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HUMAN CAPITAL, STRUCTURAL CAPITAL AND FIRM VALUE OF LISTED INDUSTRIAL GOODS FIRMS IN NIGERIA

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Abstract

The study examined the effect of human and structural capital on firm value of listed industrial goods in Nigeria from 2014-2023. The study adopts ex-post facto research design and intellectual capital is measured by human capital and structural capital efficiency while firm value is measured by firm value. Panel multiple regression was used for the analysis. From the analysis, the study found that human capital efficiency has positive but insignificant effect on firm value, structural capital efficiency has positive significant effect on firm value. Based on the finding, the study recommend that industrial goods firms place significant emphasis on enhancing human capital, recognizing it as the most vital asset for influencing firm value. Companies should implement comprehensive policies to upgrade employee skills and competencies through targeted training and development programs. By focusing on continuous learning and development, firms can harness the full potential of their workforce to improve productivity and innovation, thereby boosting market value. For structural capital, firms should avoid over-investment in rigid systems and processes that may limit flexibility and agility

Keywords: Human Capital, Structural Capital, Firm Value

Introduction

Intellectual capital plays a crucial role in the success and sustainability of organizations in today's knowledge-based economy. It encompasses the intangible assets that contribute to an organization's value creation and competitive advantage. The significance of intellectual capital lies in its ability to drive modernization, improve organizational performance, and create long-term value (Abraham & Ofosu, 2018). One of the key components of intellectual capital is human capital, which is the skills, knowledge, and expertise acquired by the employees.

Human capital, with its diverse skills and knowledge, forms the foundation for generating new ideas and solutions to complex problems (Bukh et al., 2005). Intellectual capital is central to creating economic value for a firm. By leveraging its intellectual capital, a company can develop unique value propositions, differentiate itself from competitors, and command premium prices (Shubita, 2019).

Firms with a highly skilled and motivated workforce tend to perform better. They are more innovative, productive, and adaptable to changing market conditions (Abraham & Ofosu, 2018). Human capital contributes to higher levels of product and service quality, efficiency, and customer satisfaction, all of which can boost firm performance. Human capital is a key driver of innovation within a firm. Employees with diverse skills and expertise can generate new ideas, develop innovative products or services, and improve existing processes. Innovation can lead to a competitive advantage, increased market share, and higher revenues, all of which contribute to firm value (Ousama et al, 2020).

In addition, a firm with a reputation for investing in and valuing its employees can attract top talent in the industry. Retaining skilled employees reduces recruitment and training costs and ensures continuity of knowledge and expertise within the organization. Having a talented and stable workforce can positively

influence the firm's value. Firms that invest in recruiting, developing, and retaining a skilled and motivated workforce tend to perform better, innovate, and adapt more effectively to changing market conditions. As a result, they are often more valuable to investors, shareholders, and other stakeholders (Majdalany & Henderson, 2013).

Structural capital, another component of intellectual capital, includes organizational processes, systems, patents, and databases (Shubita, 2019). Effective management of structural capital can lead to greater operational efficiency, improved knowledge sharing, and enhanced organizational learning (Edvinsson & Malone, 1997). Well-designed structural intellectual capital can enhance a firm's competitive advantage and support its growth. Efficient processes, systems, and organizational structures are essential components of structural capital. When a firm has well-designed and streamlined operations, it can reduce costs, increase productivity, and generate higher profit margins. Improved operational efficiency can lead to improved financial performance and, consequently, a higher firm value (Shubita, 2019).

Additionally, structural capital facilitates knowledge sharing and organizational learning, which are vital for innovation and competitiveness (Bontis, 1998). By codifying and organizing knowledge in databases and other systems, organizations can capture and disseminate best practices, lessons learned, and innovative ideas across the company (Kaplan & Norton, 2004). This knowledge sharing culture fosters innovation, enables faster decision-making, and helps organizations adapt to changing market conditions, ultimately contributing to higher firm value (Talaromi & Nezhad, 2013).

Firms that invest in developing and leveraging their intellectual capital tend to perform better, achieve sustainable growth, and enhance their overall financial and operational performance in both the short and long term. It is based on this backdrop that the study is motivated in evaluating effect of intellectual capital on firm value of listed Industrial companies in Nigeria.

Literature Review

Concept of Intellectual Capital (IC)

According to Engelman, et al (2015), intellectual capital is the knowledge assets of the company and how those assets change are expected to change over time. Martinez and Garcia-Meca (2005) defined IC as the knowledge, information, property rights and experience that is use to create wealth. IC is presented by Al Khayal (2005) as the frame arise from having unusual profits which exceed the range of normal profit from usual investment in the market. IC is defined by Klien (1999) as the intellectual essence that is composed, owned and improved to produce assets with high value.

