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Intellectual Capital Development and Firm Value of Technology Firms in Nigeria

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ABSTRACT

Intellectual capital is the unique knowledge of business possessed by a company different from other entities in the same industry or other entities operating in an economy. The study examined the effect of intellectual capital development on firm value of technology firms in Nigeria. Specifically, the study assesses the effect of human capital efficiency on firm value of technology firms in Nigeria. Determined the effect of structure capital efficiency on firm value of technology firms in Nigeria. Ascertain the effect of relationship capital on firm value of technology firms in Nigeria and ascertain the effect of innovation capital on firm value of technology firms in Nigeria. The study is anchored on the resource-based view (RBV) theory. The study adopted *ex-post facto* design. The result of the study revealed that human capital efficiency, structural capital efficiency, relational capital and innovation capital has no significant effect on firm value of technology firms in Nigeria. The studies therefore conclude that intellectual development has positive and significant effect on firm value of technology firms in Nigeria. Amongst the recommendations is that management of the technology firms should make more provisions for human capital efficiency to enhance the firm value of technology firms. The management of the technology firms should make policies that will enable more structural capital efficiency to improve technology firms in Nigeria. The management of the selected technology firms should also make more policies that will improve the relational capital as a catalyst to improve firm value of technology firms and the management of the selected technology firms should put in place effective and appropriate innovation capital efficiency such that would enhance the firm value of technology firms in Nigeria

Keywords: Intellectual Capital Development, Firm Value, Technology Firms, Nigeria

INTRODUCTION

Intellectual capital refers to all resources that determine the value of competitiveness of an organization (NgoziI., Charles & Kenule, 2025). It is the knowledge-based assets which the organization focuses on to increase its efficiency and sustenance of good financial performance. Intellectual capital is the most significant organizational asset in the digital economy and an organization's success will be based on the strategic management of knowledge rather than the strategic allocation of physical and financial resources (Bontis, 1998). Intellectual capital is part of strategic management and used for value creation of an organization to sustain and retain its loyal customers, employees and investors. In literatures, it is further categorized into human, structural and customer capital. Human capital is the mixture of innate legacy, education, experience and attitude about life and business; structural capital in the form of managerial procedures is the serious connection which allow intellectual capital to be dignified organization level while customer or relational capital is the combination of assets used by business in relating with its past, present and potential customers, with its network of suppliers or research and development partners, in addition to the perceptions and views that they hold about the company (Forte, Matonti & Nicolo, 2025). Customer capital mainly represents the potential that the company has for intangible items outside of the organizations

Firm value of technology firms has attracted more and more attention from academia and industry Zaid, Jaaron & Bon, 2018). The firm value of technology firms determines the dynamic development trend of technology firms, which not only reflects the potential of the firm value of technology firms but also affects its future financial performance. Some scholars believe that tangible resources are essential to the firm value of technology firms, while the intangible resources with the characteristics of scarcity, non-imitation, and irreplaceability determine whether technology firms can obtain a sustainable competitive advantage Si, Xu, & Chen, 2020). This would link intellectual capital development with the firm value of technology firms closely.

The existing literature has demonstrated that intellectual capital development has become key competitiveness of technology firms (Sardo & Serrasqueiro, 2018; Xu & Liu, 2020), contributing to its brand value, financial performance and innovation ability. However, these studies focus on short-term corporate performance or static financial profitability indicators. Nowadays, with the rapid technological upgrading, it is insufficient to evaluate an enterprise performance only by the short-term financial indicators, it is necessary to measure the long-term operation and development ability of the enterprise (Allameh, 2018). The evaluation of firm value of technology firms not only reflect the historical performance of technology firms but also predict the profit expansion of technology firms in the future. If technology firms want to own an excellent development of technology firms, they must utilize intangible resources (intellectual Capital development) to maintain competitive advantage, and adjust the investment in intellectual capital with dynamic changes of the internal and external operating environment. (Arvan et al., 2016; Rooney & Dumay, 2016). There is little research focus on the relationship between intellectual capital development and firm value of technology firms in Nigeria. Moreover, the majority of literature selects high-tech industries as samples to study intellectual capital development (Purohit & Tandon, 2015; Xu & Li, 2019) and pay little attention to the technology firms, traditional industries and emerging industries.

The impact of different resources on the industry will be variety (Wei et al., 2019 & Zhu et al., 2020). Therefore, intellectual capital invested in enterprises with high technology products should produce corresponding output that would significantly improve firm value of technology firms. There is great practical significance to answer these issues different from other industries. Hence, the study examines the effect of intellectual development on firm value of technology firms in Nigeria.

