used to perform operations and transactions in the business with ease and without error and the output creates wealth for the business. Furthermore, trademarks and copyrights could be serve as source of finance for companies when authorization is granted to third parties for usage and money is realized from such authorization. Consequently, intellectual property rights has major effect on value added such that amount required for growth and expansion of assets is dependent on investment in intellectual property rights.

Finally, company size has positive and significant effect on value added of listed CGCs in Nigeria. This denotes value added would increase as company size increase. It also means company size has substantial influence on value added of listed CGCs in Nigeria for the period specified. Company size as represented by total assets involves increase in all non-current and current assets from acquisition of tangible assets, investment in intangible assets, selling of inventories, accounts receivables, cash and cash equivalence and so on. The larger the size of the business, the likelihood of creating more wealth for CGCs in Nigeria.

CONCLUSION AND RECOMMENDATION

This study concludes that structural capital represented by intellectual property rights has significant and positive effect on performance of listed CGCs in Nigeria for the period specified. This is similar to the conclusions of Sharabati et al (2010) that intellectual property rights significantly and positively influence performance of selected pharmaceutical companies in Jordan. Therefore, intellectual property rights has material and substantial importance on performance of listed CGCs in Nigeria and so the companies should increase investment in intangible assets such as computer software, trademarks, copyrights as this could be used to create revenue for the businesses there by increasing performance. In addition, CGCs in Nigeria should ensure separation of the representation of book value for IPR from that of other intangible assets like goodwill in their financial statements. This is because intangible assets are non-physical assets and each has different method of valuation. For instance, the method of valuation for intellectual property rights could be different from that of investment in fixed deposits.

BIBLIOGRAPHY

Adejola, P. A. (2014).Financial Management Theory and Practice, Published by Rainbow Press Limited, Abuja.

Afroze, R. (2011). Intellectual Capital and its Influence on the Financial Performance, *ASA University Review, 5(1), 161-173.*

Ahangar, R. G. (2011). The Relationship between Intellectual Capital and Financial Performance: An Empirical Investigation in an Iranian Company. *African Journal of Business Management*, *5*(1), 88–95. https://doi.org/10.5897/AJBM10.712

Akinsurulere, O. (2011).Financial Management, Published by Ceemol Nigeria Limited, Lagos.

Al-Hawajreh, K. M. (2013). The Impact of Structural Capital on Business Performance in Jordanian Pharmaceutical Manufacturing Companies. *European Journal of Business and Management*, *5*(10), 177–190.

Al-Matari, E. M., Al-Swidi, A. K., & Fadzil, F. H. B. (2014). The Measurements of Firm Performance's Dimensions. *Asian Journal of Finance & Accounting*, *6*(1), 24–29. https://doi.org/10.5296/ajfa.v6i1.4761

Al-Shubiri, F. N. (2013). The Impact of Value Added Intellectual Coefficient Components on Financial Health. *Review of International Comparative Management*, *14*(962), 459–472.

Andersen R. & McLean R. (2000). *Accounting for the Creation of Value*. Research Project sponsored by the Canadian Institute of Chartered Accountants.

Andriessen, D. & Tissen, R. (2000). *Weightless Wealth: Find Your Real Value in a Future of Intangible Assets*. London, United Kingdom: Financial Times Prentice-Hall.

Anuonye, N. B. (2016). Effect of Intellectual Capital on Return on Assets of Insurance Firms in Nigeria, *Global Journal of Management and Business Research: C Finance, 16*(1), 41-51.

Awan, M. A. S., & Sarfraz, N. (2013). The Impact of Human Capital on Company Performance and the Mediating Effect of Employee Satisfaction. *Journal of Business and Management*, *8*(2), 76–82.

Banker, R., Wattal, S., Liu, F. & Ou, C. (2008).Education, Research & Development and Firm Performance in Information Technology Industries: An Empirical Examination, Working Paper Series.

Baygi, B. M., Zolfani, H. S., Rezaeiniya, N. & Aghdaie, M. H. (2011).Using Fuzzy AHP to Develop Intellectual Capital Evaluation Model in Hotel Industry. *European Journal of Scientific Research*, *59*(2), 170-178.

