INTANGIBLE ASSETS DISCLOSURES AND MARKET VALUE ADDED OF ICT FIRMS IN NIGERIA

By

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ABSTRACT

This study evaluates the effect of intangible asset on market value added of listed ICT firms in Nigeria from 2011 to 2019. The independent variables of interest which are employed in other to ascertain the possible effect on market value added include; technology based intangible assets, market related intangible assets and human capital efficiency. To test the hypotheses the researcher adopts the hierarchical regression technique. The results from the study reveal that market related and technology-based intangible assets have positive significant effects on market value added, while human efficiency has insignificant effect on market value added of ICT firms in Nigeria. The author concludes that intangible assets have significant effects on market value added of ICT firms in Nigeria and that a company maximizes its value by investing and disclosing intangible assets in the financial statements. It is recommended that management of ICT firms should update their present policy frameworks on intangible assets in order to take into account their value relevance especially with respect to the valuation of their companies.

Keywords: intangible assets, Market value added, human capital efficiency, Patent, Trademark, Technology-based, Market-based.

INTRODUCTION

Intangible assets are becoming an increasingly important part of companies' assets. Nakamura (2010) points out that expenditure on intangible assets have risen from roughly 4% of US GDP in 1977 to 9-10% in 2006. The proportion of intangible assets to total fixed assets as reported by the US companies increased from around 5% in 1978 to 75-85% at present (Svoboda et.al., 2017). Intangible assets have received increasing recognition because of the significant role they play in the valuation of companies. Uford (2017) emphasized on the importance of measuring the worth of a business' intangible assets, which is being captured from the assessment of its brand equity. Most intangible assets have not been reflected on the statement of financial position because they are not identifiable. According to IAS 38, an intangible asset is identifiable if it is separable, that is, it could be rented or sold separately. However, during the last three decades knowledge assets have been increasingly recognized as key sources of firm's competitive advantage. In addition, many authors have used the value of most intangible assets to explain the difference between the market value and the book value of firm's equity. Although traditional intangible assets, such as research and development (R&D), goodwill, are recognized in the annual accounts of firms, other internally generated intangible assets are not recognized even though they create important and crucial value for the organization. According to the Standard, the cost of internally generated intangible assets should be only costs that can be

directly attributed or allocated on a reasonable and consistent basis to creating, producing or preparing the assets for its intended use.

Today's economy is driven primarily by creation and manipulation of intangible assets that are a key factor for development and success of organizations competing in the economic and technological context. From a managerial approach, intangibles represent strategic assets that give and sustain competitive advantages for the companies. While from an economic approach, intangibles have become the main instigator of value creation and company's growth in the future. The value relevance of a financial item is ability to verify or change investors' expectations about the firm's value. Therefore, if the stock is popular among investors, the market prices should indicate a summary of collective expectations of investors about firm value.

Market Value Added (MVA) represents the value added to shares over their book values. MVA informs how much value a shareholder has added to his wealth, which he has invested in the share capital of the company. Accordingly, a company with an objective of enhancing the shareholders' wealth would attempt to capitalize on its MVA. Without prejudice, it is believed that a company increases its value if driven by a growth strategy whose guidelines are included in the strategic plan. By focusing systematically on strategic decision-making, such planning helps management allocate corporate resources to their most productive and profitable use. It is commonly assumed that the market value of the company's shares will increase as the plan materializes, thus creating value for shareholders.

Nigeria has been considered among the developing countries characterized by tangible-based economy. Consequently, Nigerian information and communication technology (ICT) companies are less competitive internationally. Nevertheless, the available data about intangibles in Nigerian ICT companies, and their contribution in value creation are insufficient. In addition, Nigerian accounting practices have known a revolutionary change since January, 2012 after the adoption of International Financial Reporting Standards (IFRS). As a result, the accounting of intangibles in Nigeria after 2012 has become similar with the international community due to IFRS recommendations. There have been some researches on intangible assets and most of these researches are not empirical in nature. Those that are empirical focused on the methods of valuation of intangibles, others focused on non ICT firms, while studies used other measures of firms' value added. Some few studies on the ICT sectors are conducted outside Nigeria with different legal framework and sophisticated accounting system. Hence the effect of intangible assets on the market value added of ICT firms in Nigeria could not really be ascertained. It is as a result of this literature gap that this research work is undertaken.