Statement of Problem

The efficiency of intellectual assets relies greatly on practices of the management. This is because apart from the oversight function being performed by the board of directors, they are holistically involved in the optimal utilization of all the available resources (physical, financial and intellectual assets) in creating value and sustaining a competitive edge. According to Horibe (2015), performance and competitive advantage are no longer primarily a matter of machines and tools but harnessing intelligence of brains. For this innate intelligence to be fully captured and use in creating wealth for the company, there is need for a workable system and conducive environment for the components of intellectual capital to thrive. Only when management of firms could provide a platform and system that will allow intellectual capital variables interaction that they will be able to generates and creates value for companies. This value generation is of utmost importance especially to the profit-maximizing companies, who seek better performance in the level of profitability, liquidity, efficiency, returns and leverage. The accounting profession is currently more than ever being challenged to reinvent itself. This move emanates from the inherent deficiencies of conventional accounting, which has failed to recognize the intangibles/knowledge acquired by organization as non-current assets. Therefore, there is need for a more elaborate platform of financial reporting that could capture knowledge and other Intellectual Capital(IC) Components (human capital development, structural capital development, relational capital development and innovation capital development) in quantitative terms in financial information for informed decision-making. The continuous exclusion of these IC components implies the neglect of the enormous intangible values and investments incurred by firms in the acquisitions and development of intellectual properties (Onyekwelu & Ubesie, 2016).

Previous attempts to understand the effect of intellectual capital development on firm value of technology firms in Nigeria have resulted in conflicting opinions. The existing studies disagreed both in the line of significance and direction of relationship. A number of the findings highlight significant influence from intellectual capital development variables especially the moderating effect of human capital development.

Aluwong (2022) investigated how intellectual capital has impacted firm performance in Nigeria. The empirical result of the study showed that out of the four independent variables adopted in the study, only human capital efficiency insignificantly affects the performance of listed non-finance firms in Nigeria.

Etim *et al*. (2022) studied the effect of natural/environmental capital reporting on the corporate profitability of manufacturing firms in Nigeria. Results revealed that environmental/natural capital reporting (ER) has a significant negative effect on ROA.

Esy and Heri (2022) investigated the relationship between intellectual capital and financial performance of Sharia Commercial Banks in Indonesia. The study found that intellectual capital affects the financial performance of Islamic banks.

Munjal and Malarvizhi (2021) study of the effects of environmental performance on financial performance in the Indian banking sector for the years 2013to 2014

and 2017 to 2018. The financial performance of Indian banks and their environmental performance are not significantly correlated.

Tahir *et al*. (2021) examined the effect of intellectual capital on the financial statements of Pakistani banks from 2007 to 2015. Findings revealed that Human Capital Efficiency (HCE) in Pakistan largely affects banks' financial performance.

The review had pointed out a strong disagreement on the effects of intellectual capital development on firm value of technology firms. This disagreement comes in forms of the direction of relationship as well as the level of significance of the relationship. Some of these studies were done in environments outside Nigeria while some of the studies done in Nigeria did not include some key variables. Furthermore some of the studies did not use the standard econometric methodology. Again, the time frames considered in some of the past studies were short and not expansive enough and gave conflicting findings. These shortcomings have somehow contributed to the knowledge gap in the literature, thus warranting a more systematic and comprehensive study on intellectual capital development on firm value of technology firms. This study seeks to improve on the past studies by making use of human capital development, structural capital development, relational capital development and innovation capital development on firm value of technology firms in Nigeria

Review of Related Literature

Conceptual Review

Intellectual Capital Development

In a rapidly changing world, knowledge is the best tool to predict future needs, and to move forward in societies towards building a sustainable knowledge economy to ensure the well-being and happiness of individuals, relying mainly on people with practical minds, knowledge, and creative and innovative ideas who contribute to the survival and growth of the institution. The real value of this institution is magnified in it's the distinct intellectual capital development, able to provide opinions and ideas that improve performance, develop products and services, and increase competitiveness (Januškaite & Užiene, 2018)

Intellectual capital development, the possible explanation for its broad definition could be seen by its synonymous use with other words such as intangible assets, invisible assets, knowledge assets, knowledge capital, information assets, human capital and the hidden value of companies

(Bontis, 2001) (Tseng & Goo,2005). According to Sullivan (2000), intellectual property as intangible assets includes patents, trademarks and copyrights, which can also be included in the traditional financial statement. Intellectual capital can be defined as the knowledge that is transformed into intellectual property or the end result of the process itself (Aluwong, 2022). Intellectual assets are a part of intellectual capital. They are "the codified knowledge and know-how of the firm's human capital" Annie Brooking(consultant and author of Intellectual Capital:Core Asset for the Third Millennium Enterprise) describes intellectual capital (IC)as the "combined intangible assets which enable the company to function." In other words, an enterprise is the sum of its tangible assets and its intellectual capital, as follows:

Enterprise = Tangible Assets + Intellectual

Capital Andre Pulic (1998, 2000), the founder of the Value Added Intellectual Coefficient -VAIC method has gone into detail in regards to the definition of intellectual capital and the definition of the components that make up Intellectual capital. In "Intellectual Capital –Handbook of IC Management in Companies", intellectual capital is defined as "intangible assets or intangible business factors of the company, which have a significant impact on its performance and overall business success (Esy & Heri, 2022).

