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## Can the CEO Improves Intellectual Capital?

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### Abstract

Intellectual capital is largely examined in association with the larger corporate governance structure. There is practically no empirical work on the relationship with the CEO. Meanwhile, it is the CEO that has the onerous task of utilizing the intellectual capital assets available to the organization from its employees. In view of this deficiency, this study examines the influence of the CEO in improving the intellectual capital assets of the firm. In this research, CEO is proxied by CEO duality, nationality, gender, tenure, turnover, and share ownership; while, intellectual capital is measured by value-added intellectual capital score. The data set is collected from the annual reports and accounts of the firms and analysed by the use of descriptive statistics, correlation and regression analysis after regression diagnostics. The findings suggest that CEO has significant influence on intellectual. The study, therefore, concludes that CEO attributes are determinants of intellectual capital of non-financial services firms in Nigeria. These findings are however, limited to listed non-financial services firms and the control variables used. Also, the relationship between CEO and intellectual is established by this study, how to carry out the needed improvements requires further investigation.

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## 1. Introduction

Intellectual capital (IC) is not well harnessed in developing worlds in general and in Nigeria in specific. This probably accounts for the low development status and the massive lack of infrastructure amidst high level of poverty, unemployment and the wide gap between the rich and the poor. Corporations can help in these regards particularly if they can harness the vast potentials available in terms of intellectual capital among the people from whom they employed.

In spite of the lack of utilization of IC in Nigeria, there is no short of academic articles on the subject. However, most of these articles associated IC with some other subjects. The purpose of this article, therefore, is to examine the effects of CEO attributes on the intellectual capital of Nigerian listed non-performing financial services companies. It is the wish of this paper to see that the CEO who is probably the most active person in charge of the affairs of the firm can bring to bear some of the desired changes to the problem of harnessing the potentialities engraved in intellectual capital. As Stewart (2010) described it, IC is the new wealth of organizations.

The CEO is the highest ranking official employee in any company. Although, the CEO represents the interests of core investors, the CEO is an employee, may be special employee or employee number one. The CEO reports to the board of directors and therefore, it must be properly recognized that the CEO is at the pleasure of the board. The CEO core responsibilities include setting and implementing strategy, allocating resources, and building the executive team and overseeing performance on a regularly basis.

The CEO must therefore possess strong communication skills, great leadership acumen, and unparalleled passion for the firm and its owners and other stakeholders. A CEO may take on other functions in order to ensure that the bottom-line is achieved within a responsible budget. In a

number of organizations, the job of the CEO is largely business development. Other employees can bring in their skills and knowledge to kill the job once the job is within the reach courtesy of the CEO.

The CEO is seen in this paper with six CEO characteristics; namely, CEO duality, gender, ownership, nationality, tenure, and turnover. It must be recognized that other CEO attributes are readily recognized such as age, ethnicity, education, and experience. Future studies may cover these features, however, this paper limits the CEO attributes to the six earlier mentioned.

This article would be useful to regulators, shareholders, lenders and other stakeholders as the CEO is expected to bring to bear improvements in harnessing the potentials engraved in intellectual capital. For example, governments at various levels would benefit in terms of reduction of unemployment as corporate organizations developed new capacities in utilizing the human resources available in the country. Furthermore, tax authorities would be in position to collect increased tax revenue from both the individual employees and corporate tax as result of improvements in the utilization of human capital.

Corporate regulators such as the Nigerian Exchange Group, the Securities and Exchange Commission, the Financial Reporting Council, and so on would have their jobs made easy for them once the companies are doing well under their watchful eyes. In addition, both existing and potential shareholders would smile home knowing very well that the corporations to receive their investment capitals are clearly known to them. For example, the most admirable corporations in the world (Apple, Amazon, Microsoft, Walmart, BP, Meta, Alphabet, Berkshire, Tesla, Tencent, Visa, Johnson & Johnson, Alibaba Group, Saudi Aramco, ExxonMobil, AT&T, Nvidia, Coca-Cola, Bank of America, JPMorgan Chase, Cisco, Intel, NASDAQ, and Home Depot) are not the results of accident. Rather they have distinguished themselves largely speaking

in terms of their abilities to utilize the human assets available to them.