Bani, M., Mehrpouyan, H., Keshavarziyan, M., & Rohani, M. (2014). Study of the Effect of Intellectual Capital Components and Firm Size. *Kuwait Chapter of Arabian Journal of Business and Management Review*, *3*(11), 212–220.

Bontis, N. (1996). *There's a Price on Your Head: Managing Intellectual Capital Strategically*.

Bontis, N. (1998). Intellectual Capital: An Exploratory Study that Develops Measures and Models. *Management Decision*, 36/2, pp. 63–76. http://dx.doi.org/10.1108/00251749810204142

Bontis, N., William, C. C. L., & Richardson, R. (2000). Intellectual Capital and Business Performance in Malaysian industries. *Journal of Intellectual Capital*, 1(1), 85–100. http://dx.doi.org/10.1108/14691930010324188

Bontis, N. (2001). Assessing Knowledge Assets: A Review of the Models used to Measure Intellectual Capital, *International Journal of Management Review*, 3(1), 41–60

Bouaziz, Z. (2016). The Impact of R and D Expenses on Firm Performance; Empirical Witness from the Bist Technology Index, *Journal of Business Theory and Practice, 4*(1), 51–60.

Brooking, A. (1996). *Intellectual Capital: Core Assets for the Third Millennium Enterprise*, Thompson Business Press, London.

Brooking, A. (1997). The Management of Intellectual Capital, *Long Range Planning*, 30(3), 364–365.

Budiandrioni, B., & Mahfudnurnajamuddin, M. (2014). The Influence of Intellectual Capital Components to Financial Performance and Value of the Firm Registered in Indonesia Stock Exchange. *Research in Applied Economics*, *6*(1), 216–224. https://doi.org/10.5296/rae.v6i1.5400

Castro, G.M., Lopez, E.N., Saez, P.L., Salazar, E.A., (2006). Organizational Capital as Competitive Advantage of the Firm, *Journal of Intellectual Capital 7*, 324–337.

Chang, W. S. (2010). The Different Proportion of IC Components and Firms' Market Performance; Evidence from Taiwan, *International Journal of Business and Finance Research, 4*(4), 121–134.

Chen, J., Zhu, Z. and Xie, H.Y. (2004). Measuring Intellectual Capital: a New Model and Empirical Study. *Journal of Intellectual Capital*, 5, 195–212.

Clarke, M., Seng, D., & Whiting, R. H. (2011). Intellectual Capital and Firm Performance in Australia. *Journal of Intellectual Capital*, *12*(4), 505–530. https://doi.org/10.1108/14691931111181706

Deep, R., & Narwal, K. P. (2014). Intellectual Capital and its Association with Financial Performance: A Study of Indian Textile Sector. *International Journal of Management and Business Research*, *4*(1), 43–54.

Deku, G. (2014). Impact of Human Capital Development on the Performance of Ghanian Road Contractors, *Kwame Nkrumah University of Science and Technology.*

Dogan, M. (2013). Does Firm Size Affect The Firm Profitability; Evidence from Turkey, *Research Journal of Finance and Accounting*, *4*(4), 53–60.

Emmanuel, O.S. (2012). Business Relational Capital and Firm Performance in South Western Nigerian Small Scale Enterprise Clusters, *European Journal of Business Management, 4(*17*), 207-215.*

Emadzadeh, Afzali, N., Bagheri, A., Rahimpoor, M., Ezadi, F., & Rahmani, M. (2013). Effect of Intellectual Capital on Firm Performance. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *3*(2), 98–103.

Ghaffar, A., & Khan, W. A. (2014). Impact of Research and Development on Firm Performance. *International Journal of Accounting and Financial Reporting*, *4*(1), 357–367. https://doi.org/10.5296/ijafr.v4i1.6087

Ghanei, H., & Kheibari, A. R. (2015). A Survey of the Relationship between Intellectual Capital and Firm Performance Criteria, *Journal of Scientific Research and Development, 2*(7), 280–284.