Since the 1990s, academia and industry have begun to discuss intellectual capital. For the composition of intellectual capital, it is the sum of all the things that can create value, such as knowledge, experience, corporate culture, internal and external relations (Sardo & Serrasqueiro, 2018; Xu et al., 2019). For the earnings of intellectual capital, it is the sum of all the expertise that can improve the competitive advantage of the enterprise. For the invisibility of intellectualcapital, it is all intangible assets that can increase enterprise value and create profits beyondits book value (Sardo & Serrasqueiro, 2017). For the components of intellectual capital, itincludes human capital, structural capital and relational capital (Nimtrakoon, 2015). Yet,the concept of intellectual capital has not been defined consistently in academia up to now.Intellectual capital was used initially in the research at the enterprise level (Ling, 2013),and then gradually extended to regional intellectual capital (Wang et al., 2013), national intellectual capital (Lu et al., 2014), as well as green intellectual capital proposed by the requirements of sustainable development.

On the other hand, the sustainable growth of enterprises has attracted more and more attention from academia and industry (Qiao et al., 2016; Xu et al., 2019c; Xu et al., 2019a; Xu et al., 2019b; Xu al., 2019d; Zaid et al., 2018). The ability of sustainable growth determines the dynamic development trend of enterprise, which not only reflects the potential of the enterprise's survival and development but also affects its future financial performance. Some scholars believe that tangible resources are essential to the growth of enterprises, while the intangible resources with the characteristics of scarcity, non-imitation, and irreplaceability determine whether enterprises can obtain a sustainable competitive advantage (Si et al., 2020; Xu et al., 2019c; Xu et al., 2019a; Xu et al., 2019b; Xu et al., 2019d). This would link intellectual capital with the corporate sustainable growth of enterprises closely. The existing literature has demonstrated that intellectual capital has become key competitiveness of enterprises (Sardo & Serrasqueiro, 2018; Xu & Liu, 2020), contributing to its brand value, financial performance and innovation ability. However, these studies focus on short-term corporate performance or static financial profitability indicators. Nowadays, with the rapid technological upgrading, it is insufficient to evaluate an enterprise performance only by the short-term financial indicators, it is necessary to measure the long-term operation and development ability of the enterprise (Scott, 2013).

Human Capital Efficiency

Human capital efficiency is critical to organizations survival and connotes the human resources that make up the entirety of the organization (Bontis 1998). It is the centerpiece of intellectual capital as it is viewed as the combined skill, innovation, knowledge and ability of employees (Bontis, Keow & Richardson,2000). HC is one of the underlying strategic resources, which is both supportive and necessary for success in any organization since human resource knowledge and skill isvital in today's fast-paced, changing competitive climate (Subramaniam & Youndt, 2005). It is the knowledge organizations possess which is embedded in its employees.

Edvinsson and Malone (1997) opined that human capital forms the generality of a person's skills to carry out a task and the shared experiences and information and acquired knowledge that the organizations including its managers and the entire staff. However, human capital can be lost, as the departure of an employee could be the end of that capital (Ahmadi et al., 2012).

Rahim, Atan and Kamaluddin (2016) examined human capital efficiency and firm performance: an empirical study on Malaysian technology industry using accounting data gotten from annual reports of all the 93 technology companies listed under main market and ace market of Bursa Malaysia in year 2009. The study applied Value Added Intellectual Coefficient (VAICTM) methodology developed by Pulic to measure human capital efficiency. The results revealed that from the correlation analysis, human capital efficiency has significant and positive relationship with firm's performance. The research relied solely on accounting data for the purpose of analysis.

Girma (2017), analyzed the effect of intellectual capital on the profitability and productivity of firms using data for Ethiopian commercial banks for five years from 2009-2014. The study adopted the Public model of IC which was used to measure the intellectual capital efficiency. Regression analysis revealed that generally, the value-added intellectual capital coefficient has a significant and positive effect in all measures of financial performances. Specifically, the study revealed that human capital efficiency has no significant effect on the profitability and productivity measure and also structural capital, on the other hand, revealed a positive effect on the profitability, but it has no significant effect on productivity. Capital employed efficiency have a significant effect on both financial measures return on equity and return on asset, and productivity measures asset turn over.