## 2. Literature Review

### 2.1 The CEO

A CEO is the top ranking executive in an establishment. Widely speaking, the CEO makes major corporate decisions, manage day to day operations, and manage communications with the board of directors, shareholders, regulators, tax authorities, lenders, clients/customers, suppliers, and internal parties such as employees and management staff. In several companies, the CEO is the known public face. Though, the CEO is elected or appointed by the board of directors and its shareholders, they report to the chair and the board who are also appointed by the shareholders of the firms.

The CEO duties vary from company to company depending on their sizes, experiences, cultures, structures, value systems, and owners. In some organizations, the CEO only deals with high strategic decisions such as strategies, cultures, organizing, while, in some others, the CEO may be involved in petty activities because they are handy and daily available.

A study from Harvard revealed that CEOs spend 72% of their time in meetings, while 28% alone; 25% on relationships, 25% on reviewing businesses, 21% on developing strategy, 16% on culture and organizing, 1% on crisis management, and 3% on customers relations. The remaining 9% on personal stuffs. Nevertheless, it is important to note that the CEOs set the tone, vision, and culture for their organizations. In this paper, CEO effects on IC are seen through their attributes such as duality, gender, tenure, nationality, share ownership, and turnover.

### 2.2 Intellectual Capital

IC is the value a company derives from its employees' knowledge, skills, training, know-how, and any information that may provide the firm with a competitive advantage over others. It is also defined as the value of a company's collective knowledge and resources that can provide it

with some form of economic advantage. It is often called intangible assets such as goodwill, patents, rights, and intellectual properties. They may not be seen physically, but they are IC assets so long as they provide the organization economic and financial benefits. Several IC assets are readily classified by researchers: human, relational, structural, and capital employed.

Human capital represents the skills, education, experiences, and value of employees. It represents the know-how and expertise of individuals in the firm. These assets can bring to the company enhanced value. It is not in doubt the value of late Steve Jobs at Apple, Bill Gate at Microsoft and Jeff Bezos at Amazon, to mention few.

Relational capital refers to all the social networks in terms of relationships that a firm maintains with clients, customers, suppliers, partners, and several other external parties. As the saying goes, 'organization's network is its net worth'. The networks come from brand names, reputation, trademarks, goodwill, and treatment of people.

Structural capital comes from the organization processes, innovation, and technologies that support both human and relational capital. It comes from culture, processes, databases, systems, structures, intellectual property, and non-physical assets.

Capital employed refers to how firm's capital is used to generate revenue, including cost of generating the revenue within the context of the total assets available to the firm. It is important to note at this point that ability to generate revenue is fundamental to firm's survival.

### 2.3 Theory of Agency

Agency theory is a long old theory, which relates the principal (shareholders) with the agent (management and other players). It is must recognized that the CEO is the face of management as far as the firm is concerned. Therefore, in discussing the relationship between the CEO and intellectual capital, it is must be noted that the CEO is representing the interests of shareholders and as a result agency theory applies. The

theory resolves the potential conflict between the shareholders and CEOs by making it clear that the job of the CEO is to protect the interests of shareholders at all times as far as the affairs of the corporation is concerned.

#### 2.4 Theory of Stewardship

As the name suggests, stewardship theory connotes that the firm is a steward at the mercy of shareholders and other stakeholders, including the communities in which the firm operates, to serve them. In this regard, the CEO is the public face of the firm and should serve the interests of all stakeholders. The key word here is service (steward) and the CEO must be seen as serving the people.

#### 2.5 Theory of Stakeholders

The stakeholders' theory refers to the understanding that the firm has several stakeholders, including people inside and outside the firm, such as governments, regulators, tax authorities, shareholders, board, employees, suppliers, customers, clients, lenders, etc. Therefore, it is the responsibility of the firm to ensure that the interests of these stakeholders are balanced at all times. This perspective probably gave rise to the concept of corporate social responsibility which has received wide attention today in both theoretical and empirical literatures.