1.1 LITERATURE REVIEW

Market value added was firstly, introduced by Simerly *et al*. in 1995, and it is defined as the difference between the current market value of the firm and the capital contributed by investors. It is a financial metrics that measures the capital that investors have contributed to a company in excess of the market value of the company. MVA is a vital concept that investors use to guage how well the company has been using its capital. A positive MVA means added value in the company while negative MVA indicates destroyed value. A negative MVA signals the investors that the company is not using its capital effectively or efficiently. This is a mixed measure because it combines both market and account values. Bharadwaj *et al*. (1999) suggest that standard accounting measures of performance, such as (ROA) return on assets, lack in their ability to evaluate the future profit potential of such practices. To overcome these limitations

some studies, consider the market value added and economic market value as key variables of research.

IAS 38 defines intangible asset as identifiable non-monetary asset without physical substance and that the asset must be controlled by the entity as a result of past events, and something from which the entity expects future economic benefits to flow. Lev (2001) notes that 'an intangible asset is a claim to future benefits that does not have physical or financial (a stock or a bond) embodiment'. He added that intangible assets are sources of value generated by innovation, unique organizational designs, or human resources practices. They often interact with tangible and financial assets to create corporate value and economic growth. Intangible assets consist of the stock of immaterial resources that affects the production process and are necessary to the creation and sale of new or improved products and processes. They include both internally produced assets such as designs, blueprints, brand equity, in-house software, and construction projects; and assets acquired through external market such as technology licenses, patents and copyrights, and the economic competences acquired through purchases of management and consulting services (Corrado, Hulten & Sichel, 2006).

Market related intangible assets help promote the company's goods or services. Market-related intangible asset in this study is represented by trademark. These assets are unique signs, symbols, or names the company uses to create a brand or unique image. A trademark is "a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise" (World Intellectual Property Organization (WIPO), 2011). Trademarks are most commonly filed in the form of a logo, symbol, name or phrase, but they can also be filed as a specific color, sound, smell or a combination of these factors. Most importantly, a trademark should be distinctive, i.e., it should not confuse consumers by being too identical or similar to an already granted trademark (Saddam,*et al*., 2021). The primary motivation behind filing a trademark is the ability to distinguish a firm's products or services from the competition. Through a trademarked brand name, consumers are able to identify the products that are offered by a specific firm..

Technology based intangible asset refers to copyrights on technical materials such as patent, computer software, technical manuals, and automated databases. A patent is the legal right of an inventor to exclude others from making or using a particular invention. This right is customarily limited in time, to 20 years from the date of the application submission in most countries. The principle behind the modern patent is that an inventor is allowed a limited amount of time to exclude others from supplying or using an invention in order to encourage inventive activity by preventing immediate imitation. In return, the inventor is required to make the description and implementation of the invention public rather than keeping it secret, allowing others to build more easily on the knowledge contained in his invention. The advantage of patent data is that they are available in great detail over a wide range of time periods, geographic areas, and technological sectors (Hintzman *et al*., 2021). Nevertheless, all patents are not equal, and it is important to understand the operation of patent systems throughout their history in order to make effective use of these data.

The contributions of the human capital of an organization is very important because it's the skills, competency and knowledge possessed by the human capital, and the efficient management of such, that will determine how other resources of the organization will be utilized to achieve organizational goals and objectives. Therefore, the human element is very crucial in determining

corporate performance. Murat and Derya, (2019) define human capital as employee's competence in creating both tangible and intangible assets by contributing in the continuous generation of knowledge and ideas. According to Kimouche (2019) human capital is defined as "the energies, skills, talents and knowledge of people which are, or which potentially can be applied to the production of goods or rendering useful services. Cater and Cater (2009) identify human capital to include "innovation, capacity, creativity, know-how and previous experience, teamwork capacity, employee flexibility, tolerance for ambiguity, motivation, satisfaction, learning capacity, loyalty, formal training and education." Lev (2001) explains that the knowledge held by employees are the primary source of value creation so therefore employees' expenses should be seen as investments rather than costs.

2.1. Theoretical Framework

This work is supported by two major theories which are Human Capital Theory and Resource Based Theory of the firm. The human capital theory is attributed to Schultz, (1961). The significance of this theory is that it regards people as assets and stresses that investment by organizations in people will generate worthwhile returns. It proposes that sustainable competitive advantage is attained when the firm has a human resource pool that cannot be imitated or substituted by its rivals. Human capital has been pivotal also in explanations of inter-individual earning differences as well as in analyses of causes of growth and development of regions and nations. Human capital theory has also been extensively used by and applied at other theories of economics and social sciences and has demonstrated impressive fecundity as a premise contributing to rendering other research programs more convincing and closer to realities (Bowman, 1980). Thus this theory supports human capital as the main source of competitive advantage that maximizes the value of the firm.