Structural Capital Efficiency

Structural capital (SCD), is sometimes used in place of organizational capital in existing intellectual capital literature. It includes all non-human reserves of knowledge in a firm for better innovativeness and performance (Bontis 1998; Youndt, Subramaniam & Snell 2004). Structural capital provides for efficient processes of communication and operation, which facilitate knowledge related activities and eventually contribute to values and profits (Karagiannis, Waldner, Stoeger& Nemetz, 2008). It is referred to as the knowledge that is left at work when employees' close from work.

Structural capital is within the control of an organization as they possess and manage it to the benefit of the organization most especially when combined with other capitals (Edvinsson & Malone 1997). It involves the assets; hardware, organizational culture and practices, intellectual property rights, software, repository, research and development activities, and whatever supports increased efficiency and effectiveness (Steenkamp, & Kashyap, 2010).

Khan (2016), explored the strategic links between structural capital and organizational innovation in Australian SMEs. The study used the Confidentialised Unit Record File (CURF) database from the Australian Bureau of Statistics (ABS), Business Longitudinal Database (BLD) (2013) to investigate 2,154 SMEs. The result revealed that structural capital was a necessary ingredient for achieving organizational innovation but however the study indicated that the relationship declines over time. This study ignored larger enterprises as though it only considered enterprises employing less than 200 employees.

Aramburu, Sáenz and Blanco (2015) analyzed the impact of structural capital on innovation capability and innovation performance, from an "intellectual capital" (IC) perspective. Questionnaire was employed to obtain data from managers of sampled 69 technology-based companies in Colombia and using structural equation modelling (partial least squares approach), the study revealed that structural capital explains to a great extent both the effectiveness of the new idea generation process and of innovation project management. The study also concluded that, structural capital significantly affect company's performance. The study also suffers generalization problem.

Aramburu and Sáenz (2011) examined the impact of structural capital on the ideation stage of innovation processes from an 'intellectual capital' (IC) perspective with the moderating role of company size. Data were collected with the aid of a questionnaire administered to a sample of 142 CEOs Spanish manufacturing firms with more than 50 employees and which carry out R&D activities. Structural equation modelling (SEM) based on partial least squares (PLS) was employed to test the hypotheses of which the findings revealed that structural capital has significant effect on innovation process and also, exert the greatest impact on the ideation phase and, hence, the priority aspects to hammer on, in order to promote the dimension of the innovation capability. The study suffers the problem of generalization. The study ignored the resource-based perspective of the organization and failed to see intellectual capital as a resource that supports performance.

Firm Value of Technology Firms in Nigeria

Firm value is the investors' perceptions of the level of success of a company which is reflected in the company's stock price. The value of the company is the present value of a series of incoming cash flows that the company will produce in the future (Daeli & Endri, 2018).

A firm's value, also known as Firm Value (FV), Enterprise Value (EV), it is an economic concept that reflects the value of a business. It is the value that a business is worthy of at a particular date. Theoretically, it is an amount that one needs to pay to buy/take over a business entity. Like an asset, the value of a firm can be determined on the basis of either book value or market value. But generally, it refers to the market value of a company. EV is a more comprehensive substitute for market capitalization and can be calculated by following more than one approach (Zamil & Hassan, 2019).

Firm value of technology firms in Nigeria is a subjective measure of how well a technology firms in Nigeria can use assets from its primary mode of business and generate revenues. This term is used as a general measure of a firm's overall financial health over a given period of time, and can be used to compare similar firms across the same industry or to compare industries or sectors in aggregation (Okeke, 2015).

There are many different ways to measure firm value, but all measures should be taken in aggregation. Line items such as revenue from operations, operating income or cash flow from operations can be used, as well as total unit sales. Furthermore, the analyst or investor may wish to look deeper into financial statements and seek out margin growth rates or any declining debt.Return on Equity, Return on Assets and Net Assets Per Share were used as a performance measurement in the prior expectations of Nahiba (2017), Brockman (2015), Oliveira, Rodrigues and Craig, (2015), Raheman, Salleh, Afza and Chek (2014), Abd.Hamid, Abdul Aziz, Dora and Said (2017) and Rouf (2016) etc

For the purpose of this study, one accounting based measurement (ROE) was used. i.e Return on Equity (ROE) was used to measure financial performance as used by Oliveira, Rodrigues and Craig, (2015), Raheman, Salleh, Afza and Chek (2014). This was captured as Net Profit After Tax divided by Total Equity i.e (ROE) This is expressed mathematically as:

ROE = NPAT

Total Equity

Theoretical Framework

The study is anchored on the resource-based view (RBV) theory which was propounded by Barney, 1991. Based on the central premise of RBV, organizations would be able to outperform other organizations and gain an edge over competitors if they possess valuable, rare, inimitable, and non-substitutable resources and capabilities (Barney, 1991).