#### 2.6 CEO and Intellectual Capital

Empirically, Nadeem et al. (2021) examined the relationship between chief executive officers (CEO) managerial ability and investments in IC and found a positive significant association with investments in human, innovation and relational capital. Also, Ullah et al. (2022) examined the association between CEO ethical leadership and corporate social responsibility and IC. They found positive and significant relationship particularly in human and social capital.

Hidalgo et al. (2011) examined the relationship between corporate governance and IC and found board size to have positive relation with IC but negative association with

institutional investors. Further, Battisti et al. (2021) examined the association between CEO and IC in China Stock 100 Index for over 2016-2018. The results suggested a positive impact on IC, when the CEO is a woman, and the lower the age the higher the effect was.

Similarly, Mardini and Lahyani (2020) examined the impact of firm financial performance and corporate governance mechanisms on IC disclosure (ICD) of SPF-120 companies using agency and impression management theories. They found that firm financial performance (FFP) indicators play a vital role in the extent of ICDs. Among the corporate governance mechanisms, they found that cultural and gender diversity affected some ICD components. Moreover, CEO characteristics such as age, education and role duality affected ICD, while institutional ownership drove the extent of such disclosures. Also, Bontis and Nikitopoulos (2007) talked about the growing importance of IC in a book, titled, '*Managing Organizational Knowledge by Diagnosing IC: Framing and Advancing the State of the Field*'.

In addition, Cerbioni and Parbonetti (2007) explored the effects of corporate governance on ICD using European biotechnology companies. Their results suggested that governance-related variables strongly influenced the quantity of information disclosed. Specifically, their results showed that the proportion of independent directors was positively related to the disclosure; CEO duality was negatively linked to the disclosure of forward-looking information, and board structure helped to improve the annual report's overall readability.

Abhayawansa and Guthrie (2010) reviewed and synthesized current knowledge on the importance of intellectual capital (IC) information to the capital market. They concluded that these studies provided evidence on the usefulness/importance of many types of IC information. They also found evidence from IC disclosure studies on initial public offering prospectuses sheds light on perceived importance of types of IC information to the capital market. Also,

O'Regan et al. (2001) used Irish software/telecom sector to provide empirical evidence in support of the continuing and central importance of intellectual capital. The findings demonstrated consistency in the composition of the human, internal and external components of intellectual capital.

Bose and Thomas (2007) examined IC in relation to the issue of measuring performance of a major Australian company (The Fosters Brewing Group), where a newly appointed CEO reversed a decline in performance by adopting, among other initiatives, the balanced scorecard approach to management. Also, Bontis (2003) outlined a study in which content analysis was conducted on the annual reports of 10,000 Canadian corporations. A list of intellectual capital related terms was searched within the annual reports yielding a significantly small number of instances in which intellectual capital disclosure took place. A major recommendation for corporations who are concerned with their relationship with the capital markets is to develop strategic and tactical initiatives that provide for voluntary disclosure of intellectual capital.

Furthermore, Hooper (2016) examined the relationship between CEO compensation and intellectual capital as a measure of organizational performance of 90 firms listed on NASDAQ Exchange over 2009-2014 using VAIC model. The results found capital employed efficiency, a subcomponent of VAIC, was the sole significant predictor of the variance in CEO compensation. Caddy (2000) contended that the current treatment of intellectual capital possessed by organizations has been somewhat superficial. He argued that intellectual capital is more appropriately derived as a net figure (subtracting intellectual liabilities from intellectual assets) rather than a mere summation of the organization's identified intellectual assets.

Tseng et al. (2005) examined the relationship between intellectual capital and corporate value in an emerging economy. From the empirical findings, for Taiwanese manufacturers, a positive relationship existed between intellectual capital and corporate value. Also, Muttakin et al.

(2015) undertook an empirical examination of the relationship between corporate governance and the extent of ICD of Bangladeshi companies. Their key findings suggested that there was a non-linear relationship between family ownership and the extent of ICD; foreign ownership, board independence, and the presence of audit committees were positively associated with the extent of ICD. Conversely, family duality was negatively associated with the extent of ICD.