Gigante, G. (2013). Intellectual Capital and Bank Performance in Europe. *Accounting and Finance Research*, *2*(4), 120–129. https://doi.org/10.5430/afr.v2n4p120

Griffiths, W., & Jensen, P. (2005). The Effects on Firm Profits of the Stock of Intellectual Property Rights. *Intellectual Property Research Institute*, *Working Paper Series*. Retrieved from http://www.ipria.com/publications/wp/2005/IPRIAWP05.2005.pdf

Holienka, M., & Pilková, A. (2014). Impact of Intellectual Capital and its Components on Firm Performance before and after Crisis. *Electronic Journal of Knowledge Management*, *12*(4), 261–272.

Ibrahim, F. A., Shafiei, M. W. M., Ismail, R., & Said, I. (2012). Australian Journal of Business and Management Research. *Australian Journal of Business and Management Research*, *2*(8), 56–62.

International Accounting Standards Board (2004), Intangible Assets, IAS 38, International Accounting Standards Board, London.

Institute of Chartered Accountants of Nigeria-ICAN (2010). Study Park on Financial Reporting and Ethics, VI Publishing Limited, Nigeria.

Isanzua, J. (2015).Impact of Intellectual Capital on Financial Performance of Banks in Tanzania, *Journal of International Business Research and Marketing, 1(1).*

Iswati, S., & Anshori, M. (2007). The Influence of Intellectual Capital to Financial Performance at Insurance Companies in Jakarta Stock Exchange (JSE). *Proceedings of the 13th Asia Pacific Management Conference*, 1393–1399.

Jasour, J., Shagagi, F., & Rezazadeh, S. (2013). Impact of Intellectual Capital on Financial Performance in the Pharmaceutical Industry in Iran. *International Journal of Accounting and Economics Studies*, *1*(1), 1–8. https://doi.org/10.14419/ijaes.v1i1.771

Kamath, G. B. (2015). Impact of Intellectual Capital on Financial Performance and Market Valuation of Firms in India. *International Letters of Social and Humanistic Sciences*, *48*(1), 107–122. https://doi.org/10.18052/www.scipress.com/ILSHS.48.107

Kamukama, N., Ahiauzu, A. & Ntayi, J. M. (2010). Intellectual Capital and Financial Performance in Uganda's Microfinance Institutions. *African Journal of Accounting, Economics, Finance and Banking, 6*(6), 17–31.

Khanqah, V. T., Khosroshahi, M. A., & Ghanavati, E. (2012). An Empirical Investigation of the Impact of Intellectual Capital on Firms' Market Value and Financial Performance: Evidence from Iranian Companies. *International Journal of Management Business Research, 2*(1), 1–12.

Kehelwalatenna, S., Gunaratne, P. S. M., & Lanka, S. (2010). The Impact of Intellectual Capital on the Firm Performance and Investor Response: An Empirical Study of Selected Sectors in Colombo Stock.

Lev, B. & Zarowin, P. (1999). The Capitalization, Amortization and Value-Relevance of R&D. *Journal of Accounting and Economics*, 21, 107-138

Lev, B. (2001) *Intangibles: Management, and Reporting, Bookings Institution Press*, Washington, DC.

Low, J & Kallafut, P. C. (2002).Invisible Advantage: How Intangibles are Driving Business Performance, Perseus Publishing, Cambridge.

Luthy, D. H. (1998). *Intellectual Capital and its Measurement*. *Proceedings of the AsianPacific Interdisciplinary Research in Accounting Conference (APIRA*), Osaka, Japan.

Mehri, M., Umar, M. S., Saeidi, P., & Hekmat, R. K. (2017). Intellectual Capital and Firm Performance of High Intangible Intensive Industries: Malaysia Evidence, *9*(9), 146–155. https://doi.org/10.5539/ass.v9n9p146

Mohammadi, R., Sherafati, M. & Ismail, B. M. N. (2014). Factors Affecting Intellectual Capital and its Role in Financial Performance of Organization. *Indian Journal of Scientific Research,5*(1), 314–320.–

Miller, M., DuPont, B., Fera, V., Jeffrey, R., Mahon, B., Payer, B. and Starr, A. (1999). *Measuring and Reporting Intellectual Capital from a Diverse Canadian IndustryPerspective*, OECD Symposium Amsterdam, Holland.