The resource-based view (RBV) of the firm argues that sustained competitive advantage derives from the firm's resources and capabilities – bundles of tangible and intangible assets, including management skill, organizational operations and activities, and the depth of knowledge and information that they control (Barney, 2001). Nowadays, organizations should be held accountable for their performance for a broad range of clients, from the board of managers to staff, and investors to market regulators (Tayles et al., 2007).

Thus, companies should assure clients that their performance exceeds all known expectations. Many scholars asserted that investment in intellectual capital leads to an improvement in economic performance (Bollen, Vergauwen and Schnieders, 2005; Bontis, 1998; Sharabati, Jawad & Bontis, 2010). This performance is defined by the profitability of operations, which represents a surplus or a margin that is captured due to the difference between the cost of income or production. Along the same lines, several researchers observed that intellectual capital development significantly affects a firm's financial performance (Chen, Cheng & Hwang, 2005; Clarke, Seng & Whiting, 2011). Profitability, which expresses the ability of invested capital in profiteering, is reflective of this financial performance.

This theory is used as a foundation to assess intellectual capital efficiency and corporate sustainability of consumer goods companies. The underlying assumption of this theory is the basis for our study that intellectual capital can influence corporate sustainability of consumer goods companies in Nigerian. As the RBV theory provides that performance improvement is only possible when a firm has a comparative advantage over its competitors, and this competitive advantage is gained through intellectual capital acquisition. The theory supports that having intellectual capital provides an advantage for improved corporate sustainability of consumer goods companies in Nigerian.

Empirical Review

Ngozi., Charles, and Kenule, (2025) determined the effect of intellectual capital on cost of debt of listed manufacturing firms in Nigeria. To accomplish this objective, this study employed longitudinal research design and a panel data set sourced from annual financial reports of a sample made up of forty-two (42) manufacturing companies listed on the floor of the Nigerian Exchange Group Limited (NGX) over an 11-year period beginning from year 2012 to year 2022.

Specifically, this study examined the effect of human capital efficiency, structural capital efficiency, capital employed efficiency and relational capital efficiency, on cost of debt capital. A multilevel mixed-effects linear regression analysis technique was employed to test the hypotheses which relates to cost of equity and cost of debt capital models. Broadly, the results reveal mixed evidence suggesting that the effect of intellectual capital management on cost of debt is dependent on the unique characteristics of the proxy employed. The outcome indicates that human capital efficiency has a significant negative effect on cost of debt capital. Structural capital showed an insignificant effect on cost of debt capital, while capital employed revealed a insignificantly affect cost of debt capital. Further investigation indicate that relational capital has no significant effect on cost of equity capital but revealed a significant negative effect on cost of debt capital of listed manufacturing firms in Nigeria during the period under analysis. Based on these empirical outcomes, the study recommended amongst others, that policy makers such as the Federal Ministry of Industry, Trade, and Investment (FMITI) should promote and support initiatives that encourage manufacturing firms to invest in workforce development, training, and skill enhancement to equip the workforce with skills that align with industry demands

Forte, Matonti, and Nicolo (2025) analyzed intellectual capital (IC) in the context of Italian publicly traded companies. By employing the VAIC model, the study investigated the relationship between intellectual capital and organisations financial outcomes and market worth. The information was gathered from 135 Italian listed companies over the period from 2008 to 2017. The study employed ordinary least squares regression models for the analysis. Based on the research findings, companies as a whole benefited significantly from intellectual capital, leading to improvements in profits, revenue, and market value. Human capital plays a crucial role in influencing the financial performance of organizations, while the effectiveness of structural capital and capital employed has a negative effect on companies' market value.

Gomes, Semuel, and Devie (2024) indicate that intellectual capital has a significant effect on the company's value by reducing information asymmetry and capital costs. 67 Indonesian manufacturers were intentionally chosen for the study based on financial reports obtained from the Indonesian Stock Exchange website and Bloomberg. By employing partial lea square analysis for data analysis, the study also reveals a positive significant influence of disclosing intellectual capital on firm value, along with a negative significant effect of information asymmetry on firm value. Moreover, the cost of capital can have a negative effect on firm's value, while information asymmetry can have a positive impact on the cost of capital.

Isola and Akanni (2025) examine the impact of each component of intellectual capital on the performance of Nigerian companies. The study employed a panel data set consisting of publicly traded companies. 97 companies were selected over the 1999 to 2014 period. Using Pulic's (2002) Value-Added Intellectual Capital approach as a metric, and static panel data methodology the outcome suggest that VAIC positively influences performance. There is a strong significant correlation between structural and human capital components, whereas the capital employed component show an negative relationship.