Edvinsson (1997) described Skandia's approach to measuring Intellectual Capital. As neither 'human capital' nor 'structural capital' are represented in traditional accounting systems, Skandia developed their own method for capturing the true value potential of the organization with the help of two models: the Skandia Value Scheme and the Skandia Navigator. In addition, Guo et al. (2012) attempted to understand the influence of intellectual capital on the performance of 279 biotech firms listed in the US market for the period 1994 to 2005. The results showed that the association between patents and Research and Development expenditure was found to be positive, although the increase in patents did not significantly improve the accounting performance.

Appuhami and Bhuyan (2015) examined the influence of corporate governance (CG) on IC in top service firms in Australia. The findings of the regression analysis indicated that CEO duality, board composition and remuneration committee composition were significantly associated with IC. In contrast, there was no evidence that board size and audit committee composition have effects on IC. Further, Li et al. (2008) investigated the relationship between ICD and CG, controlling for other firm-specific characteristics, for a sample of 100 UK listed firms. Results of the analysis based on the three measures of intellectual capital disclosure indicated significant association with all the governance factors except for role duality.

Ismail (2005) investigated the influence of intellectual capital on the performance of Telekom Malaysia. The study indicated a

positive significant relationship between relational, human, spiritual and structural capital and managing and leveraging of intellectual capital on the performance whereas knowledge management has indirect relationship to the performance. Also, Chen (2004) depicted the role of TTY Biopharm Company (a Taiwan-based pharmaceutical company) intellectual capital in building competitive advantages and enhancing the achievement of corporate strategies. He argued that TTY's success illustrated that even in a relatively small pharmaceutical market such as Taiwan, where a full-range new drug R&D, covering from discovering new chemicals to developing new drugs, seems economically infeasible, adopting fit R&D strategies and developing intellectual capital to establish competitive advantages can overcome the limitations in home market size and bear fruitful results.

Rodrigues et al. (2017) used agency and a resource-based theories to explore the influence of boards of directors on listed companies' voluntary disclosure of information concerning IC of 15 listed Portuguese companies in a 5 year period, 2007–2011. IC disclosures were found to increase with company size, dual corporate governance models, industry, listing on sustainability indexes and increases in board size. IC disclosures were reduced by CEO duality and by a higher proportion of independent directors on boards. Firm age was not significant.

Also, Ulrich (1998) argued that IC is a firm only appreciable asset; that other assets such as buildings, plant, equipment, machinery begin to depreciate the day they are acquired. He concluded that IC must grow if a firm is to prosper. Curado (2008) captured the perceptions of knowledge management and intellectual capital in the banking industry. His study led to some interesting findings, allowing verification of most of the theoretical knowledge management and intellectual capital literatures, and also identifying the value given to knowledge management and intellectual capital.

Roos et al. (2001) discussed intellectual

capital concepts as a mechanism for strategic analysis and facilitator of the strategy-formulation process. The authors argued that the intellectual capital approach has a number of advantages leading to more effective implementation and strategic performance measurement. Also, Demartini and Paoloni (2013) analysed the transition from measurement to management in relation to IC. The study aimed to understand the relationships between measurement of IC and operational activities, strategies and context. They provided effective support to general management, providing a link between intangible assets and capabilities that create value.

Giuliani and Marasca (2011) reflected on how the specific nature of intellectual capital influences the valuation process. The study highlighted the relevance of the intellectual capital valuation process. While intellectual capital value presented a limited level of objectivity, consistency, comparability and understandability, its valuation process can be considered an opportunity to visualise and understand intellectual capital and its influence on financial performance.

In addition, Subramaniam and Youndt (2005) examined intellectual capital influenced various innovative capabilities in organizations. In a longitudinal, multiple-informant study of 93 organizations, they found that human, organizational, and social capital and their interrelationships selectively influenced incremental and radical innovative capabilities. They reported that organizational capital positively influenced incremental innovative capability, while human capital interacted with social capital to positively influence radical innovative capability. However, human capital was negatively associated with radical innovative capability. But social capital played a significant role in both types of innovation, as it positively influenced incremental and radical innovative capabilities.