The knowledge-based literature of the firm fosters and develops the Resource-Based Theory (RBT) in that it considers knowledge to be the most complex of an organization's resources (Barney, 1991). According to resource-based theory, the intangible assets are the main resource to improve enterprise growth. The resource-based theory posits that all important resources that drive a firm's competitive advantage and ultimate market performance should be recognized and their contributions measured (Barney, 2018 cited in Inseng & Uford, 2019). According to RBT, sustainable competitive advantage results from resources that are inimitable, not substitutable, tacit in nature, and synergistic (Barney, 1991). Therefore, managers need to be able to identify the key resources and drivers of performance and value in their organizations. The RBT also states that a company's competitive advantage is derived from the company's ability to assemble and exploit an appropriate combination of resources. Such resources can be tangible or intangible, and represent the inputs into a firm's production process; such as capital, equipment, the skills of individual employees, patents, financing, and talented managers. Thus RBT supports intangible assets as resources that are inimitable, not substitutable, tacit in nature, and synergistic and fosters sustainable advantage

1.2 Empirical Framework

Nnado and Ozouli (2021) try to ascertain the impact of total intangible assets on the financial performance of manufacturing firms publicly listed on the Nigerian Stock Exchange (NSE). The study uses secondary data collected and collated from 46 manufacturing firms audited annual reports. Both descriptive and inferential statistics are employed in data analysis.

In particular, Prais Winsten Regression Correlated Panels Corrected Standard Errors (PCSEs) is used to test the relationship between the variables given that panel cross-sectional and time series data are used for the study. Findings indicate the existence of a strong negative relationship between EVA and IA as $P = 0.011 < 0.05$ significant level. In addition, there is a significant negative relation between EVA and LnTA at $P = 0.026$. These results explain the behavior of firms in minimizing the value of intangible assets given that the relationship between intangible assets and financial performance proxied by EVA is very significant and negative.

Hintzman et.al. (2021) examine the contribution to labor productivity growth in the manufacturing sector of investment in different intangible asset categories—computerized information, innovative property, and economic competencies—for a set of 18 European countries between 1995 and 2017, as well as whether this contribution varies between different groups of countries. The main findings can be summarized as follows. Firstly, all the three different categories of intangible assets contribute to labor productivity growth. Secondly, splitting the sample of European Union (EU) member states into three groups—northern, central and southern Europe—allows for the identification of a significant differentiated behavior between and within groups, in terms of the effects of investment in intangible assets on labor productivity growth. They conclude that measures promoting investment in intangibles at EU level should be accompanied by specific measures focusing on each country's needs, for the purpose of promoting labor productivity growth.

Maliko, et.al (2019) study the impact of intangible assets (IAs) and the difference between the market value and the book value of a company in the food sector after a business combination. The degree of Intangibility (GI) of the company was calculated, before and after adjustment of the IAs, whose record in the normal course would be prohibited by current standards. The intangibility degree means that in the market vision the company worth more than 14 times its book value. When considered disclosed value of internally generated intangible assets the new GI reduced by more than 12 times, to 1.83, demonstrating that the absence of identifiable IAs generated internally impacts substantially on the difference between the book value and the market value of the company . As a result of this research the researchers conclude that the records of identifiable IAs would bring greater uniformity of numbers of financial statements in relation to the perception and assessment of the market.

Kimouche (2019) evaluates whether intangible assets reported in financial statements explain the market valuation of Algerian listed companies and whether they affect the explanatory power of accounting information expressed by the company's book value. The methodology consists of testing the associations of companies' market values with their book values and intangible assets, based on *Ohlson*'s model and depending on Pooled regression. The study includes all Algerian listed companies during the period of 2005 to 2018, using their financial statements available in the COSOB's database, and stock prices published in the SGBV's database. The results indicate that the book values of Algerian listed companies affect the market values of companies and explain their variability, but the explanatory power is weak. They observe that intangible assets are not value relevant, do not have any incremental value relevance, cannot explain the variability of market values of Algerian listed companies and they do not affect the explanatory power of accounting information. The results suggest a failure of accounting information to explain the market valuation of Algerian listed companies.

