

Intellectual Capital and Financial Performance of Quoted Manufacturing Firms

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Article History

Received on 11 October 2022

1st Revision on 15 December 2022

2nd Revision on 20 March 2023

3rd Revision on 6 May 2023

4th Revision on 14 May 2023

5th Revision on 19 May 2023

6th Revision on 28 June 2023

Accepted on 10 August 2023

Abstract

Purpose: This study examined the effect of intellectual capital on the financial performance of quoted manufacturing firms on the Nigerian Stock Exchange (NSE). The study specifically evaluated the effect of the value-added intellectual coefficient (VAIC) on Asset Turnover (ATR), Gross Profit Margin (GPM) and Return on Assets (ROA) from 2011 to 2019.

Research Methodology: The research design used in the study is ex post facto. Non-probability sampling was the method of sampling that was employed in the investigation. Twenty (20) consumer products manufacturing companies that had been listed on the NSE for nine years made up the final sample. In earlier investigations, this was deemed sufficient for regression analysis. The analysis makes use of secondary data taken from the companies' annual reports. The information spanned a nine-year span, from 2011 to 2019.

Result: There is a non-significant negative effect of value added intellectual coefficient on the Asset Turnover Rate (ATR) of quoted manufacturing firms; however, there is a non-significant positive effect of VAIC on Gross Profit Margin (GPM) and Return on Assets (ROA) of quoted manufacturing firms.

Limitation: The main limitation is the duration of time the study was conducted and the delisting of some firms during the period.

Contribution: The research adds to the body of knowledge about developing nations, on the nexus of VAIC and financial performance. It reiterates the point that firms should emphasize intellectual capital accounting and disclosure to boost and maintain a motivated workforce and its potentially beneficial effect on firm valuation in this knowledge era.

Keywords: *Intellectual Capital, GPM, ROA, ATR, VAIC*

How to Cite: Chude, I. D., Chude, N. P., & Egbunike, C. F. (2022). Intellectual Capital and Financial Performance of Quoted Manufacturing Firms. *Annals of Human Resource Management Research*, 2(2), 147-160.

1. Introduction

Technological advancements, globalization and the development of an information-driven economy have greatly widened attention on the role of intellectual capital (IC) in achieving competitiveness (Martín-de Castro, Díez-Vial, & Delgado-Verde, 2019). It has long been acknowledged as a crucial factor in the productivity of an organization and an age-long determinant of the strategic competitiveness of a firm (Bartel, 1989; Engelman, Fracasso, Schmidt, & Zen, 2017). Recent studies have shown that intellectual capital is an important strategic asset for any organization desirous of survival in the 21st century (Celenza & Rossi, 2014; Sarea & Alansari, 2016). IC is defined by Dumay, Guthrie, and Puntillo (2015) as “intellectual property, know-how, skills, assets, and data that can be utilized to add value”. It is the vast majority of knowledge that a firm can utilize to add value while conducting business (Zeghal & Maaloul, 2010). Studies have shown that IC is an intangible asset that can determine the earnings potential of a firm as well as its absorptive capacity (Engelman et al.,

2017). Thus, intellectual capital is increasingly being regarded as the paramount asset at the disposal of an organization. In the words of [Enofe, Mgbame, Otuya, and Ovie \(2013\)](#) the write-up “our greatest assets are our people” is a common feature in many annual reports and accounts in the Nigerian context. This phenomenon is also attributed to the growing accounting recognition of intellectual capital which is hinged on the premise that people are as valuable as other organizational resources ([Islam, Kamruzzaman, & Redwanuzzaman, 2013](#)). According to [Beattie and Smith \(2010\)](#), who cites the Institute of Chartered Accountants of England and Wales' past president (ICAEW, 2000), businesses that overlook intellectual capital will become extinct.

The totality of persons that make up an organization's workforce is known as its human resources ([Edom, Inah, & Adanma, 2015](#)). Additionally, the ability of intellectual capital to creatively maximize other resources like land, equipment, and money is a key factor in an organization's success. Intellectual capital efficiency in recent years till date is receiving more attention universally both at the organizational and individual levels. This involves an increased investment in the education and training of employees to improve requisite skills and abilities to bring about efficiency in job performance. IC is becoming more widely recognized as a useful technique for securing a long-lasting competitive edge. People are therefore regarded as having the greatest influence on how value is created. Becker, Huselid and Ulrich (2002) stated that intellectual capital in the organization should be valued based on its performance. To analyze the effectiveness of intellectual capital development, it is necessary to ascertain whether the goals are being achieved or the outcomes are being improved by the actions undertaken. Intellectual capital efficiency has to do with the productivity derived from human beings at a minimized cost. In the modern corporate environment, measuring intellectual capital efficiency has become crucial since it may assist firms in gaining the proper perspective on intellectual capital. At the organizational level, evaluating efficiency informs managers on the ability of the organization to generate profits from the possessed resources.