Anam, et al. (2011a) defined intellectual capital as the knowledge-assets that can create value for firms as well as achieve and sustain a competitive edge for them; also, Saleh (2010) seen intellectual capital as a non-monetary asset that can generate future economic values in firms. Such intellectual assets themselves, according to Bismuth and Tojo (2008), do not create value nor generate growth and development but need to be combined with other factors of production. The focus of Intellectual Capital is on the resources of organizations which are clearly relevant in decision making as to the wealth-creating ability of the firm; whilst Intellectual Capital Disclosure, on the other hand, is about achieving full disclosure of these intangibles, thereby guaranteeing fairness and transparency. Therefore, the disclosure of Intellectual Capital is to ensure that the firm has steady control of its value-creation intangibles and to enhance their transparency as well as facilitate their effective and efficient management.

Human Capital

Human capital represents the collective skills, knowledge, experiences, and attributes individuals possess that contribute to their productivity and value within an organization or economy. Unlike physical or financial capital, human capital is intangible and resides in people, making it a critical resource for economic growth and organizational success. It is developed through investments in education, training, and healthcare, which enhance individuals' abilities to innovate, adapt, and perform effectively. Schultz (1961) described human capital as the abilities and knowledge that enable individuals to produce goods and services, while Becker (1994) emphasized its components, including skills, information, and health,

as determinants of economic outcomes. The OECD (2001) further highlighted its role in fostering personal, social, and economic well-being, demonstrating its multidimensional significance.

Mincer and Polachek (2021) defined human capital as the accumulation of education, training, experience, and health that individuals acquire over their lifetimes, enhancing their productivity and earning capacity". Lucas (2018) defined human capital as "the intangible assets embodied in individuals, including their education, skills, knowledge, and health, which contribute to their productivity and economic value. Anuonye (2014) defined human capital as knowledge, skills, and abilities of employees. It is an organization's combined human capability for solving business problems. Human capital is inherent in people and cannot be owned by organizations. It also encompasses how effectively an organization uses its people resources, as measured by creativity and innovation.

Ali (2018) describes human capital (HC) as the knowledge, skill, expertise/know-how, problem solving capacity, education, training, judgment, experience, abilities, and loyalty of the employees of the firm; represented as the collective capabilities of a company's workforce to solve customer and operational problems (Phusavat, et al., 2011). Human capital is the firm's collective capability to extract the best solutions from the knowledge of its people. It is important because it is a source of innovation and strategic renewal, whether it is from brainstorming in a research lab, daydreaming at the office, throwing out old files, reengineering new processes, improving personal skills or developing new sales leads.

Acemoglu and Autor (2011) stressed the importance of skills acquired through education and training in determining productivity and competitiveness. Similarly, Bontis et al. (1999) linked human capital to organizational success, focusing on the combined knowledge and innovative capacities of employees. These perspectives underscore that developing human capital is pivotal for achieving competitive advantage, fostering inclusive growth, and addressing societal challenges. Ultimately, human capital serves as a vital foundation for economic and social progress, where enhancing individual capabilities directly translates into broader prosperity. This study aligns with the definition of human capital by Sonnier (2008) that human capital (HC) is the knowledge, skill, expertise/know-how, problem solving capacity, education, training, judgment, experience, abilities, and loyalty of the employees of the firm.

Structural Capital

Anuonye (2014) defined structural capital as everything in an organization that supports employees (human capital) in their work. It is the supportive infrastructure that enables human capital to function (such as: buildings, hardware, software, processes, patents and trademarks). In addition, structural capital includes things such as the organization's image, organization structure, information system, and proprietary databases.

Abraham and Ofosu (2018) described structural capital (SC) as the knowledge that belongs to the organization as a whole in terms of technologies, inventions, data, publications, strategy and culture, structures and systems, organizational routines and procedures. Structural capital is the firm's organizational capabilities to meet market requirements. It involves the organization's routines and structures that support employees' quests for optimum intellectual performance and, therefore, overall business performance. An individual can have a high level of intellect, but if the organization has poor systems and procedures by which to track his or her actions, the overall intellectual capital will not reach its fullest potential. In this study, structural capital are the supportive infrastructure that enables human capital to function in an organization as defined by Anuonye (2014).