Mosavi, S. A., Nekoueizadeh, S., & Ghaedi, M. (2012). A Study of Relations between Intellectual Capital Components, Market Value and Finance Performance. *African Journal of Business Management*, *6*(4), 1396–1403. https://doi.org/10.5897/AJBM11.1466

Nash, H.H. (1998). Accounting for the Future: Prospective Accounting Initiative. http://home.sprintmail.com/, humphreynash/indexback.htm.

Obińska-Wajda, E. (2016). The New Institutional Economic Main Theories. "e-Finanse" Financial Internet Quarterly, 12(1), 78–85. https://doi.org/10.14636/1734-039X

Ordonez de Pablos, P. (2003). Intellectual Capital Reporting in Spain a Comparative View. Journal of Intellectual capital, 4(1), 61-81.

Pandey, I. M. (2010). Financial Management, VIKAS Publishing House PVT Limited, New Delhi.

Pena, D.N., Ruiz, V.L. and Navarro J.A. (2012).A case study of control strategy based on intellectual capital management. African Journal of Business Management, 6(16), 5622-5632.

Pulic, A. (2000a). VAIC – an accounting tool for IC management. From http://www.measuringip. at/papers/hamggtxt.html

Pulic, A. (2000b). MVA and VAIC analysis of randomly selected companies from FTSE 250. From http://www.vaic-on.net/downloads/ftse30.pdf.

Rehman, W., Abdul-Rehman, C., Rehman, H. & Zahid, A. (2011). Intellectual Capital Performance and its Impact on Corporate Performance: An Empirical Evidence from Modaraba Sector of Pakistan. Australian Journal of Business and Management Research, 1(5), 8–16.

Rehman, W., Asghar, N. & Rehman, H. (2013). Intellectual Capital Efficiency and Financial Performance of Insurance Sector in Pakistan: A Panel Data Analysis, Middle-East Journal of Scientific Research, 17(9), 1251-1259. https://doi.org/10.5829/idosi.mejsr.2013.17.09.12285

Salman, R. T., Tayib, M., Mansor, M., & Babatunde, A. D. (2012). Impact of Intellectual Capital on Return on Asset in Nigerian Manufacturing Companies. Interdisciplinary Journal of Research in Business, 2(4), 21–30.

Santos, J. B. & Brita, L. A. D. (2012). Toward a Subjective Measurement Model for Firm Performance. Brazilian Administration Review, 9(6), 95–117.

Sharabati, A.A.A., Jawad, S. N. & Bontis, N. (2010). Intellectual Capital and Business Performance in the Pharmaceutical Sector of Jordan. Management Decision, 48(1), 105–131. https://doi.org/10.1108/00251741011014481

SPRING Singapore. (2011). A Guide to Productivity Measurement. A Guide to Productivity Measurement, 3–29. Retrieved from https://www.spring.gov.sg/Resources/Documents/Guidebook_Productivity_Measurement.pdf

Stewart, T. A. 1997. Intellectual Capital, the New Wealth of Organizations. Nicholas Brealey Publishing: London.

Sullivan, P. H. 2000. Value-Driven Intellectual Capital: How to Convert Intangible Corporate Assets into Market Value. Canada: John Wiley and Sons.

Tharmila, K., & Arulvel, K. K. (2013). The Impact of the Capital Structure and Financial Performanceξ A Study of the Listed Companies traded in Colombo Stock Exchange. Merit Research Journal of Accounting, Auditing, Economics and Finance,1(5), 106–117.

Thompson, P. (2001). The Microeconomics of an R&D-Based Model of Endogenous Growth, Journal of Economic Growth, 6,263-283.

Thumm, N. (2000). Intellectual Property Rights: National Systems and Harmonisation in Europe, Springer-Verlag, Berlin Heidelberg GmbH, 31-43.

Uadiale, O. M., & Uwalomwa, U. (2011). Intellectual Capital and Business Performance: Evidence from Nigeria. Interdisciplinary Journal of Research in Business, 1(10), 49–56.

Umar, G., Emmanuel, O., Emmanuel, T. & Oluseyi, A. (2013). Empirical Study of Training and Development as a Tool for Organizational Performance: Case Study of Selected Banks in Nigeria. Kuwait Chapter of Arabian Journal of Business Management Review, 2(10), 78-87.

Venugopal, D. (2010). Impact of Intellectual Capital on Corporate. Joint International Conference on Technology, Innovation and Industrial Management, Italy, 675–687.