The Nigerian manufacturing industry is home to several businesses ranging from consumer goods, industrial goods, healthcare, ICT, etc. The study focuses on the manufacturing sector with over fifty companies classified under this sector. The sector has food products, beverages, automobiles, healthcare, ICT, agriculture, personal and household durables goods, also referred to as FMCGs, listed in the sector. In addition, Shohren and Geert (2015) noted that the majority of businesses, particularly sizable ones in developing countries, spend close to 70% of their overall operating budgets on intellectual capital. Against this backdrop, the current study examines the effect of intellectual capital efficiency on the financial performance of quoted manufacturing firms in Nigeria. Studies have been conducted on intellectual capital and financial performance in developed and developing countries. However, the nature of the relationship remains unclear and uncertain in developing and emerging economies ([Kasoga, 2020](#)). Kirfi and Abdullahi (2012), cited in [Enofe et al. \(2013\)](#), consider the concept of human resources accounting in Nigeria to be more of a fantasy than a reality given that intellectual capital is not disclosed in financial statements. They argued that the existing accounting practice lacks regard for intellectual capital as an asset and has also significantly discouraged its disclosure as an asset in the financial statements of corporate firms in Nigeria.

Measuring organizational performance may be inconclusive without considering the effect of intellectual capital efficiency. Intellectual capital cannot be handled the same way businesses manage jobs, goods, and technologies since it is ethereal and elusive. One of the reasons for this is that, unlike material assets, which are managed and owned by the organization, intellectual capital is controlled and owned by the personnel, not the company. If a company's most valuable employees depart, they take their intellectual property and any investments the company may have made in their training and development are lost. Over the years and in recent times, studies on intellectual capital efficiency have confirmed that IC efficiency has a significant relationship with the financial performance of corporate firms but its measurement and reporting represent a major challenge for managers and researchers. This problem originates from a lack of additional data, in addition to the fact that there are strict regulatory requirements and a shortage of workers with the skills required to perform these measurements and analyses. The primary criterion for gauging effectiveness is the alignment of the outcomes with the organization's objectives (Skrzypek & Hofman, 2010). Although estimating

intellectual capital is a particularly challenging undertaking, [Edvinsson \(1997\)](#) argues that it is preferable to “measure roughly what is significant rather than quantify precisely what is inconsequential”.

However, because every business is different and has different needs for intellectual capital, it is challenging to develop a single, uniform model for gauging its effectiveness. Additionally, different methods are used to accomplish organizational goals depending on the theme or character of the specific business in question. Nevertheless, the theory cannot be ignored or overemphasized. Moreover, while intellectual capital is ignored by some organizations as the main factor affecting the overall performance of corporate firms, whenever structural capital investment does not meet the set target, they directly accuse the operator (intellectual capital) of the main source of the problem.

Based on the divergent views of different authors and inconclusive findings ([Agbiogwu, Ihendinihu, & Azubike, 2016](#); [Kwarbai & Akinpelu, 2016](#); [Olowolaju & Oluwasesin, 2016](#)), this forms the rationale of the study. This study empirically examined the effect of VAIC on the ATR, GPM, and ROA of quoted manufacturing firms.

2. Literature Review

2.1. Conceptual Review

2.1.1. Intellectual Capital (IC)

IC is a multidimensional concept with several facets as identified by numerous authors in the literature ([Buallay, Hamdan, Reyad, Badawi, & Madbouly, 2020](#)). According to [Dumay et al. \(2015\)](#), ‘IC includes information, knowledge, expertise, and other assets that can be used to produce value’. The competitive advantage that a company gains from the growth of its knowledge-based assets is reflected in IC’s dynamic dimension ([Pirozzi & Ferulano, 2016](#)).

Table 1. Summary of IC & HC definitions in the literature

Intellectual Capital (IC)		
Author(s)	Year	Definition
Zeghal and Maaloul	2010	The whole of knowledge that a business can employ to add value while conducting business.
Lee	2010	The organization's infrastructure, interactions with partners and stakeholders, ability to innovate and manage change, and staff expertise, experience, and transferrable skills.
Gavious and Russ	2009	The increased worth of a corporation is attributed to assets, usually intangible in nature, as a result of organizational structure, operational procedures, information technology networks, staff competence and productivity, and customer relationships.
Bontis, Keow, and Richardson	2000	An individual's knowledge base gives him or her the ability to offer the best solutions to difficult jobs and duties.
Human Capital (HC)		
Ramezan	2011	“Tacit or explicit information that people hold, as well as their ability to develop it, that is helpful for the organization's mission and encompasses values and attitudes, aptitudes, and know-how”.
Lim, Chan, and Dallimore	2010	HC, which includes values, culture, and philosophy, is “the combined knowledge, wisdom, expertise, competence, skill, intuition, innovativeness, and capacity of the individuals” to accomplish the tasks at hand.