Chiucchi and Montemari (2016) investigated how and why IC indicators may end up not being used, thus shedding

light on the barriers to their use. The case analysis showed how the different perspectives and expectations that were at stake when subjects engaged with IC indicators can play a central role in hindering or enabling their use in practice. The case also showed that scores play a role in hindering the use of the IC indicators. Also, Young et al. (2010) explored the intellectual capital performances of commercial banks in eight Asian economies by applying Pulic's value-added intellectual coefficient method (VAIC™) for 1996-2001. The results showed that after controlling for the influence of loan quality, fund utilisation, and Asian financial crisis, both physical and human capitals were the main factors creating value for banks.

Furthermore, Abeysekera (2010) examined the effect of board size on firms disclosing more, rather than less, strategic and tactical intellectual capital resources using the top 26 of the 52 firms ranked by the Nairobi Stock Exchange for market capitalization in 2002 and in 2003. The study found that firms disclosing more tactical internal capital and more strategic human capital have larger boards. Bart (2001) attempted to understand the link between mission statements and their impact on the human intellectual capital construct. The results showed that mission statements indeed have a valid place in the measurement and reporting of an organization's intellectual capital.

Ho and Williams (2003) investigated the link between corporate board features and corporate performance for a sample of 286 publicly traded firms from South Africa (84 firms), Sweden (94 firms), and the UK (108 firms). Comparable to general findings from studies using U.S. data, the empirical analysis as a whole did not discern consistent significant link between the four board features and corporate performance across the three nations. However, individual board features were found to influence corporate performance in isolated cases. Furthermore, Giuliani (2016) investigated how organizations make sense of and give sense to IC measurements. The findings were that the development of an IC

project requires the development of an intense sensemaking and sensegiving activity as the managers of an organization need to make sense of this new object and of the consequent new managerial practices.

In addition, Moore and Craig (2008) revisited the role of IC in an enterprise success story and concluded that IC was crucial to organization's success. Seleim et al. (2004) described IC in Egyptian software firms. The study's objective was to contribute to the IC theory development by building a measurement system in an unique context. The paper highlighted the key IC indicators as reported by Egyptian CEOs.

Boudreaux and Ramstad (1997) suggested that designers of human resource (HR) measurement systems can learn from the success of well-accepted measurement models in the financial and marketing arenas. They showed that the historical development of these measurement systems suggested several lessons for the HR measures of the future. Also, Edvinsson and Kivikas (2007) summarised a successful, pioneering prototyping project in Germany with IC statements, supported by the German Ministry of Labour and Economics. They found that most of the participating companies would like to have a more standardized IC indicators for added value in order to use the tool as a complimentary report.

Sullivan (2000) discussed the problem of valuing intangibles companies and suggested two approaches to determining their value: the going-concern value and the value under merger or acquisition circumstances (recognizing that these two circumstances produce very different valuations for the corporation). Further, Hermans and Kauranen (2005) empirically verified the impacts of IC to the anticipated future sales of small- and medium-sized companies within the biotechnology industry. In the econometric analyses, the interactions, or empirical co-variation, between the three categories of IC explain two-thirds of the variance in the anticipated future sales of the sample companies.

Makki and Lodhi (2009) examined the

relationship between intellectual capital and return on investment (ROI) using the VAIC. 7 years data set for Lahore Stock Exchange Index companies (LSE-25) was used. The results obtained using multiple regression analysis support the argument that IC efficiency contributes significantly to ROI of an organization. Also, Nicholson and Kiel (2004) provided a model of board effectiveness that uses the construct of board intellectual capital to integrate the predominant theories of corporate governance and illustrated how the board can drive corporate performance. They further contended that boards that wish to improve their performance need to review their intellectual capital. They concluded by linking the model to a practitioner-focused framework that identifies four key areas on which a board must concentrate to develop its intellectual capital.

Mehralian et al. (2013) developed and prioritized the most important indicators of intellectual capital in knowledge-based industries. The results revealed participants remarked high concerns especially about knowledge and skills of managers and employees regarding to human capital, high concerns particularly about positive climate, ratio of investment in R&D and numbers of R&D projects according to structural capital. Further, Peng et al. (2007) investigated how hospitals view the importance of intellectual capital and performance in the healthcare sector using 30 healthcare managers. The critical intellectual capital elements and performance indicators regarded as important for performance management practices in the Taiwanese hospital industry were identified. They revealed the relative importance and ranking of human, organizational and relational capitals, and performance indicators.