Marat and Derya (2019) explore the effect of intangible assets and sub-components of intangible assets on sustainable growth and firm value in Turkey. The cumulative (i.e., aggregative) value of intangible assets of firms and sub-components of intangible assets are used as test variables in the current study. Further, intangible assets of the firms were divided into

three sub-components using the classification of Corrado, Hulten and Sichel, namely computerized information and database, innovative property, and economic competence. Firms listed on Borsa ˙Istanbul were analyzed to test the hypotheses. Two different measures of sustainable growth of firms and unique measure of firm value were used as dependent variables. The final sample includes 1353 observations for nine years (2005 – 2013) in Turkey. Ordinary least square (OLS) and Heckman two-stage estimation procedures were employed to test the hypotheses. Estimation results of OLS and Heckman two-stage procedures show that the cumulative value of intangible assets, affect the sustainable growth rates of firms and firm value positively. When the cumulative value of intangible assets was classified into three sub-components, both computerized information and database and economic competence impact the sustainable growth rates of firms and firm value.

Mehdi, Mohammed and Mohammad (2012) analyze the effect of intangible assets on market value in Metals industry of Tehran Stock Exchange. Therefore, financial information of mentioned test case companies were collected from year 2001 to 2011. Pooled/Panel regression method and F-Limer, Hausman and Levin Lin Chu tests are used to analyze the data. Test results show that reported intangible assets have significant positive relation with market value in Tehran Stock Exchange as in Metals industry of Tehran Stock Exchange. It seems an increase in intangible assets leads to an increase in market value of company in this industry. Also, result shows that there is positive and meaningful relation between abnormal earnings and market value in Metals industry of Tehran Stock Exchange.

In the context of signaling theory, "Deng *et al.* (1999) emphasized the role of intangibles in the future performance of companies. They found that intangible investments increase future earnings, which determine the market value of the company, so a correlation can be expected between market prices and intangible investments, as well as a positive correlation between market returns and growth in intangible investments. Therefore, when selecting and applying accounting policies, managers can use accounting choices of intangibles to send desired signals towards the financial market. According to "Dumontier"35, accounting choices adopted by managers conveyed signals about the company to investors, so the capitalization of intangibles, their depreciation or impairment is assumed to reflect managers' expectations and increase the value relevance of accounting information.

3.0 RESEARCH METHODOLOGY

This study adopts ex post facto research design because the study used secondary data sourced from the sampled companies' financial statements. In this study, the population is made up of all ICT companies that are listed on the floor of the Nigerian Stock Exchange for the period between 2011 and 2019. As at 31st December, 2019 the total number of listed ICT companies was nine. Based on this size the whole population is studied and the sampling technique is census. The Spearman Ranked correlation analysis is adopted in the data analysis. The model used in this work is specified below:

Market value added (MVA) = *f* (Intangible assets)

MVA = *f* (Market related intangible assets, technology based intangible assets, human capital efficiency).

$MVA = \alpha + \beta 1mktasset + \beta 2techasset + \beta 3hce + e$

Where:

MVA = market value added
α = Intercept
β1 – β3 = Coefficients
mkt_asset = Market related intangible asset
tech_asset = Technology based intangible assets
hce = Human capital efficiency
e = Error Term

Variable	Measurement	Source
Dependent		
Market Value Added	MVA is measured as share price multiplied by outstanding shares	Parker and Van Praag, 2006
Independent Variables		
Market related intangible Asset	Market related intangible asset is expressed as the natural log of Goodwill Value	Adam and Mehran, 2003; Bonn, 2004
Technology based intangible assets	Technology based intangible asset is expresses as the natural log of the value of Software.	Carlsson, 2001
Human Capital Efficiency (HCE)	$\frac{\text{Net Operating Profit}}{\text{Number of Staffs}}$	Tarus, and Sitienei, 2015

4.0 DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Data presentation and analysis

The study evaluates the effect of intangible assets on market value added in Nigeria drawing samples from ICT firms listed on the Nigerian Stock Exchange market. While market value added is the dependent variable, the independent variables that is employed for this study includes: market related intangible asset, technology based intangible asset and human capital efficiency. The data set span through a 9 year period (2011 – 2019).