Source: Author’s compilation from the reviewed literature (2021)

Human capital is the culmination of a worker's abilities, tacit knowledge, and skills ([Edvinsson, 1997](#)). The terms ‘intellectual capital’ and ‘human capital’ are frequently used interchangeably however both broadly refer to different conceptualisations. As opined by [Lombardi and Dumay \(2017\)](#) the evolution of intellectual capital has led to its disclosure but no one consistent method exists. The research along

the intellectual capital (IC) spectrum evolved along four key dimensions: firstly, were the advances in IC measurement; second, the development of the concept of “human capital”; thirdly, the “role of IC in new business models”; and, lastly, refers to issues which revolve around the disclosure of IC in corporate reports ([Buallay et al., 2020](#); [Martín-de Castro et al., 2019](#)).

2.1.2. Intellectual Capital Measurement

The Value Added Intellectual Coefficient (VAIC) is a tool used to assess how effectively a company creates value using accounting data ([Pulic, 2000](#)). VAIC is composed of three major components: intellectual capital, structural capital and capital employed; and, the more recent Modified VAIC of human capital, structural capital and relational capital ([Buallay et al., 2020](#)).

1. Intellectual capital efficiency may be simply defined as the ability of an organization to efficiently and cost-effectively manage its intellectual capital. Intellectual capital measures the value-added of the human resources in an organization. Intellectual capital efficiency can be computed as the ratio of Value Added (specifically by the human assets) to Human Costs (which indicates personnel expenses salaries and benefits for the company);
2. Structural capital refers to explicit knowledge that the company has internalized ([Campos & Sánchez, 2000](#)). It is "the complex of resources and information that make up an organization, including its policies, databases, schedules, equipment, and organizational culture" ([Meles, Porzio, Sampagnaro, & Verdoliva, 2016](#)).
3. Relational capital is the knowledge that is obtained from a firm's internal and external relationships ([Buallay et al., 2020](#); [Delgado-Verde, Martín-de Castro, & Emilio Navas-López, 2011](#); [Ferenhof, Durst, Zaniboni Bialecki, & Selig, 2015](#); [Inkinen, 2015](#)). According to [Ramezan \(2011\)](#), relational capital “gathers the value of the relationships that the firm maintains with external agents business activity close by or with other more distant social agents”.

2.1.3. Financial Performance

Financial ratios, the results of calculations made from yearly reports and accounts, are used to assess a company's financial success. The management is interested in all facets of financial analysis because it is their duty to use the resources of the company effectively and efficiently. The profitability of the business is the main concern of the shareholders (investors), who also pay close attention to the company's present and future earnings. The providers of long-term debt focus on both long- and short-term solvency and assess the capital structure relationships between different sources of funding (Osisioma, Egbunike, & Jesuwunmi, 2015). Lenders, on the other hand, are worried about the company's capacity to pay its claims in a very short amount of time. As a result, their analysis will be limited to evaluating the firm's liquidity position. Profitability is important to the government because it helps it determine its tax obligations, secure its survival, and promote economic growth. Customers are concerned with the company's continuous existence so that supplies can be maintained at potentially lower rates without compromising standards, whereas employees are concerned with the stability and longevity of the business because it is essential to their livelihoods and pay. Ratios of profitability, activity, leverage, and liquidity are the firm's financial ratios that can be used to determine all of these. The capacity of a company to fulfill its immediate obligations is gauged by liquidity ratios. The ratio of debt to equity used to finance a company's assets is shown by leverage ratios. Profitability ratios gauge the company's overall efficacy and performance, whereas activity ratios show how well it uses its resources. The current study focuses on three financial ratios, namely the Assets Turnover Ratio (ATR), Gross Profit Margin (GPM), and Return on Assets. The ratios will be discussed as follows:

1. Assets Turnover (ATR)

This financial ratio assesses how well a corporation uses its resources to produce sales revenue or income for the business. In other terms, asset turnover refers to the link between sales and assets. The higher the ratio, the better the company's performance. It is represented as $\text{Sales} \div \text{Total Assets}$.

2. Gross Profit Margin (GPM)

This is a financial ratio used to assess the financial performance of an organization and it is calculated as $\text{revenue less cost of goods sold as a percentage of total revenue}$. Mathematically, it is represented as $\text{Gross Profit/Sales} \times 100$. The average difference between the cost of products sold and sales income is shown by this ratio. An organization can produce at a significantly lower cost if it has a

large gross profit margin in comparison to the industry average. It is a sign of good or optimal performance by management.

3. Return on Asset (ROA)

It is commonly defined as net income (profit) after tax as a percentage of total assets. That is $\text{Net Income} / \text{Total Assets} \times 100$. ROA provides insight into how well management uses its assets to produce profits.