Wang, M. (2011). Measuring Intellectual Capital and its Effect on Financial Performance: Evidence from the Capital Market in Taiwan. Frontiers of Business Research in China, 5(2), 243–265. https://doi.org/10.1007/s11782-011-0130-7

Zadeh, E., Afzali, N., Bagheri, A., Rahimpoor, M., Ezadi, F. & Rahmani, M. (2013).Effect of Intellectual Capital on Firm Performance, International Journal of Academic Research in Accounting, Finance and Management Sciences, 3(2), 98-103.

Zia ul haq, M., Sabir, M. H., Arshad, S. S., A., & Latif, B. (2014). VAIC and Firm Performance: Banking Sector of Pakistan. Information and Knowledge Management, 3(4), 100–107.

Zambon, S. (2002).Accounting, Intangibles and Intellectual Capital: An Overview of the Issues and some Considerations, PRISM Project, University of Ferrara.

Zehri, C., Abdelbaki, A. & Bouabdellah, N. (2012).How Intellectual Capital Affects a Firm's Performanceξ Australian Journal of Business and Management Research, 2(8), 24-31.

APPENDIX:

DESCRIPTIVE STATISTICS: STRUCTURAL CAPITAL AND PERFORMANCE

```
. tabstat va ipr fsize, statistics( mean min max median sd skewness kurtosis )

   stats |        va     ipr     fsize
---------+------------------------------
    mean |  28.78606  .4538882  102.4348
     min | -1.111131   .001598  10.13941
     max |  127.9538  1.962124  482.6033
     p50 |   14.5893   .301173  70.96574
      sd |  32.98029   .471799  105.8857
skewness |  1.735271  1.365173  1.677572
kurtosis |    5.2675  4.380642  5.103442
----------------------------------------
```

NORMALITY TEST: STRUCTURAL CAPITAL AND PERFORMANCE

```
. sktest va ebenefit estock rec pay equity ipr fsize

                    Skewness/Kurtosis tests for Normality
                                                      ----- joint ------
   Variable |    Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)    Prob>chi2
------------+-------------------------------------------------------------
         va |     81      0.0000         0.0042        25.41         0.0000
        ipr |     58      0.0001         0.0426        14.58         0.0007
      fsize |     83      0.0000         0.0056        24.68         0.0000
```