Justin, Kwaghfan and Michael, (2021) investigated the relationship between Intellectual Capital Reporting (ICR) and Financial Performance of listed consumer goods companied in Nigeria in the Covid-19 Pandemic era. The study deployed ex-post facto research design as data were sourced from published accounts and annual reports of fifteen (15) listed consumer goods companies in Nigeria from 2012-2019. OLS regression was used to analyze the data. Results revealed that ICR components that is HCR, SCR and RCR have significant relationships with financial performance proxied by Tobin's Q. The study therefore concluded that there is a strong relationship between ICR and financial performance of listed consumer goods companies in Nigeria. The study made a policy recommendation among other things that, management should invest more aggressively in human capital development in order to enhance value and competitiveness of their companies in the post Covid-19 pandemic era.

Mutalib and Abdul, (2020) examined the intellectual capital (IC) disclosure's effect on the market value of the companies listed on Nigerian Stock Exchange's main board. The hypothesis for the study is formulated using signaling theory. Using content analysis of sampled 30 most capitalised firms, the study generates IC disclosure scores from annual reports. IC is surrogated with customer capital, protected capital, human capital, innovation capital and process capital, while corporate market value is proxied with market capitalisation. This study longitudinally examined the connection between market capitalization and IC disclosure quality using data between 2016and 2019 financial years based on ordinary least square method.The result shows that the listed companies' corporate market value and the overall IC disclosure are significantly and positively correlated. The study recommends that managers should disclose adequate information on IC because of its influence on investors' decisions and activities at capital market.

Salim and Ejikeme, (2019) explored the effect of human, structural and relational capital on operational performance of hospitality firms. The study adopted a survey research design whereby questionnaires were administered to a sample of two hundred and forty (240) respondents. Multiple regression analysis was employed to test the three (3) hypotheses formulated. The study found that human, structural and relational capital has a significant and positive effect on operational performance. The study concludes that intellectual capital is an important and necessary factor to be considered by firms in terms of achieving competitive advantage. The study recommends intensive and well-structured training for staff, the creation of corporate memory as well as the improved relationship with stakeholders.

Uche and Johnson (2017) appraised the effect of intellectual capital on financial performance of firms in Nigeria using the banking industry. The research used the Value Added Intellectual Coefficient (VAIC) to ascertain the extent that intellectual capital indices affect financial performance of three Nigeria. Data were collected from the published annual financial statements of the three banks and analyzed using regression tool. The study indicates that IC has a positive and significant effect on banks' financial performances of the banks but some are not significant. The results further showed that the banks are statistically different in both the intellectual capital and its financial performance indicators. It also shows that the banks with high IC also show high financial performance. The study recommends banks in Nigeria invest vigorously in development of their human capital as a key driver of firm's performance. They should also provide the infrastructures needed for to achieve a virile human capital in the system.

Awan and Saeed (2015) analyzed the concept of intellectual capital, its importance for higher educational institutions and its impact on their working environment and performance. The author selected two universities, namely: Bahauddin Zakariya University Multan and Islamia University Multan and has taken a sample of 200 employees of these Universities: 150 academic and 50 non-academics. The data was collected through a structured questionnaire by conducting face-to-face interview. Three estimation methods were used to analyze the data. Five point likert scales was used to record the view of respondents about the importance of intellectual capital and its management by these two selected Universities.

Abdel-Aziz, Abdul-Naser and Shamaric (2013) examined the impact of intellectual capital on Jordanian Telecommunication Companies' (JTC) Business Performance (BP). The study surveyed the managers at JTC companies. Practical data were used in the empirical analysis collected from 84 managers out of about 500 managers, by means of a questionnaire. Statistical techniques such as descriptive statistics, t-test, ANOVA test, correlation and multiple regressions were employed. The results also indicated that RC is positively and significantly affect JTCs' BP, while SC and RC do not significantly affect JTCs' BP. The Empirical results also indicated that there are strong inter-relationships and interactions among the three components of IC.

Mbugua and Rotich (2014) examined the effects of intellectual capital on profitability of listed Kenyan commercial banks. The study focused on four variables; human capital, structural capital, relational capital and innovation capital. Descriptive research design was used to test how independent variables influenced listed banks profitability. The target population was ten commercial banks that were listed in Nairobi Securities Exchange by 2012. The study used secondary data sources from published audited accounts for last 5 years from 2009-2013 in gathering data for analysis. Descriptive statistical tool MS-Excel and SPSS was used to analyze data. The study found that structural capital and innovation capital affects listed commercial banks of Kenya profitability. The study recommends that Kenyan listed banks to continue with strong control over structural and innovation capital, more allocations for intellectual capital investment be made to the two elements of intellectual capital for more growth in profitability. In addition, Kenyan listed banks to be more focused in making managerial decisions in the areas of its relational and human capital reforms and their utilization to enhance efficiency of generating profit for banks.