2.2. Conceptual Framework

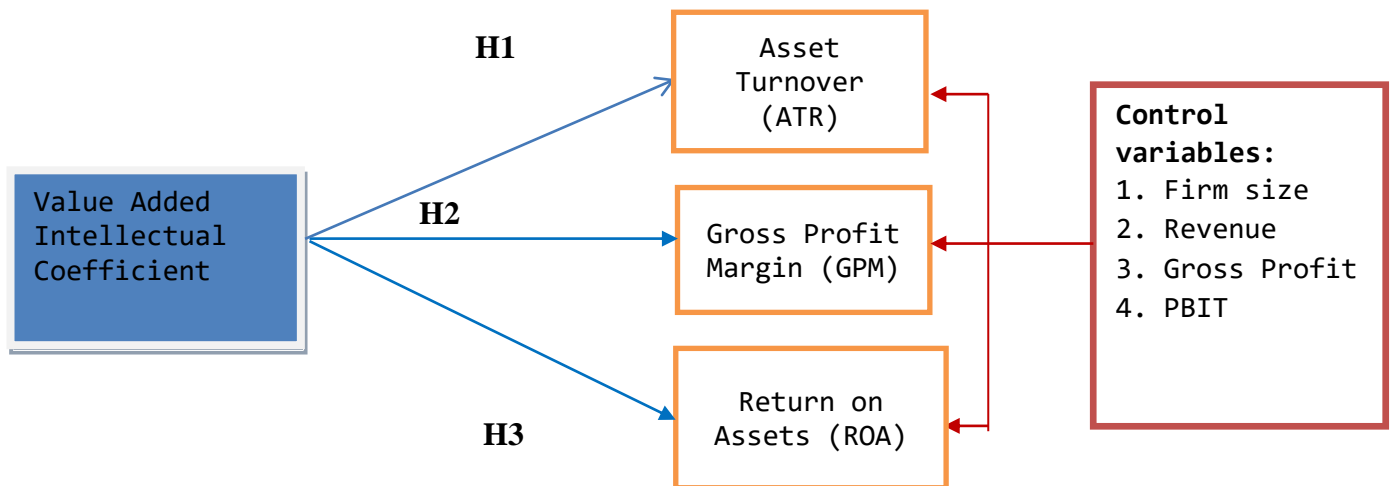


Figure 1. The relationship between the independent and dependent variables is shown schematically.

Source: Author's Conceptualisation (2021)

The conceptual model shown above describes the effect of the intellectual capital proxy, i.e., VAIC on the dependent variables (ATR, GPM, and ROA). The diagram displays a few firm-specific variables that have been found in the literature to have an impact on the link between IC and financial performance ([Adebawojo, Enyi, & Adebawo, 2015](#); [Agbiogwu et al., 2016](#); [Babajee, Seetanah, & Nunkoo, 2020](#); [Buallay et al., 2020](#); [Okpako, Atube, & Olufawoye, 2014](#); [Omodero, Alpheaus, & Ihendinihu, 2016](#)). The study employs firm size, revenue, gross profit, and PBIT to control for firm-specific factors affecting financial performance. The variable firm size was included because the size of a firm largely determines its performance over time.

2.1.5. Intellectual Capital and Asset Turnover Ratio

The literature documents mixed findings on the effect of intellectual capital on Asset Turnover Rate (ATR). In a study conducted by [Buallay et al. \(2020\)](#), the authors reported that MVAIC had a negative non-significant effect on ROA. [Kwarbai and Akinpelu \(2016\)](#) in Nigeria using a sample of industrial goods companies found an insignificant negative relationship between human capital efficiency and size. Similarly, [Omodero et al. \(2016\)](#) using a sample of 10 firms found no significant effect of personnel benefit costs on firm turnover.

2.1.6. Intellectual Capital and Gross Profit Margin

Studies have shown mixed findings on the effect of intellectual capital on financial performance. For instance, [Sardo, Serrasqueiro, and Alves \(2018\)](#) using a sample of Small-and-Medium hotels in Portugal found a positive effect of intellectual capital components, i.e., human capital, relational capital, and structural capital on financial performance. Similarly, [Agbiogwu et al. \(2016\)](#) in Nigeria found a significant positive effect of staff cost on Net Profit Margin.

2.1.7. Intellectual Capital and Return on Assets

Studies have shown a positive relationship between intellectual capital and ROA. Using a sample of Thai banks, [Tran and Vo \(2018\)](#) showed that the relationship between Value-Added Intellectual Coefficient (VAIC) and financial performance (return on assets [ROA]) are positively related. This

finding was consistent with the study of [Thakur \(2017\)](#) using a sample of Indian banks, which reported a significant positive association between VAIC and financial performance.

2.1.8. VAIC

The Value-Added Intellectual Coefficient is an analytical method for evaluating the effectiveness of human (intellectual) capital (VAIC). It was created to make it possible for the management, shareholders, and other key stakeholders to effectively track and assess how effectively the firm's overall resources and each significant resource component are being used. The methodology offers a fresh perspective on how the organization measures and tracks the effectiveness of value generation using accounting-based metrics. The Value Added Intellectual Coefficient (VAIC), according to experts, generates quantitative and objective measurements without the need for any subjective grading or the giving of points or scales. The coefficients enable management to see how effectively the company's resources create value. The higher the coefficient, the better management utilizes the company's value-creation potential. It provides a concrete basis for comparing the human (intellectual) capital of different companies (Kujansivu & Lonnqvist, 2007). The management's ability to maximize the company's potential for value generation is reflected in the coefficient.

2.2. Empirical Review

[Babajee et al. \(2020\)](#) analyzed the impact of intellectual capital on the financial performance of 43 hotels in Mauritius. The authors employ secondary data from the years 2007 to 2017 analyzed using a panel data regression framework and found evidence of a significant positive effect of intellectual capital on financial performance. However, the result also confirms evidence of a reverse cause-effect for financial performance on intellectual capital.