Longo and Mura (2011) examined the effect of intellectual capital on employees' job satisfaction and retention, and also identified two human resource management practices that positively influenced intellectual capital. Their results identified two measures of human resource management practices: communication and

alignment that positively influenced intellectual capital and also contributed to the improvement of employees' job satisfaction and retention. Also, Pike et al. (2002) examined the nexus between IC management and disclosure and found that for the CEO and company boards, intellectual capital issues were all considered to be of above average importance in terms of reporting.

Ehin (2012) in a book titled, 'unleashing IC', made a case for the development of IC in organizations. Berezinets et al. (2016) defined the role of board IC in generating firm IC. The authors suggested that IC was generated not only by company staff, but also by governing bodies, particularly the Board of Directors, whose members are not always under contract with the company in the traditional sense. They concluded that members of the board used their knowledge, experience, and networking opportunities to build IC for effective monitoring, advising, and providing the company with resources.

Stewart (2010) referred to IC as the new wealth of organizations. Furthermore, Lonnqvist et al. (2009) examined the role of IC management in an organizational change process. They concluded that an IC model can be a useful tool for change management as it helps to ensure the alignment of the change content with the strategic goals of the organization. Youndt and Snell (2004) introduced intellectual capital into the strategic human resource management literature in an effort to start to fill in the "black box" between HR activities and organizational performance. Results from a multi-industry survey of 208 organizations indicated that different HR activities are related to three distinct forms of intellectual capital: human, social, and organizational.

Albertini (2016) enhanced knowledge of the full set of interrelations between IC components by providing an inductive typology of their strategic interactions. The author used 122 companies among the 200 first companies from the Fortune Global 500 from 2008 to 2012. The results showed that three IC components interacted with each other around the central position held



by relational and structural capital and to a lesser extent human capital. Companies that have a positive evolution in the ranking focus significantly more on the structural capital while those who have a negative evolution in the ranking mention more the relational capital.

However, to the best of information available to the writer, in Nigeria in particular, there is no single effort to document the relationship between the CEO and intellectual capital of a firm. This is the focus and motivation of this study. Intellectual capital is seen in this paper within the context of value-added intellectual capital (VAIC) because it is value creation asset and in this case, it is derived from structural capital, human capital and capital employed efficiencies.

It should be noted that non-financial services companies in Nigeria consist agriculture, conglomerates, consumer goods, industrial goods, oil and gas, construction/real estate, health care, information and technology, and services firms. They are made up of 75 of the 112 of the quoted firms on the floor of the Nigerian Exchange Group. Only financial services sector is not covered in this study because they come under different regulatory environment. Financial services sector include deposit money banks, insurance companies, share registrars and mortgage banks.

The paper is divided into five sections: introduction, methods, findings, discussions and conclusions. The next section covers the research design, population, sample, methods of data collection and analysis, model, variables, a priori expectation and regression diagnostics.

### 3. Data and Methods

This study is a correlational research, which involves the assessment of the effects of CEO attributes on the intellectual capital of listed non-financial services companies trading on the floor of the Nigerian Exchange Group (NGX). The sample is 75 and the period covered by the study is ten years (2012-2021), thereby providing an observation of 750

(75 companies over 10 years). Following from the work of Nadeem et al. (2021), the model of the study was adjusted after providing for control variables:

$$VAIC_{i,t} = \beta_0 + \beta_1 CDUAL_{i,t} + \beta_2 CGEND_{i,t} + \beta_3 CTENU_{i,t} + \beta_4 CTURN_{i,t} + \beta_5 COWNE_{i,t} + \beta_6 CNATI_{i,t} + \beta_7 LAGE_{i,t} + \beta_8 LEV_{i,t} + \beta_9 FSIZE_{i,t} + \beta_{10} GROWT_{i,t} + \epsilon_{i,t}$$

Whereas:

VAIC = Value added intellectual capital, measured as the sum of capital employed efficiency + Human Capital efficiency + Structural capital efficiency (Yahaya, 2019; Yahaya & Tijani, 2020; Yahaya & Apochi, 2022c).