STRUCTURAL CAPITAL AND PERFORMANCE

```
. correlate va   ipr  fsize
(obs=56)

             |       va      ipr    fsize
-------------+---------------------------
          va |   1.0000
         ipr |   0.2027   1.0000
       fsize |   0.8641   0.1829   1.0000


. regress va ipr  fsize

     Source |       SS       df       MS              Number of obs =      56
------------+------------------------------          F(  2,    53) =   78.99
      Model |  52618.3654     2  26309.1827           Prob > F      =  0.0000
   Residual |  17652.6033    53  333.067987         R-squared     = 0.7488

------------+------------------------------          Adj R-squared = 0.7393
      Total |  70270.9688    55  1277.65398           Root MSE      =  18.25

------------------------------------------------------------------------------
         va |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
        ipr |   3.459055   5.233588     0.66   0.512    -7.038193     13.9563
      fsize |   .2513682   .0205716    12.22   0.000     .2101067    .2926296
      _cons |   .5137923   3.977167     0.13   0.898    -7.463395     8.49098
------------------------------------------------------------------------------

. estat vif
```

```
    Variable |       VIF       1/VIF
-------------+----------------------
       fsize |      1.03    0.966563
         ipr |      1.03    0.966563
-------------+----------------------
    Mean VIF |      1.03


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of va

         chi2(1)      =    58.57
         Prob > chi2  =   0.0000


. rreg va ipr fsize

   Huber iteration 1:  maximum difference in weights = .89901506
   Huber iteration 2:  maximum difference in weights = .28508697
   Huber iteration 3:  maximum difference in weights = .11778433
   Huber iteration 4:  maximum difference in weights = .02017464
Biweight iteration 5:  maximum difference in weights = .29405411
Biweight iteration 6:  maximum difference in weights = .1494391
Biweight iteration 7:  maximum difference in weights = .07712247
Biweight iteration 8:  maximum difference in weights = .0322938
Biweight iteration 9:  maximum difference in weights = .08850544
Biweight iteration 10:  maximum difference in weights = .15543771
Biweight iteration 11:  maximum difference in weights = .1434866
Biweight iteration 12:  maximum difference in weights = .44280611
Biweight iteration 13:  maximum difference in weights = .40417407
Biweight iteration 14:  maximum difference in weights = .40415182
Biweight iteration 15:  maximum difference in weights = .32318721
Biweight iteration 16:  maximum difference in weights = .09640538
Biweight iteration 17:  maximum difference in weights = .02079896
Biweight iteration 18:  maximum difference in weights = .00501981

Robust regression                                   Number of obs =      56
                                                    F(  2,    53) =  644.11
                                                    Prob > F      =  0.0000

------------------------------------------------------------------------------
          va |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ipr |   3.114561   1.138049     2.74   0.008     .8319248    5.397197
       fsize |   .1551506   .0044733    34.68   0.000     .1461783     .164123
       _cons |   2.727182   .8648387     3.15   0.003      .992535    4.461829
------------------------------------------------------------------------------

. xtset id year
       panel variable:  id (strongly balanced)
        time variable:  year, 2012 to 2017
                delta:  1 unit

. xtreg va ipr fsize, fe
```

```
Fixed-effects (within) regression               Number of obs      =        56
Group variable: id                              Number of groups   =        13

R-sq:  within  = 0.4005                         Obs per group: min =         1
     between = 0.7495                                        avg =       4.3
     overall = 0.7062                                        max =         6

                                                F(2,41)            =     13.70
corr(u_i, Xb)  = 0.6558                         Prob > F           =    0.0000

------------------------------------------------------------------------------
          va |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ipr |  -5.578031    4.50817    -1.24   0.223    -14.68247    3.526404
       fsize |   .1171178   .0271617     4.31   0.000     .0622636    .1719719
       _cons |   20.98732    4.57564     4.59   0.000     11.74663    30.22801
-------------+----------------------------------------------------------------
     sigma_u |   22.24753
     sigma_e |  6.8626806
         rho |  .91311415   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 41) =    27.82                 Prob > F = 0.0000

. estimates store fixed


. xtreg va ipr fsize, re

Random-effects GLS regression                   Number of obs      =        56
Group variable: id                              Number of groups   =        13

R-sq:  within  = 0.3899                         Obs per group: min =         1
      between = 0.7660                                        avg =       4.3
     overall = 0.7403                                         max =         6

                                                Wald chi2(2)       =     47.57
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
          va |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ipr |  -2.187984   4.305065    -0.51   0.611    -10.62576    6.249788
       fsize |   .1582395   .0241881     6.54   0.000     .1108317    .2056474
       _cons |   13.75127   6.116952     2.25   0.025     1.762269    25.74028
-------------+----------------------------------------------------------------
     sigma_u |  16.256774
     sigma_e |  6.8626806
         rho |  .84874905   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimates store random


. hausman fixed random

                 ---- Coefficients ----
```

```
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
         ipr |   -5.578031    -2.187984       -3.390046        1.337915
       fsize |    .1171178     .1582395       -.0411218        .0123569
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        4.64
                Prob>chi2 =      0.0984
                (V_b-V_B is not positive definite)



xtgls va ipr fsize, panel (hetero) corr (ar1)
(note: 3 observations dropped because only 1 obs in group)
Cross-sectional time-series FGLS regression
Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.3116)
Estimated covariances      =        10       Number of obs        =        53
Estimated autocorrelations =         1       Number of groups     =        10
Estimated coefficients     =         3       Obs per group: min   =         3
                                                           avg    =       5.3
                                                           max    =         6
                                             Wald chi2(2)         =    262.56
                                             Prob > chi2          =    0.0000
------------------------------------------------------------------------------
           a |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ipr |   4.566799   1.241727     3.68   0.000     2.133059    7.000539
       fsize |   .2272951   .0144995    15.68   0.000     .1988766    .2557136
       _cons |   .4806421   .3253854     1.48   0.140    -.1571016    1.118386
------------------------------------------------------------------------------
```