[Buallay et al. \(2020\)](#) examined the relationship between intellectual capital efficiency and three proxies of financial performance, i.e., ROA, ROE and Tobin's Q. The sample comprised 59 banks from the GCC region, and secondary data from annual reports and accounts from 2012 to 2016 was analyzed using multiple regression techniques. The results showed that human capital, relational capital and capital employed efficiency were significant and positively affected ROA; while MVAIC had a negative non-significant effect on ROA. The authors recommended that banks in the GCC region pay greater attention to intellectual capital to bridge the gap between banks' value as reported in financial statements and actual market value.

[Gama, Wiagustini, Sedana, and Purbawangsa \(2020\)](#) examined the nexus of intellectual capital and financial performance. The authors utilize secondary data from a sample of 34 banks listed on the Indonesian Stock Exchange over five years. They proxy financial performance using CAMEL ratios and utilized the panel data regression technique to analyse the data. The results revealed a positive effect of intellectual capital on capital, asset quality, management, and earnings.

[Sardo et al. \(2018\)](#) explored the relationship between intellectual capital and financial performance. The authors utilized secondary data from a sample of 934 small-and-medium hotels in Portugal. The data was analyzed using the system GMM estimator. The results showed that the intellectual capital components of human capital, relational capital, and structural capital positively affect financial performance.

[Agbiogwu et al. \(2016\)](#) investigated the effects of human capital cost on the profitability of banks in Nigeria using empirical data from First Bank and Zenith Bank for the periods 2010 to 2014. The study adopted the content analysis method and linear regression model to test the formulated hypotheses. The results revealed that staff cost significantly affects EPS, NPM, and ROCE by banks. The authors recommend, among other things, that a uniform standard for the identification and measurement of human capital assets be implemented.

[Kwarbai and Akinpelu \(2016\)](#) looked at the effects of human capital efficiency on the corporate performance of industrial goods companies listed on the Nigerian Stock Exchange (2009–2014). They made use of the Value Added Intellectual Coefficient (VAIC) methodology's human capital

component. The research used secondary data that was examined with linear regression models. The findings showed that human capital efficiency had a considerable positive impact on ROA and EPS and a negligible negative association with size, which followed human capital efficiency and staff growth. They advise businesses to regularly invest in staff training and development, as well as to make sure their workplaces are comfortable for them, to ensure improvement in employees' productivity and performance.

[Olowolaju and Oluwasesin \(2016\)](#) examined the effect of human capital on the profitability of quoted manufacturing companies in Nigeria. The sample comprised 10 manufacturing firms listed on the Nigerian Stock Exchange. The study relied on secondary data sources. They employed the panel regression technique to analyze the data. The results revealed a positive relationship between human capital and profitability. The authors recommended that companies place greater emphasis on human capital, maintaining it and treating it as a pure asset will motivate the workforce.

[Omodero et al. \(2016\)](#) in their study titled "Human resource costs and financial performance: Evidence from selected listed firms in Nigeria". The study relied on secondary data from published financial statements of 10 firms quoted on the Nigerian Stock Exchange. The data were analyzed using the OLS technique and the results indicate that personnel benefit costs have a positive and significant effect on profitability. However, the findings show that employee benefit expenditures have no discernible impact on business turnover. The report makes recommendations for increased investment in training and personnel development as well as in providing the right infrastructure and a happy work environment to improve employees' ability to contribute to improvements in corporate financial performance.

[Adebawojo et al. \(2015\)](#) in their work titled "Human Asset Accounting and Corporate Performance", conducted their research on all eighteen publicly quoted banks in the Nigerian Capital Market. They adopt the ex-post facto research design and questionnaire for data collection. The hypotheses were tested using the simple regression model. The result confirmed that human asset accounting significantly affects banks, performance. They recommend disclosure of human assets as intangible assets in the Statement of Financial Position.

[Ifurueze, Odesa, and Ifurueze \(2014\)](#) in their study titled, "Impact of Aggregated Cost of Human Resource on Profitability", examined the effect of aggregated and disaggregated cost of human resources on organizations' profitability. The data were extracted from internal sources using a structured information card and annual financial report, while regression analysis was used for hypothesis testing. The findings showed a positive relationship between profitability and human resource cost. The study suggests that businesses adopt a culture of capitalizing and disclosing all investments in people that raise standards of quality and productivity.

[Khadijeh and Arash \(2014\)](#) empirically analyzed the relationship between the value of human resources and firms' stock prices and financial performance. The data was collected from eight selected Manufacturing companies listed in the BSE-500 Index for the years 2005-06 to 2011-12. The study adopts regression analysis and correlation in testing the postulated hypotheses. Their findings reveal that human asset has no impact on stock price and human value is positively and negatively affected by the financial performance of the companies. The correlation results show that ROA does not affect human resource value, current ratio and acid ratio, while human resource value has a negative relationship with liquidity ratios and a positive relationship with two financial variables (i.e. sales revenue and net income).