CDUAL = CEO duality, measured as a dummy where "1" is assigned to companies that have a CEO that is separated from the chairman and "0" for otherwise (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

CGEND = CEO gender, measured as dummy where "1" is assigned to companies that have Female CEOs and "0" for otherwise (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

CTENU = CEO tenure, measured as dummy where "1" is assigned to companies that have CEOs that have stay for 3 years and "0" for CEOs with less than 3 years tenure (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

CTURN = CEO turnover, measured as dummy where "1" is assigned to companies that have a change of CEOs in a particular year and "0" for otherwise (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

COWNE = CEO share ownership, measured as number of CEO shares divided by total numbers of shares (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

CNATI = CEO nationality, measured as dummy where "1" is assigned for companies that have foreign CEOs and "0" for otherwise (Yahaya, 2022a; Yahaya, 2022b; Yahaya & Awen, 2021).

LAGE = Listing age, measured as number of years a company is trading in the stock

exchange (Yahaya et al., 2017; Yahaya & Tijjani, 2021).

FSIZE = Firm size, measured as natural log of total asset (Yahaya et al., 2017; Yahaya & Tijjani, 2021).

LEV = Leverage, measured as total liabilities divided by total asset (Yahaya & Andow, 2015; Yahaya et al., 2017; Yahaya & Tijjani, 2021).

GROWT = Growth, measured as current year revenue minus previous year revenue divided by previous revenue (Yahaya et al., 2017).

The data was hand-picked from the annual reports and accounts of the sampled firms and analysed with using descriptive statistics, correlation and regression analyses after accounting for regression diagnostics. The hypotheses are as follows:

H<sub>1</sub>: CEO duality and IC are significantly interrelated.

H<sub>2</sub>: CEO gender and IC are significantly related.

H<sub>3</sub>: CEO tenure and IC are significantly linked.

H<sub>4</sub>: CEO turnover and IC are significantly affected.

H<sub>5</sub>: CEO share ownership and IC are significantly associated.

H<sub>6</sub>: CEO nationality and IC are significantly interrelated.

#### 4. Findings

In this study, data analysis is done using descriptive and inferential statistics, including regression diagnostics as follows:

##### 4.1 Descriptive Statistics

Descriptive statistics such as the number of observations, central mean, standard deviation, minimum and maximum means are used in order to better understand the nature of the sample used in the research and more familiarity with research variables. Also, statistical data description identifies the dominant model on them and explains the relationships between variables used in the study.

**Table 1. Descriptive Statistics**

Variable	Obs	Mean	StdDev.	Min	Max
VAIC	750	3.393	1.563	.02	10.52
CDUAL	750	.919	.274	0	1
CNATI	750	.263	.441	0	1
CGEND	750	.019	.136	0	1
CTENU	750	.681	.467	0	1
CTURN	750	.194	.396	0	1
COWNE	750	2.551	6.772	0	25.081
LEV	750	.762	.22	.315	2.478
LAGE	750	26.9	11.901	2	48
FSIZE	750	7.653	.509	5.97	9.03
GROWT	750	25.814	22.332	0	99.44

##### 4.2 Inferential Statistics

In order to confirm or reject the research hypotheses, correlation and regression analyses are carried out. The results are in Tables 2 and 3 using STATA 14. See the end of the paper before the references.

Furthermore, Table 4 is used to represent the results of regression diagnostics as shown:

**Table 4. Regression Diagnostics**

Test	chi <sup>2</sup>	p-value
Normality	12.42	.002
Homoscedasticity	56.08	.2575
Multicollinearity	Mean VIF	1.35
<b>Model specification error</b>		
Linktest	_hatsq	.056
Omitted variables	2.08	.1059

Also, since there are hypotheses to be tested, the result of normality test of residual in Table 4 indicates that the

residual is not normally distributed and therefore, the final method of regression analysis is a non-parametric test. The result in respect of test of homoscedasticity shows that there is no het problem in the residual. Furthermore, the result of multicollinearity indicates that there is no multicollinearity among the predictors and control variables. In fact, the biggest VIF is 1.88 from CEO turnover. In addition, two model specification error tests show that the model is correctly specified and that there are no omitted variables. Table 5 presents the results of Kolmogorov-Smirnov test.