Fathi, Farahmand and Khorasani (2013) examined the relationship between intellectual capital and financial performance. The empirical data were drawn from a panel consisting of 49 Iranian companies listed in the Tehran Stock Exchange (TSE), classified in three different industrial sectors observed over the ten-year period of 2001 to 2010. Various regression models were examined in order to test the hypotheses included in the proposed conceptual framework. The results demonstrate that there is significant positive relationship between intellectual capital and
value added efficiency of structural capital component with the three financial performance measures (ROE, ROA, GR). Moreover, results indicate that that there is significant positive relationship between value added efficiency of capital employed and value added efficiency of human capital with two independent variables ((ROE, ROA) and there is no significant relationship between value added efficiency of capital employed and value added efficiency of human capital with growth revenue (GR).

Gap in Literature

The review had pointed out a strong disagreement on the effects of intellectual capital development on firm value of technology firms in Nigeria. This disagreement comes in forms of the direction of relationship as well as the level of significance of the relationship. Again, most of the studies were done in environments outside Nigeria while some of the studies done in Nigeria did not include some key variables. Furthermore some of the studies did not use the standard econometric methodology and the time frames considered in some of the past studies were short and not expansive enough and gave conflicting findings.

Another gap in literature is the coverage of intellectual capital development variables employed in the investigation of effects of intellectual capital development on firm value of technology firms in Nigeria. These shortcomings have contributed to the knowledge gap in the literature, thus warranting a more systematic and comprehensive study on intellectual capital development and firm value of technology firms in Nigeria.

METHODOLOGY

Research Design

The researcher adopted *ex-post facto* design in the study. The study employed secondary data sourced from the financial statements of the selected listed technology firms in Nigeria. The selected listed technology firms in Nigeria stock exchange include LG, MTN, SAMSUNG, TECNO, ARTEL Ng, GLO Ng,

The sampling was based on the criteria that:

- The firms are in the category as technology firms.
- The firm submitted financial reports within the periods under study.
- All the variables for the specified objectives are available in the selected firms.

Model Specification

The model adopted for study is the model of Onuorah and Osuji (2014) who examined intellectual capital development and firm value of technology firms in Nigeria

The Model is stated thus:

FV= f (HCD, SCD, RCD)

Where:

FV= Firm Value

HCD= Human capital development

SCD= Structural capital development

RCD= Relational capital development

The model is modified by introducing innovation capital development

FV= f (HCE, SCE, RC, IC)

The Econometric Equation Form of the Model is:

$FV = \beta0 + \beta1\ HCE + \beta2\ SCE + \beta3\ RC + \beta4\ IC + \mu$-

Where:

FV= Firm Value

HCE= Human Capital Efficiency

SCE= Structural capital Efficiency

RCD= Relational capital

IC= Innovation Capital

μ = Stochastic Disturbance (Error Term)

f = Functional Relationship

$\beta0$ = Intercept of Relationship in the Model Constant

$\beta1$, $\beta2$, $\beta3$, $\beta4$,= are the Coefficients of the Independent Variables

DATA ANALYSIS AND DISCUSSION

Pearson Correlation Matrix

Table 1: Correlation Analysis Intellectual Development and Firm Value of Technology Firms in Nigeria

	FV	HCE	SCE	RC	IC
FV	1.0000				
HCE	0.1763	1.0000			
SCE	0.0995	0.0639	1.0000		
RC	0.1562	0.4077	0.3907	1.0000	
IC	0.3103	0.0537	-0.1115	0.1619	1.0000

Source: researcher's summary of correlation result (2025)

The above results show that there exist a positive and weak relationship between firm value of technology firms and human capital efficiency (FV/HCE= 0.1763). It was discovered that structural capital efficiency (SCE and FV= 0.0995) were positively but weakly correlated to each other. There also exists a positive and very weak association between firm value of technology firms and other explanatory variables such as relational capital and innovation capital **(**0.15623, and 0.3103) respectively.

Test of Hypotheses

In order to examine the relationship between the dependent variables on firm value of technology firms and the independent variables such as human capital efficiency, structural capital efficiency, relational capital and innovation capital and to test the formulated hypotheses, we employed panel regression analysis since the data had both time series (2016-2021) and longitudinal properties (6 listed companies). Our analysis is presented in table 4.3.1 below:

Hausman Effect Test

The summary result of regression analysis is presented below. However, the study takes into cognizance the non homogeneity nature of the companies hence the need for testing its effect on the data. This necessitated the use of Hausman effect test to ascertain which effect to explain.

That is whether fixed effect or random effect is to be used in interpreting the regression result or to ascertain that which is best to be adopted in the study since our data is a panel data with complete information. Below is the summary of the Hausman test result, details of the result was presented in table 7 under the appendix.

Hausman Effect Test: Decision rule

H_0 – random effect is preferable to fixed effect

H_1 – fixed effect is preferable to random effect

When chi-square probability value is less than 5% – rejects H_0 and accepts H_1 ($P \leq 0.05$).