[Okpako et al. \(2014\)](#), in their study "Human Resource Accounting and Firm Performance", determined the relationship between HRA and firms' performance. The study surveyed seven companies quoted on the Nigerian Stock Exchange, using primary and secondary data and adopted the principal component analysis to quantify the responses. The study revealed that HRA variables impacted positively the level of firms' performance. They recommend that HR value should be

ascertained and introduced to the Statement of Financial Position as an intangible or intermediate asset as it increases the assets of organizations.

2.2.1. Gap in the Study

Prior studies have examined the effects of intellectual capital efficiency (or human resources) on corporate performance. The majority of the studies have found a positive relationship between intellectual capital efficiency and firm performance ([Gama et al., 2020](#)) while others report a negative or weak relationship between the two variables ([Buallay et al., 2020](#)); yet others discover no relationship at all. In the Nigerian context, mainly studies have focused on a sample of banks as the scope. Hence, this study tries to fill the gap by investigating the degree of effect of intellectual capital on Nigerian manufacturing firms quoted on the Nigerian Stock Exchange. That is if the effect is positive or negative, is it significant or is it just a positive or negative effect? The study also concentrates on quoted manufacturing firms in Nigeria selected from the consumer goods sector because the workforce of such manufacturing firms is always engaged in productivity through intellectual capital and based on this fact, performance can be measured.

2.3. Theoretical Framework

The current study is anchored on the resource-based theory. The theory is described in further detail below as follows:

2.3.1. Resources-Based View (RBV) Theory:

The focal point of this theory is how organizations can achieve and maintain competitive advantage from the use of their resources. As stated in [Wernerfelt \(1984\)](#) resources refer to anything which can strengthen or weaken a firm. [Barney \(1991\)](#) opines that resources are valuable when they utilize the advantage of an opportunity or reduce a threat in a firm's environment. To gain a competitive advantage, the resources must meet two conditions: first, the available resources to competing firms must be variable among competitors; and, secondly, such resources must be immobile, that is, not easily obtained. In this context, intellectual capital is an asset sustained that provides a source of competitive advantage ([Buallay et al., 2020](#)).

3. Methodology

3.1. Research Design

The study adopts the ex post facto research design. Also referred to as 'after the fact', the researcher cannot manipulate the variables during the study ([Ary, Jacobs, Razavieh, & Sorensen, 2009](#)). The researchers sought to establish a cause-and-effect link between the dependent and independent variables, hence the design is acceptable for the current study. The population comprised of quoted consumer goods manufacturing firms on the Nigerian Stock Exchange (NSE). The justification of this sector was premised on the previously established scope of the study of manufacturing companies that provide goods and services.

3.2. Sample Size of the Study

The study utilizes the non-probability sampling technique (i.e. convenience sampling method) to select firms included in the final sample for the study. The final sample consisted of twenty (20) quoted consumer goods manufacturing firms on the NSE for a period of 9-years. This is considered adequate for regression analysis from prior studies. The firms selected were limited to those with available data on the variables of interest for the period of the study.

3.3. Sources of Data for the Study

The study utilizes secondary data obtained from annual reports of the firms. The data covered a period of nine years from 2011 to 2019. The annual reports are considered reliable because it is signed by management, approved by the Security and Exchange Commission (SEC) and finally audited by external auditors. This is also consistent with that utilized in prior studies of a similar nature.

3.4. Method of Data Analysis

The study utilized descriptive and inferential statistical procedures to analyze the data. The study employs panel data methodology because of the nature of the data. The hypotheses are tested using the pooled OLS technique with the aid of the E-Views software.

3.4.1. Decision Rule

A 5% level of significance will be used to base the judgment. If the probability value estimated exceeds or equals the indicated 5% level of significance, accept the null hypothesis (Ho); otherwise, reject and accept the alternate hypothesis (Ha) if the probability value or significance determined is below the 5% level of significance.

3.4.2 Model Specification

$$ATR_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Firm\ Size_{it} + \beta_3 REV_{it} + \beta_4 GP_{it} + \beta_5 PBIT_{it} + \varepsilon_{it} \quad \dots\dots Eq. 1$$

$$GPM_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Firm\ Size_{it} + \beta_3 REV_{it} + \beta_4 GP_{it} + \beta_5 PBIT_{it} + \varepsilon_{it} \quad \dots\dots Eq. 2$$

$$ROA_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 Firm\ Size_{it} + \beta_3 REV_{it} + \beta_4 GP_{it} + \beta_5 PBIT_{it} + \varepsilon_{it} \quad \dots\dots Eq. 3$$

Where:

β_{1-5} represents the regression coefficient;

ε is the error term;

i represents individual firms and t represents the time/year.

The model was adapted from the studies, by [Buallay et al. \(2020\)](#), and in the Nigerian context of [Agbiogwu et al. \(2016\)](#) and [Kwarbai and Akinpelu \(2016\)](#).