Concept of Firm Value

Oktarina (2018) defined firm value as a firm value which is closely related to stock prices and which gives investors an insight into the risks and prospects of the company in the future. Firm value is very important because high firm value results in high prosperity of shareholders. Thus, it can be concluded that, a good firm value will have a good impact on investors and dividend distribution and this will attract investors to invest in a company. The study further asserted that firm value is one of the factors that can affect investors

and the public. Investors tend to invest their capital in companies that have good firm value because if firm value is good, it will have a good impact on dividend distribution and shareholder welfare. While from the community point of view, the public will use a product or service of a company that has a good brand image because the public will have the view that the company has good quality and performance.

Pratiwi et al. (2019) defined company value as an investor's perception of a public company that is often associated with stock prices. The company value can be measured in several ways, one of which is the value of the equity market. The value of the equity market is based on market prices that are often associated with the price of a company's stock in the capital market (Hariati & Prihatiningtyas, 2015). The ups and downs of stock prices in the capital market have become an interesting phenomenon to study the issue of fluctuations in the value of the company.

Pratiwi et al. (2019) further asserted that company value can be interpreted as an assessment conducted by investors on the level of success of the company in managing its resources. Company value can describe the condition of the company. The better the value of the company, the more attractive it would be to prospective investors.

Sundari and Sendiany (2021) opined that an important goal of a company is to optimize shareholder wealth and to maximize the value of its shares. Firm value can be interpreted as the company's performance which can be seen from the stock price due to supply and demand in the capital market and becomes a benchmark for public assessment of the company's financial performance. The increasing value of the company has the potential to increase investor confidence in investing in a company because it illustrates the company has the potential to have good prospects in the future and bring high returns on equity.

Intellectual Capital and Firm Value

Novita, et al., (2023) examined the effect of intellectual capital and corporate governance on firm value and tests whether company performance can mediate the relationship between intellectual capital and corporate governance on firm value. The population in this study are all banking companies listed on the Indonesia Stock Exchange in 2015-2019. The sample was determined using a purposive sampling technique with certain criteria so that 26 companies were selected as samples with a total data of 130 companies. The analysis technique in this study is path analysis using Structural Equation Modeling based on Partial Least Square. The study results show that intellectual capital and corporate governance affect company performance. Intellectual capital does not affect firm value. Company performance and corporate governance affect firm value. Furthermore, company performance can mediate the relationship between intellectual capital and firm value but does not mediate the relationship between corporate governance and firm value. The study is recent but it cannot be generalized since the sector of the study differs.

Nguyen and Duong (2020) investigate the impact of intellectual capital on firm value in the context of Vietnam. The study sample includes 61 manufacturing companies listed on Vietnam stock market for the period from 2013 to 2018. Three statistical methods approaches are employed to address econometric issues and to improve the accuracy of the regression coefficients include Ordinary Least Square (OLS), Random Effects Model (REM) and Fixed Effects Model (FEM). The study used value-added intellectual capital (VAIC) to measure the intellectual capital of a firm. The VAIC includes the sum of three components: Human Capital Efficiency (HCE), Structure Capital Efficiency (SCE) and Capital Employed Efficiency (CEE, including physical and financial capital). In the study, firm value is measured by Tobin’s Q ratio. Some control variables such as leverage, firm size, growth rate, and state capital are used in the regression model that pointed out the impact of intellectual capital on a firm value. The empirical results show a statistically significant positive impact of value-added intellectual capital (VAIC) on a firm’s profitability. This evidence provides a new insight to managers on how to improve the value of manufacturing companies listed on Vietnam stock market. The study cannot be generalized to Nigeria since economic factors differs between domain of the study and Nigeria context.

Ousama, et al (2020) investigate the relationship between the intellectual capital (IC) disclosure reported in the annual reports and firm value of the companies listed on the Qatar Stock Exchange. The study is based on a panel data for six years from 2010-2012 and 2016-2018. The regression model is based on Ohlson's model, which has been modified by including IC information. The study found that there is a significant relationship between IC information and firm market value. This study is recent but however, intellectual capital was not examined based on the various component of human capital, structural capital.

Shubita (2019) applied the value-added intellectual coefficient (VAIC) model to test the impact of intellectual capital (IC) on firm valueof 73 Jordanian manufacturing companies during the period 2005–2017. firm valuewas measured using the market capitalization over the total assets. The IC and its components: capital employed (CEE), structural capital (SCE), and human capital (HCE) of industrial firms have been analyzed, and their impact on firm valuehas been estimated using regression models. The results show that there is no relationship between IC and the market value; HCE is associated with the market value, and SCE and CEE are not associated with the market value. Difference in the sectoral analysis of the study hinder generalization of the findings to other sector like financial services companies in Nigeria.