Table 4.1 Descriptive Statistics

years	mva	mkt_as~t	tech_a~t	hce
2011	3.673333	2.805	1.676667	3.921667
	3.071681	1.412215	.7979641	2.945617
	.56	1.22	.32	1.08
	8.59	4.48	2.66	9.56
	6	6	6	6
2012	3.278333	2.643333	1.641667	3.433333
	3.084454	1.517797	.9447416	1.678507
	.56	1.1	.44	1.54
	8.26	4.86	2.99	6.48
	6	6	6	6
2013	5.035	2.358333	1.751667	3.056667
	3.938714	.5865635	1.357062	1.106791
	.66	1.81	.21	1.76
	11.5	3.24	3.59	4.81
	6	6	6	6
2014	5.011429	1.875714	1.847143	2.918571
	4.413878	.8769808	.8650185	.8144002
	.8	.32	.17	1.77
	13.1	2.63	2.86	3.87
	7	7	7	7
2015	3.667143	1.767143	2.128571	2.852857
	2.409853	.8827554	.8934657	1.019292
	.55	.42	.52	1.63
	6.04	2.83	3.3	4.56
	7	7	7	7
2016	3.067143	2.371429	2.48	2.682857
	2.157937	1.365814	.75516	1.076982
	.57	.24	1.2	1.2
	6.69	3.49	3.48	4.68
	7	7	7	7
2017	3.422857	2.505714	2.944286	2.758571
	2.619413	1.097465	.7719425	1.105297
	.56	.9	1.89	1.42
	7.42	3.73	4	4.74
	7	7	7	7
2018	3.587143	2.538571	3.33	3.041429
	3.148109	1.208104	1.042705	1.521922
	.44	1.14	1.8	1.59
	8.14	4.18	4.65	6.29
	7	7	7	7
2019	3.944444	2.728889	2.557778	3.358889
	3.689096	1.472094	1.627727	1.421904
	.22	.6	.21	1.8
	10.9	4.86	4.7	5.76
	9	9	9	9
Total	3.850161	2.400161	2.299194	3.104516
	3.10441	1.175452	1.147941	1.438445
	.22	.24	.17	1.08
	13.1	4.86	4.7	9.56
	62	62	62	62

From the descriptive statistics in table 4.1 above, it is observed that on the average market value added increased from 3.28 in the year 2012 to 5.04 in the year 2013, 5.01 in the year 2014. However, there was an 8% increase in market value added between 2011 and 2019. Market related intangible asset decreased on the average from 2.81 in the year 2011 to 2.64 in the year 2012, 2.36 in the year 2013, 1.88 in the year 2014, 1.78 in the year 2015. However, a slight increase is observed in the year 2016 (2.37), year 2017 (2.51), year 2018 (2.54) and the year 2019 (2.73) when compared to year 2015 (1.78). For the variable of technology based intangible asset, it observed that on the average in the year 2018 (3.33) more of the firms in the sample used technology compared to other years. Furthermore, it is observed that on the average, there was a 52% increase in technology based intangible asset. Human capital efficiency decreased from 3.92 in the year 2011 to 3.43 in the year 2012, 3.06 in the year 2013, 2.92 in the year 2014, 2.85 in the year 2015, 2.68 in the year 2016, 2.76 in the year 2017, 3.04 in the year 2018 and 3.36 in the year 2019.

Table 4.2
Shapiro Wilk Test for Data Normality

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
mva	62	0.90887	5.085	3.512	0.00022
mkt_asset	62	0.98178	1.017	0.036	0.48549
tech_asset	62	0.97578	1.351	0.650	0.25776
hce	62	0.85648	8.009	4.493	0.00000

Source: STATA'16 Output (2021)

From the results obtained in table 4.2, we find that both the dependent variable of market value added (MVA, Prob>z 0.00022) and the independent variables of human capital efficiency (HCE, Prob>z 0.00000) are not normally distributed. However, it is observed that the independent variables of market related intangible assets (MKT_ASSET, Prob>z 0.48549) and technology based intangible assets (TECH_ASSET, Prob>z 0.25776) are normally distributed. This is obtained from the probability z statistics revealed in the table 4.2.

Table 4.3
Pearson Test for Correlation

Key
rho *Number of obs* *Sig. level*

	mva	mkt_as~t	tech_a~t	hce
mva	1.0000 62			
mkt_asset	0.4902 62 0.0001	1.0000 62		
tech_asset	0.2743 62 0.0310	0.2713 62 0.0330	1.0000 62	
hce	-0.0162 62 0.9003	-0.1691 62 0.1889	-0.1607 62 0.2121	1.0000 62

Source: STATA'16 Output (2021)

In table 4.3, the analysis from the spearman rank correlation shows that market related intangible asset (0.4902) and technology based intangible asset (0.2743) are all positively correlated to the dependent variable of market value added, while human capital efficiency (-0.0162) is negatively correlated. However, it is observed that all the associations are seen to be weak (not up to 0.8) hence there is no room to suspect the presence of multicollinearity in the estimated model.