When chi-square probability value is greater than 5% – accepts H_0 and rejects H_1. ($P \geq 0.05$).

Hausman test is used to decide between fixed effect model or random effect model. When the Chi square (Prob) value is greater than 5%, you interpret random effect and say that random effect is mostly preferred to fixed effect but when it is less than 5%, you interpret fixed effect and say that fixed effect is preferred to random effect.

Table 2. Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.433112	8	0.0513

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
HCE	8.225703	8.471618	0.089836	0.4120
SCE	-0.034647	-0.038730	0.000019	0.3526
RC	0.867245	-1.271406	2.106034	0.1406
IC	0.093053	-0.018063	0.001076	0.0007

Cross-section random effects test equation:
Dependent Variable: FV
Method: Panel Least Squares
Date: 09/06/25 Time: 06:02
Sample: 2019 2024
Periods included: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.025670	1.546506	0.663218	0.5080
HCE	8.225703	1.682878	4.887878	0.0000
SCE	-0.034647	0.026127	-1.326102	0.1863
RC	0.867245	2.430293	0.356848	0.7216
IC	0.093053	0.061604	1.510500	0.1325

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.722356	Mean dependent var	11.69205
Adjusted R-squared	0.697493	S.D. dependent var	9.431674
S.E. of regression	5.187483	Akaike info criterion	6.212779
Sum squared resid	5408.907	Schwarz criterion	6.505865
Log likelihood	-664.4057	Hannan-Quinn criter.	6.331135
F-statistic	29.05275	Durbin-Watson stat	0.255889
Prob(F-statistic)	0.000000		

Source: Author's computations 2025

For the Hausman test, the null hypothesis is that the preferred model is random effects, while the alternative hypothesis is that the fixed effects model is preferred (Green, 2008). Based on this premise, the fixed effect model was selected since the p-value of the Hausmann's test is less than

0.05. This implies that the study rejects the null hypothesis of the Hausman test in favour of the alternative hypothesis, that the fixed effect model is preferred. Hence, the fixed effect model was used as the best estimator of the effect of intellectual development on firm value of technology firms in Nigeria

Hypotheses Testing

Accept the null hypothesis (H_0) if p-value is greater than 0.05 (i.e p >0.05). On the other hand, reject null hypothesis if p-value is less than 0.005 (ie P< 0.05).

$H0_1$: Human capital efficiency has no significant effect on firm value of technology firms in Nigeria

The p-value (0.0000<0.05) reveals that Human capital efficiency has significant effect on firm value of technology firms. Based on this finding, the null hypothesis (H_{01}) is rejected and the alternative hypothesis accepted that Human capital efficiency has positive and significant effect on firm value of technology firms in Nigeria.

$H0_2$: Structural capital efficiency has no significant effect on firm value of technology firms in Nigeria

The p-value (0.001<0.05) reveals that structural capital efficiency has significant effect on firm value of technology firms. Based on this finding, the alternative hypothesis (H_{01}) is accepted and the null hypothesis rejected which implies that structural capital efficiency has no significant effect on firm value of technology firms in Nigeria

$H0_3$: Relationship Capital has no significant effect on firm value of technology firms in Nigeria

The p-value (0.000<0.05) reveals that relational capital has significant effect on firm value of technology firms. Based on this finding, the null hypothesis (H_{01}) is rejected and the alternative hypothesis accepted that relational capital has positive and significant effect on firm value of technology firms in Nigeria**.**

$H0_4$: Innovation capital has no significant effect on firm value of technology firms in Nigeria

The p-value (0.000<0.05) reveals that innovation capital has significant effect on firm value of technology firms. Based on this finding, the null hypothesis (H_{01}) is rejected and the alternative hypothesis accepted which means that innovation capital has no significant effect on firm value of technology firms in Nigeria

CONCLUSION AND RECOMMENDATIONS

The study examined the effect of intellectual development on firm value of technology firms in Nigeria. The result of the study revealed that human capital efficiency, structural capital efficiency, relational capital and innovation capital has no significant effect on firm value of technology firms. The studies therefore conclude that intellectual development has positive and significant effect on firm value of technology firms in Nigeria.

Amongst the recommendations is that management of the technology firms in Nigeria make more provisions for human capital efficiency since this will enhance the firm value of technology firms in Nigeria. The management of the technology firms in Nigeria should make policies that will enable more structural capital efficiency to improve technology firms in Nigeria. The management of the selected technology firms in Nigeria should also make more policies that will improve the relational capital as a catalyst to improve firm value of technology firms in Nigeria. The management of the selected technology firms should put in place effective and appropriate innovation capital such that would enhance the firm value of technology firms in Nigeria.

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