Table 2. Description of the model variable

Dependent variables		
ATR	Asset turnover rate	Net sales / Average assets
GPM	Gross profit margin	Gross profit / Revenue
ROA	Return on assets	Net profit before interest and taxes / Average assets
Independent variable		
VAIC	Value Added Intellectual Coefficient	Calculated as: ICE + SCE + CEE; where ICE is Intellectual capital Efficiency, SCE is Structural Capital Efficiency, and CEE is Capital Employed Efficiency.
Control variables		
Firm Size	Average Assets	Natural logarithm of average assets
REV	Revenue	Natural logarithm of total revenue for firm i at time t
GP	Gross profit	Revenue – Cost of sales
PBIT	Profit before interest and tax	Gross profit – SGA Expenses

Source: Authors Computation 2021

4. Data Analysis and Results

The study's data were collected from the sampled companies' annual reports and accounts.

4.1. Test of Hypotheses

4.1.1. Hypothesis One:

Ho₁: There is no significant effect of VAIC on the ATR of quoted manufacturing firms.

Table 3. Pooled OLS output for hypothesis one

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.090026	0.031113	35.03477	0.0000
VAIC	-1.22E-09	1.76E-09	-0.694394	0.4899
Firm Size	-7.68E-09	8.31E-10	-9.247810	0.0000
Revenue	7.02E-09	8.40E-10	8.360539	0.0000

Gross Profit	4.50E-09	2.46E-09	1.830957	0.0718
PBIT	-4.02E-09	4.22E-09	-0.950858	0.3453
R-squared	0.598232	Mean dependent var		1.088571
Adjusted R-squared	0.566843	S.D. dependent var		0.257609
F-statistic	19.05915	Durbin-Watson stat		2.117120
Prob(F-statistic)	0.000000			

Source: E-Views 9.0

The regression result shown above indicates that the model had an R-squared value of 0.598 and the adjusted R-squared value was 0.567. The model with explanatory or predictor variables accounts for 56.7% of the dependent variable; while, unexplained variation, i.e., *error term* or *stochastic random variable* captures the remaining 43.3% of the model. Table 3 above shows that the explanatory variables have a significant effect on the Asset Turnover Rate (ATR) of quoted manufacturing firms, (F-statistic = 19.059; p-value = 0.000). The shaded section is used to validate the hypothesis. The decision rule is to accept the null hypothesis (Ho) if the probability value calculated is greater than or equal to (\geq) stated 5% level of significance (α); otherwise, reject and accept the alternate hypothesis (Ha). The probability value is 0.4899, and the coefficient of VAIC is also negative (-1.22E-09), the null hypothesis is therefore accepted and alternate rejected. Therefore, there is no significant effect of the value-added intellectual coefficient on the Asset Turnover Rate (ATR) of quoted manufacturing firms.

4.1.2. Hypothesis Two:

Ho₂: There is no significant effect of VAIC on the GPM of quoted manufacturing firms.

Table 4. Pooled OLS output for hypothesis two

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.295405	0.011027	26.79012	0.0000
VAIC	5.79E-10	6.24E-10	0.927861	0.3570
Firms Size	-8.73E-10	2.94E-10	-2.966568	0.0042
Revenue	-2.58E-10	2.98E-10	-0.864895	0.3903
Gross Profit	5.33E-09	8.71E-10	6.123931	0.0000
PBIT	-3.77E-09	1.50E-09	-2.517728	0.0143
R-squared	0.763618	Mean dependent var		0.315129
Adjusted R-squared	0.745151	S.D. dependent var		0.119027
F-statistic	41.34971	Durbin-Watson stat		1.932960
Prob(F-statistic)	0.000000			

Source: E-Views 9.0

The regression result shown above indicates that the model had an R-squared value of 0.764 and the adjusted R-squared value was 0.745. The model with explanatory or predictor variables accounts for 74.5% of the dependent variable; while, unexplained variation, i.e., *error term* or *stochastic random variable* captures the remaining 25.5% in the model. Table 4 above shows that the explanatory variables have a significant effect on the Gross Profit Margin (GPM) of quoted manufacturing firms, (F-statistic = 41.349; p-value = 0.000). The shaded section is used to validate the hypothesis. The decision rule is to accept the null hypothesis (Ho) if the probability value calculated is greater than or equal to (\geq) stated 5% level of significance (α); otherwise, reject and accept the alternate hypothesis (Ha). The probability value is 0.3570, and the coefficient of VAIC is also positive (5.79E-10), the null hypothesis is therefore accepted and alternate rejected. Therefore, there is no significant effect of the value-added intellectual coefficient on the Gross Profit Margin (GPM) of quoted manufacturing firms.

4.1.3. Hypothesis Three:

Ho₃: There is no significant effect of VAIC on the ROA of quoted manufacturing firms.