Regression Analysis

The researcher follows the study of McManus (2011) who noted that General Linear Model is the foundation of linear panel model estimation. The Ordinary Least Square (OLS) estimator is consistent when the regressors are exogenous and optimal in the class of linear unbiased estimators when the errors are homoscedastic and serially uncorrelated. Under these conditions, the method of Least Squares provides minimum-variance mean-unbiased estimation when the errors have finite variances. Hence, the researcher first carries out Panel Ordinary Least Square regression analysis and proceed to check for possible regression errors. The results obtained from the panel least square regression is as shown in the table below;

Table 4.4
Panel Least Square Regression Estimation Result

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mkt_asset	.8711471	.321769	2.71	0.009	.2270564	1.515238
tech_asset	.7279004	.3342867	2.18	0.034	.0587529	1.397048
hce	.151787	.2630368	0.58	0.566	-.3747384	.6783123
_cons	-.3855412	1.476332	-0.26	0.795	-3.340741	2.569658

No of Observations = 62 Probability F- Statistics = 0.0029 $R^2 = 0.2130$
Authors Computation 2021

Test for Multicollinearity

Multicollinearity occurs when the explanatory variables in a regression model are correlated suggesting that there is a strong relationship among the independent's variables which violates the model's estimation.. In this study like in most other related studies, we employ the variance inflation factor (VIF) technique to diagnose the presence or absence of multicollinearity in the model. Variance inflation factors (VIF) measures how much the variance of the estimated regression coefficients is inflated as compared to when the predictor variables are not linearly related. A cut-off value of 10 is given for regarding a VIF as high. Specifically, the researcher follows Gujarati (2004) which allows VIF to be less than 10. However, the result shows that VIF (1.10) is within the threshold of 10.

Test for homoscedasticity

The assumption of homoscedasticity states that if the errors are heteroscedastic then it will be difficult to trust the standard errors of the least square estimates. Hence, the confidence intervals will be either too narrow or too wide. The presence of heteroscedasticity tends to produce p-values that are smaller than they should be due to increased variance of the coefficient estimates which unfortunately least squares' estimators does not detect this increase. The result obtained from the regression reveals a probability value of (P-value: 0.766) obtained from the Breusch-Pagan test. This result indicates that the assumption of homoscedasticity has not been violated due to very high P-values which is statistically insignificant at 1% or 5% level.

Test for fixed and random effects

This test checks for a more efficient model, against a less efficient, but consistent model. It ensures that the more efficient model also gives consistent results. It tests the null hypothesis that the coefficients supplied by the efficient random-effects estimator are the same as the ones estimated by the consistent fixed-effects estimator. If the p-value > $\chi 2$ is larger than .05, then it is safe to use random effects, but if the p-value < $\chi 2$ is less than .05, then the fixed-effects model should be adopted (Gujarati, 2004; Ajibolade & Sankay, 2013). Table 4.5 provides a summary result obtained from both fixed and random effect models.

Table 4.5

Fixed and random effect model

Variables	**Mkt_asset**	**Tech_asset**	**HCE**
Fixed Effect Model			
Coefficient	0.481	0.179	-0.095
t_ Statistics	(1.47)	(0.53)	(-0.31)
Probability_t	{0.147)	{0.599)	{0.759)
No. of Obs = 62		**Prob. F statistics = 0.3595**	**R^2 = 0.0617**
Random Effect Model			
Coefficient	0.592	0.335	0.006
z_ Statistics	(1.91)	(1.05)	(0.02)
Probability_z	{0.056)	{0.293)	{0.983)
No. of Obs = 62		**Prob. Wald Chi^2 = 0.1093**	**R^2 = 0.0592**

Hausman = 0.5011

Note: t & z -statistics and respective probabilities are represented in () and {}
Where: ** represents 5% & * represent 1% level of significance
Source: Authors' Computations (2021)

From table 4.5, a careful examination of the results provided by the effects models show that both models of interest suggest appropriateness as it relates to the dependent variable of market value added for the period under investigation. However, a look at the p-value of the Hausman test (0.5011) implies that we should accept the null hypothesis since the p-values of the Hausman test is insignificant at 5% or 1% level. This suggests that the random effect results tend to be more appealing statistically when compared to the fixed effect results. However, to correct for the random effect in the model the researcher adopts the hierarchical regression estimator.