Nnubia, et al (2019) investigate the effect of intellectual capital on the performance of non-financial firms in Nigeria. A sample of 21 non-financial Nigerian businesses listed on the NSE for ten years (from 2007-2016). The data were analyzed using the Ordinary Least Squares Method. The results showed that for the Nigerian listed non-financial firms, the explanatory variables – capital employed efficiency, human capital efficiency and structural capital efficiency has positive and significant effect on measurement of performance.

Elfiswandi et al. (2019) explored the influence of IC on the financial performance of 25 listed banking companies in Indonesia from the year 2008 to 2013 using an explanatory method (verification survey) and descriptive survey) while the data analysis method used is data panel regression. Findings showed SCE, HCE and CEE positively influenced performance while CEE slightly influenced Net Interest Margin. Contribution to the world of banking needs to observe the decisions of capital employed efficiency in improving human resources in upgrading bank performance.

Knowledge-Based View Theory

Knowledge is the life-wire of any organisation which makes it unique, valuable, rare and not easy to replicate as it provides the firm with a capability and competence needed to achieve a competitive advantage via knowledge workers who are embodied in the human capital and structural capital of the firm. Drucker (1999) states that the most important contribution management needs to make in the 21st century is similarly to increase the productivity of knowledge worker. The knowledge-based view of the firm identifies the primary rationale for the firm as the creation and application of knowledge (Demsetz, 1991; Nonaka, 1994; Grant, 1996; Pender, 1996).

The transition of society from the industrial era to the knowledge era has shifted the importance from tangible assets to intangible ones. Hall (1992) in a survey of CEOs found that employee know-how and reputation were viewed as the most critical intangible resources for the firm. Therefore, the ability of firms to generate and exploit new forms of knowledge is vitally important (Anand, 2007). The relevance of the theory to this study is that it considers cost of education, training, development and even workers' medical treatment as investments towards improved productivity of individual workers and also creates a sort of competitive advantage which ultimately results in improved organizations corporate value. Thus, if these are investments like other physical assets which are reflected on the statement of financial position, considerable effort must also be made to reflect such value of knowledge in human capital on the statement of financial position.

The Knowledge-Based View (KBV) theory emphasizes that knowledge is the most strategic resource for achieving competitive advantage and superior firm performance. It builds on the Resource-Based View (RBV) by focusing specifically on intangible resources, such as human and structural capital, as key drivers of firm value. KBV argues that firms that effectively acquire, integrate, and apply

knowledge through their human and structural capital can enhance their value by fostering innovation, improving efficiency, and achieving sustainable competitive advantages.

Human capital, encompassing employees' skills, knowledge, and expertise, is central to creating and applying valuable knowledge within a firm. According to KBV, individuals generate new ideas, solve complex problems, and adapt to dynamic business environments, contributing directly to a firm's ability to innovate and compete. Structural capital, which includes systems, databases, processes, and organizational culture, complements human capital by institutionalizing and preserving knowledge, making it accessible and reusable across the organization. For instance, a firm with robust structural capital can codify tacit knowledge held by individuals into explicit knowledge stored in processes or systems, ensuring knowledge continuity even when employees leave.

Together, human and structural capital create a synergistic effect on firm value. Human capital generates innovative insights and expertise, while structural capital provides the infrastructure to scale and institutionalize those insights, enhancing organizational efficiency and decision-making. KBV posits that firms that strategically align these knowledge assets can outperform competitors, leading to increased market value and long-term growth. This alignment highlights the role of both types of intellectual capital in transforming knowledge into a tangible advantage, thereby strengthening their contribution to firm value.

Methodology

The study adopts ex-post facto research design. The population of the study comprised of the entire listed industrial companies on the Nigeria exchange group from 2014-2023. The data on intellectual capital components and firm value is sourced from audited annual reports of the companies. Panel multiple regression is used to determine the effect of intellectual capital on firm value of listed Industrial goods in Nigeria. The study also conducts descriptive statistics of the variables, correlation matrix, multicollinearity test using variance inflation factor, heteroskedasticity test and normality test of the variables. The linear model for the study is specified as:

$$FV_{\text{it}} = \beta_0 + \beta_1 HCD_{it} + \beta_2 SCD_{it} + \varepsilon_{it} \qquad (1)$$

Where;

FV_{it} = firm value of firm I at time t

HCD_{it} = Human capital disclosure of firm I at time t

SCD_{it} = Structural capital disclosure of firm I at time t

βo = constant

β_1- β_7 = coefficients of estimates

$\mathcal{E}$ = error term

Table 1: Measurement of Variables

Variables	Measures	Validity construct
Firm Value (FV)	Tobins Q = Market Value of Firm / Replacement Cost of Firm's Assets	Thenmozhi (2000); Stern (1991)
Human capital disclosure (HCD)	Aggregate of human capital disclosure in the annual report	Mehralian, Reza, Akhavan and Sadeh (2012); Ali (2018)
Structural capital disclosure (SCD)	Aggregate of structural capital disclosure in the annual report	Jihene (2013); Umar (2017)

Source: Compiled by the Researcher

Results and Discussion

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Fv	140	3922153	9.217431	-1.071343	2.674372
Hcd	140	8.593113	1.517427	6.347749	10.49307
Scd	140	9.217431	**1.** 027663	.704897	11.80582

Source: Generated from Stata, 2024.