DATA FOR VARIABLES

YEAR	Id	VA	IPR	FSIZE
2012	1	7.876575000		77.449018000
2013	1	-0.464926000		75.481540000
2014	1	-0.742351000		54.801489000
2015	1	-1.111131000		49.354982000
2016	1	19.898188000		79.979982000
2017	1	34.102667000	0.239218000	129.357118000
2012	2	20.064607000		83.051450000
2013	2	22.137719000	0.301711000	83.159877000
2014	2	20.963026000	0.263885000	92.801302000
2015	2	25.541188000	0.136571000	102.232144000
2016	2	29.937690000	0.012753000	178.381640000
2017	2	60.986417000	0.002564000	195.080449000
2012	3	46.641358000	0.679792000	102.534172000
2013	3	40.102595000	0.578771000	121.060621000
2014	3	36.512939000	0.608138000	132.328273000
2015	3	40.466106000	0.942887000	122.246632000
2016	3	27.017425000	1.708807000	136.992444000
2017	3	32.943833000	1.364420000	146.038216000
2012	4	5.325356000		10.689542000
2013	4	5.494730000		11.431167000
2014	4	4.739209000	0.234993000	12.555885000
2015	4	5.400862000	0.141184000	16.294826000
2016	4	6.286251000	0.047374000	24.603267000
2017	4	11.438062000		30.123247000
2012	5	43.921319000	0.026347000	88.963218000
2013	5	48.449104000		108.207480000
2014	5	52.203248000		106.062067000
2015	5	58.924411000		119.215053000
2016	5	69.206858000		169.585932000
2017	5	91.181900000		146.804128000
2012	6	127.953812000	0.890878000	253.633629000
2013	6	116.509322000	0.697975000	252.759633000
2014	6	118.430536000	0.673757000	349.229163000
2015	6	127.071588000	0.524251000	358.218676000
2016	6	112.428952000	0.548129000	367.146468000
2017	6	126.560289000	0.506247000	382.228093000
2012	7	13.765161000		64.406797000
2013	7	15.911240000		72.296420000
2014	7	15.878513000		70.965735000
2015	7	15.826290000		67.387914000
2016	7	13.338694000		74.430174000
2017	7	13.975886000	1.017337000	90.087525000
2012	8	15.382384000	1.962124000	36.497624000
2013	8	14.996567000	1.627836000	43.754114000
2014	8	13.737531000	1.398037000	45.736255000
2015	8	13.379513000	1.168581000	50.172484000

2016	8	16.637122000	0.940124000	72.491309000
2017	8	25.409792000	0.705890000	121.084365000
2012	9	12.092405000	0.054636000	40.156508000
2013	9	14.589302000	0.011693000	43.172624000
2014	9	8.958360000	0.342076000	28.111286000
2015	9	8.842980000	0.283218000	28.417005000
2016	9	6.643311000	0.397439000	28.409000000
2017	9	6.431980000	0.300635000	28.423122000
2012	10	31.467708000	0.520868000	232.578054000
2013	10	46.689129000	0.672908000	280.137992000
2014	10	51.827365000	0.554905000	296.561247000
2015	10	57.387200000	0.496248000	343.260830000
2016	10	63.908073000	0.735330000	345.348326000
2017	10	73.969895000	0.208370000	482.603257000
2013	11	6.283443000	0.024765000	23.036762000
2014	11	6.953109000	0.022444000	24.370540000
2015	11	7.677724000	0.054383000	30.171590000
2016	11	10.039958000	0.054923000	33.482106000
2017	11	10.286277000	0.045738000	44.962735000
2012	12		0.169024000	28.006505000
2013	12		0.303296000	32.663299000
2014	12	10.307634000	0.147933000	49.818490000
2015	12	7.690837000	0.183581000	55.477999000
2016	12	34.039910000	0.192566000	83.161837000
2017	12	14.009229000	0.370234000	98.324096000
2012	13	2.412961000	0.001508000	10.591638000
2013	13	2.461210000	0.036326000	10.139408000
2014	13	2.669062000	0.041293000	11.913500000
2015	13	3.186567000	0.050575000	12.849555000
2016	13	2.919870000	0.050763000	13.269399000
2017	13	3.541344000	0.047166000	13.410672000