Table 4.6

Hierarchical Model Summary

Model	R2	F(df)	p	R2 change	F(df) change	p
1:	0.113	7.644(1,60)	0.008			
2:	0.114	3.777(2,59)	0.029	0.001	0.034(1,59)	0.855
3:	0.213	5.232(3,58)	0.003	0.099	7.330(1,58)	0.009

Source: STATA'16 Output (2021)

From the table 4.6 the addition of a second predictor variable (human capital) brought about a significant change in R^2 from 0.113 to 0.114. This indicates that about 0.1% (0.001) of the change in market value added is explained by the addition of human capital efficiency to

technology based intangible asset as the predictor variables. In the same vein, the addition of a third predictor variable (market related intangible asset) brought about a significant change in R^2 from 0.114 to 0.213. This indicates that about 10% (0.099) of the change in market value added is explained by the addition of market related intangible asset to technology based intangible asset and human capital efficiency as the predictor variables. Furthermore, a look at the F-statistics reveal an overall increased (7.330) when compared to the previous models. The p-value of 0.009 indicates that this change in the F-Statistics is significant at 5%. From the foregoing, since the explanatory power of R^2 in the third model is significantly (5%) better compared to the previous models, the researcher adopts the 3rd model for interpretation and policy recommendation. The result is presented below:

Table 4.7
Hierarchical Regression Estimates {3rd Model}

mva	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
tech_asset	.7279004	.3342867	2.18	0.034	.0587529	1.397048
hce	.151787	.2630368	0.58	0.566	-.3747384	.6783123
mkt_asset	.8711471	.321769	2.71	0.009	.2270564	1.515238
_cons	-.3855412	1.476332	-0.26	0.795	-3.340741	2.569658

No of Observations = 62 Probability F- Statistics = 0.0029 R^2 = 0.2130
Authors Computation (2021)

Table 4.7 shows a summarized result obtained from hierarchical estimator for the 3rd model. Specifically, the researcher provides interpretation for the hierarchical regression estimator as recommended by Cohen (2001) and Wampold& Freund (1987). The model goodness of fit as captured by the Fisher Statistics (7.330) and the corresponding probability value (0.009) shows a 5% statistically significant level suggesting that the entire model is fit and can be employed for interpretation and policy recommendation.

4.2 Discussion of findings

The hierarchical regression of the 3rd model presented in table 4.7 reveals the result of the variable of market related intangible asset as follows: (Coef. = 0.871, t = 2.71 and P -value = 0.009). Following this result, it is revealed that the effect of market related intangible asset on market value added is positive and statistically significant during the period under review. This finding corroborates the works of Marat and Derya (2019) and Nnado and Ozouli (2021) who found positive and significant relationship between intangible assets and market value of firms.

The hierarchical regression of the 3rd model presented table 4.7 reveals the result of the variable of technology based intangible asset as follows: (Coef. = 0.728, t = 2.18 and P -value = 0.034). Following the results above, it is revealed that the effect of technology-based asset on market value added is positive and statistically significant during the period under review. This is consistent with prior studies of Mehdi, Mohammed and Mohammed (2012) and Deng et.al (2021) who admitted that technology based intangible asset can promote market values of companies especially that of the information and communication technology firms.

The hierarchical regression of the 3rd model presented in table 4.7 reveals the result of the variable of human capital efficiency as follows: (Coef. = 0.152, t = 0.58 and P -value = 0.566). Following the results above, it is revealed that the effect of human capital efficiency on market value added is positive and statistically insignificant during the period under review. This is against prior studies of Hintzman et.al. (2021) who explained that the knowledge held by employees are the primary source of value creation so therefore employees' expenses should be seen as investments rather than costs.

5.2 Conclusion

The relationship between Intangible Assets (IAs) and Market Value Added (MVA) has been a subject of discussion in empirical literature. Although the significant effects of intangible assets on business performance is greatly acknowledged, few studies have been devoted to demonstrating how the various intangible assets affect market value added and what specific performance dimensions are affected. From the foregoing, it is ascertained that intangible assets are also major determinants of companies' market value. Also there are opinions that intangible assets and human capital create competitiveness and as a consequence enterprises are able to generate more value added. Thus this study concludes that market related intangible asset as well as technology-based intangible has significantly improved market value added of listed ICT firms in Nigeria. Our findings provide evidence for updating the present policy frameworks in order to take into account the relevance of intangible capital. Hence the study recommends that management of ICT firms should target and invest more in market value added intangible assets while not down playing on their intellectual capital efficiency.