The descriptive of the variables indicates that industrial goods companies had a maximum firm value value of 2.674372. This therefore means that there is an addition on the value of the asset to the companies while the minimum of -1.071343 indicates a loss on the asset of the companies. Averagely the sector had firm value of .3922. Human capital efficiency which shows knowledge, skills, and abilities of employees has a maximum of 10.49 while the minimum is 6.347. Averagely the sector had human capital efficiency of 8.59.

Structural capital efficiency which is the supportive infrastructure that enables human capital to function has a mean of 9.217431 while the maximum and minimum is 11.80582 and 6.704897 respectively.

Table 3: Correlation Matrix

	fv	hcd	scd
fv	1.0000		
hcd	-0.1283	1.0000	
scd	-0.2392	0.7293	1.0000

Source: Generated from Stata, 2024

The relationship between the variables is check with the correlation result above. It was found that human capital efficiency has negative relationship with firm value to the extent of 12.8%. Also, structural capital efficiency is negatively correlated with firm value to the extent of 23.9%.

Table 4: Hausman Specification

	fixed	random	Difference	S.E.
hcd	.1055207	.0725003	.0330204	.0113411
scd	.0388403	.0303525	.0084878	

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(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 5.85
Prob>chi2 = 0.5573
(V_b-V_B is not positive definite)

Source: Generated from Stata, 2024

The Hausman result above indicates the model that is appropriate for the study. It was found that random model regression is appropriate because the p-value of Hausman specification is greater than 5% level of significance.

Table 5: Breusch and Pagan Lagrangian multiplier test for random effects

	Var	sd = sqrt(Var)
fv	.381053	.6172949
e	.0434237	.2083836
u	.1910452	.4370872

Test: Var(u) = 0 chibar2(01) = 256.30
Prob > chibar2 = 0.0000

Source: Generated from Stata, 2024

The Lagrangian result is used to choose between random model and the pooled regression but the result support the choice of random model because the prob. value is less than 5% level of significance.

Table 6: Regression Result

sq: within = 0.7703
between = 0.0627
overall = 0.2522
Prob > chi2 = 0.0000

Fv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
hcd	.0725003	.0410154	1.77	0.077	-.0078885	.1528891
scd	.0303525	.0149972	2.02	0.043	.0009585	.0597465

Source: Generated from Stata, 2024

The result shows that human capital efficiency has positive but insignificant effect on firm value. Despite the insignificant effect, the positive relationship shows that increase in skills, knowledge and abilities of the employees will enable them to perform better. This will increase the firm value of the companies. However, structural capital efficiency has positive significant effect on firm value. This indicates that when the companies spend more on the supportive infrastructure such as: buildings, hardware, software, processes, patents and trademarks, it will improve the firm value because the support the operations of the business.

The coefficient of determination indicates that the independent variables used in this study explained 25% variation on firm value while the remaining

variation is explained by other variables not included in the model.

Conclusion and Recommendations

The study concludes that human capital, a key component of intellectual capital, has an insignificant positive effect on the firm value of listed industrial goods companies. Human capital, which represents the skills, knowledge, and abilities of employees, is found to be a critical driver of market value. The results suggest that an increase in human capital efficiency directly contributes to enhanced firm value, highlighting the importance of investing in employee development and expertise.

On the other hand, the study finds that structural capital comprising the firm's systems, processes, and organizational knowledge is essential, an excessive focus on these elements may lead to increasing returns. Therefore, a balance must be struck in optimizing structural capital investments to ensure they support, rather than hinder, value creation.

Based on these conclusions, it is recommended that industrial goods firms place significant emphasis on enhancing human capita and structural capitall, recognizing it as the most vital asset for driving firm value. Companies should implement comprehensive policies to upgrade employee skills and competencies through targeted training and development programs. By focusing on continuous learning and development, firms can harness the full potential of their workforce to improve productivity and innovation, thereby boosting market value. For structural capital, firms should optimized investmentsthat will support core activities that directly contribute to firm value.

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