Table 5. Pooled OLS output for hypothesis three

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.173039	0.020524	8.431120	0.0000
VAIC	6.01E-10	1.16E-09	0.517400	0.6067
Firm Size	-1.25E-09	5.48E-10	-2.287852	0.0255
Revenue	4.92E-10	5.54E-10	0.887193	0.3783
Gross Profit	-1.27E-09	1.62E-09	-0.786002	0.4348
PBIT	6.38E-09	2.79E-09	2.291485	0.0252
R-squared	0.309365	Mean dependent var		0.167447
Adjusted R-squared	0.255410	S.D. dependent var		0.129612
F-statistic	5.733679	Durbin-Watson stat		1.950252
Prob(F-statistic)	0.000197			

Source: E-Views 9.0

The regression result shown above indicates that the model had an R-squared value of 0.309 and the adjusted R-squared value was 0.255. The model with explanatory or predictor variables accounts for 25.5% of the dependent variable; while, unexplained variation, i.e., *error term* or *stochastic random variable* captures the remaining 74.5% of the model. Table 5 above shows that the explanatory variables have a significant effect on the Return on Assets (ROA) of quoted manufacturing firms, (F-statistic = 5.734; p-value = 0.000). The shaded section is used to validate the hypothesis. The decision rule is to accept the null hypothesis (Ho) if the probability value calculated is greater than or equal to (\geq) the stated 5% level of significance (α); otherwise, reject and accept the alternate hypothesis (Ha). The probability value is 0.6067, and the coefficient of VAIC is also positive (6.01E-10), the null hypothesis is therefore accepted and alternate rejected. Therefore, there is no significant effect of the value-added intellectual coefficient on the Return on Assets (ROA) of quoted manufacturing firms.

4.2. Discussion of Findings

The VAIC had a non-significant negative impact on listed manufacturing businesses' asset turnover rates (p=0.4899), according to the first hypothesis. These results concur with those of [Buallay et al. \(2020\)](#), who discovered that MVAIC had a detrimental but non-significant impact on ROA. An insignificantly negative association between human capital efficiency and size was discovered in Nigeria by [Kwarbai and Akinpelu \(2016\)](#) utilizing a sample of industrial goods enterprises. Similarly, [Omodero et al. \(2016\)](#) did not discover any appreciable impact of employee benefit expenditures on company turnover using a sample of 10 firms.

The value-added intellectual coefficient had a non-significant positive impact on the quoted manufacturing firms' gross profit margins (p=0.3570) according to the second hypothesis. This is somewhat in line with the research of [Sardo et al. \(2018\)](#), which examined a sample of small-and medium-sized hotels in Portugal and discovered that human capital, relational capital, and structural capital all had a beneficial impact on financial performance. In Nigeria, [Agbiogwu et al. \(2016\)](#) found that personnel costs had a sizable beneficial impact on the net profit margin.

The *third hypothesis* showed a non-significant positive effect of the value-added intellectual coefficient (p=0.6067) on the Return on Assets (ROA) of quoted manufacturing firms. This is consistent with the findings of [Adebawojo et al. \(2015\)](#); [Agbiogwu et al. \(2016\)](#); [Babajee et al. \(2020\)](#); [Kwarbai and Akinpelu \(2016\)](#); [Okpako et al. \(2014\)](#); [Omodero et al. \(2016\)](#) found a positive effect of human capital or intellectual capital on organizational financial performance. The study by [Babajee et al. \(2020\)](#) in Mauritius found evidence of a significant positive effect of intellectual capital on financial performance. The study by [Buallay et al. \(2020\)](#) found a significant positive effect of human capital, relational capital and capital employed efficiency on ROA. In Indonesia, [Gama et al. \(2020\)](#)

using a sample of banks found a positive effect of intellectual capital on capital, asset quality, management, and earnings. However, the findings do not align with the findings of [Khadijeh and Arash \(2014\)](#) that revealed human or capital assets have no significant effect on firms' financial performance.

5. Conclusion

The study concludes that IC affects the financial performance of quoted manufacturing firms quoted on the NSE. However, the results revealed mixed findings. The VAIC had a positive effect on profitability measures and a negative effect on the assets turnover rate. The sample was delimited to consumer goods manufacturing firms quoted on the NSE. The study makes several recommendations based on the empirical findings, for policymakers and managers in manufacturing firms:

1. Firms should place more emphasis on intellectual capital accounting and disclosure to boost and maintain a motivated workforce and should also commit to the development of employees to improve employee productivity and avoid redundancy of human assets. In addition, the capitalization of intellectual capital cost, which involves all costs related to the expenses incurred in enhancing the knowledge, education, expertise and skills of employees.
2. There is a need for managers to develop competencies in human resource accounting of an organization which is a crucial factor to decision-makers thereby permitting or allowing the shareholders and stakeholders to make informed decisions on the intellectual capital efficiency of the firm. Managers should establish the level of intellectual capital efficiency that can be said to be optimal, so that, organizational financial performance can be improved.
3. The managers should foster a culture of capitalizing and disclosing all investments in intellectual capital, which boosts productivity and financial performance inside the firm, so that management and stakeholders may decide how quickly human resources are employed to generate revenue. The Financial Reporting Council of Nigeria (FRCN) and other relevant organizations should also develop accounting standards for intellectual capital accounting measurement in order to guarantee uniformity in disclosures, reliable comparisons of intellectual capital, and an efficiency value for intellectual capital.

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