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APPENDIX A

DATASET EMPLOYED

Years	Companies	Exchange Sector	Mkt_Asset	Tech_Asset	HCE	MVA
2019	Airtel Africa Plc	ICT	0.60	0.21	4.90	3.20
2011	Chams	ICT	1.22	0.32	9.56	4.47
2012	Chams	ICT	1.10	0.44	6.48	2.12
2013	Chams	ICT	2.12	0.21	4.81	3.55
2014	Chams	ICT	2.38	2.10	3.56	6.42
2015	Chams	ICT	2.83	2.48	2.83	5.96
2016	Chams	ICT	3.28	2.90	2.90	6.69
2017	Chams	ICT	3.73	3.50	3.53	7.42
2018	Chams	ICT	4.18	4.10	3.00	8.14
2019	Chams	ICT	4.63	4.70	3.20	8.87
2011	Courteville Business Solutio	ICT	3.21	2.12	2.49	0.56
2012	Courteville Business Solutio	ICT	2.10	1.75	2.69	0.56
2013	Courteville Business Solutio	ICT	1.89	0.75	2.98	0.66
2014	Courteville Business Solutio	ICT	1.08	0.17	3.04	0.80
2015	Courteville Business Solutio	ICT	0.42	0.52	2.21	0.55
2016	Courteville Business Solutio	ICT	0.24	1.20	1.98	0.57
2017	Courteville Business Solutio	ICT	0.90	1.89	2.89	0.56
2018	Courteville Business Solutio	ICT	1.56	2.57	2.31	0.55
2019	Courteville Business Solutio	ICT	2.22	3.26	1.80	0.22
2014	Computer Warehouse Group	ICT	2.41	2.56	1.77	2.13
2015	Computer Warehouse Group	ICT	2.34	2.71	1.63	2.20
2016	Computer Warehouse Group	ICT	3.21	2.20	1.20	2.01
2017	Computer Warehouse Group	ICT	3.33	1.98	1.89	4.27
2018	Computer Warehouse Group	ICT	3.73	1.80	2.24	5.94
2019	Computer Warehouse Group	ICT	4.09	1.58	2.27	2.71
2011	E-Transact Internationa	ICT	4.48	2.66	4.10	8.59
2012	E-Transact Internationa	ICT	4.86	2.99	2.91	8.26
2011	Tripple Gee and Company	ICT	4.35	1.31	2.80	2.59
2012	Tripple Gee and Company	ICT	4.19	0.68	3.93	2.30
2013	Tripple Gee and Company	ICT	2.16	1.07	3.49	1.76
2014	Tripple Gee and Company	ICT	0.32	1.73	3.87	0.95
2015	Tripple Gee and Company	ICT	1.31	1.73	4.56	0.82
2016	Tripple Gee and Company	ICT	0.69	2.00	4.68	0.74
2017	Tripple Gee and Company	ICT	1.59	3.27	4.74	0.57
2018	Tripple Gee and Company	ICT	1.45	2.99	6.29	0.44
2019	Tripple Gee and Company	ICT	1.74	4.25	5.76	0.33

2013	E-Transact Internationa	ICT	3.24	3.16	2.00	6.11
2014	E-Transact Internationa	ICT	2.63	2.86	2.22	4.17
2015	E-Transact Internationa	ICT	1.01	3.30	2.55	4.77
2016	E-Transact Internationa	ICT	3.39	3.48	2.37	3.67
2017	E-Transact Internationa	ICT	2.59	4.00	2.33	5.99
2018	E-Transact Internationa	ICT	2.44	4.31	3.06	6.37
2019	E-Transact Internationa	ICT	2.30	4.33	3.27	10.90
2019	MTN Nigeria	ICT	2.55	1.98	2.51	4.88
2011	NCR	ICT	1.68	1.85	3.50	0.64
2012	NCR	ICT	1.55	2.08	3.05	0.66
2013	NCR	ICT	1.81	3.59	3.30	11.50
2014	NCR	ICT	1.77	1.60	3.63	13.10
2015	NCR	ICT	1.92	1.76	3.87	5.33
2016	NCR	ICT	2.30	3.02	3.04	4.29
2017	NCR	ICT	1.82	2.96	1.42	2.81
2018	NCR	ICT	1.14	4.65	1.59	1.53
2019	NCR	ICT	1.57	1.81	1.91	2.53
2011	Omatek Ventures	ICT	1.89	1.80	1.08	5.19
2012	Omatek Ventures	ICT	2.06	1.91	1.54	5.77
2013	Omatek Ventures	ICT	2.93	1.73	1.76	6.63
2014	Omatek Ventures	ICT	2.54	1.91	2.34	7.51
2015	Omatek Ventures	ICT	2.54	2.40	2.32	6.04
2016	Omatek Ventures	ICT	3.49	2.56	2.61	3.50
2017	Omatek Ventures	ICT	3.58	3.01	2.51	2.34
2018	Omatek Ventures	ICT	3.27	2.89	2.80	2.14
2019	Omatek Ventures	ICT	4.86	0.90	4.61	1.86