**Table 5. Non-Parametric Test**

Variable	chi <sup>2</sup>	p-value
CDUAL	10.884	.000
CNATI	10.937	.000
CGEND	10.972	.000
CTENU	10.942	.000
CTURN	10.949	.000
COWNE	5.922	.000
LEV	10.927	.000
LAGE	10.886	.000
FSIZE	10.900	.000
GROWT	10.718	.000

##### 4.3 Test of Hypotheses

In respect to hypothesis one, since the p-value of CEO duality (CDUAL) is lower than .05, there is a significant difference between the CEO duality and VAIC, therefore, CEO duality has significant influence on intellectual capital. Also, in the case of CEO nationality (CNATI), the p-value is lower than .05, thus, it is accepted that CEO nationality has an influence on intellectual capital. Furthermore, in the case of CEO gender (CGEND), the p-value is less than .05 and therefore, it is accepted that CEO gender has significant influence on intellectual capital. Similarly, in the case of CEO tenure (CTENU), the p-value is lower than .05 meaning that CEO tenure has significant influence on intellectual capital. In the case of CEO turnover, the p-value is significant, that is, it is lower than .05 and thus, CEO turnover has significant influence on intellectual capital. Also, in the case of CEO share ownership, the p-value is less than .05 suggesting that CEO ownership has significant influence on intellectual capital.

In the case of control variables, Table 5 shows that in the case of leverage (LEV), the p-value is lower than .05, therefore, leverage has significant influence on IC. Also, in the case of listing age (LAGE), the p-value is less than .05 meaning that listing age has significant influence on IC. Similarly, in the case of firm size (FSIZE), the p-value is lower than .05 suggesting that firm size has significant influence on IC. Finally, in the case of firm growth (GROWT), the p-value is less than .05 which implies that firm growth has significant influence on IC.

## 5. Discussions

The section is devoted to the discussion of the findings of this study beginning with the results of the descriptive statistics. The number of observation is 750 (75 firms over 10 years) indicating that the data is balanced for all the firms and the years under consideration. The average of VAIC is 3.393 with a standard deviation of 1.563, which is lower than the central mean, while the minimum and maximum means are .02 and 10.52 respectively.

CEO duality averages .919 with a spread of .274 which is lower than the central means, while the least and highest means are 0 and 1. Also, CEO nationality averages .263 with a spread of .441 which is higher than the central means, suggesting that its volatility is of concern to the board, the least and highest means are 0 and 1. CEO gender averages .019 with a spread of .136 which is highest than the central means, signaling that the presence of woman as the CEO is not common among the firms under consideration. The least and highest means are 0 and 1. CEO tenure averages .681 with a spread of .467 which is lower than the central means, while the least and highest means are 0 and 1. In the same vein, CEO turnover averages .194 with a spread of .396 which is higher than the central mean, suggesting that the turnover of CEO is high during the period of study. The least and highest means are 0 and 1. CEO share ownership averages 2.551 with a spread of 6.772 which is higher than the central means, meaning that there is high deviation in CEO equity ownership. The least and highest means are 0 and 1.

In terms of the control variables used in this study, leverage averages 76.2% with a spread of 22% which is lower than the central means, while the least and highest means are 31.5% and 247.8%, respectively. These are empirical evidences that most of the firms in Nigeria are heavily leveraged. In term of listing age, the firms' average age is 27 years with standard spread of 12 years and minimum and maximum age as 2 and 28 years. Firm size averages 7.653 with a spread of .509 which is lower than the central means, while the least and highest means are 5.97 and 9.03. Finally, growth averages 25.814% with a spread of 22.332% which is lower than the central means, while the least and highest means are 0% and 99%.

The second phase of the discussion is on the results of correlation analysis. The results in Table 2 indicate that CEO duality is negatively and significantly related to IC (coeff = -.235, p-val = .003). Also, it shows that CEO nationality is negative but not significant (coeff = -.140, p-val = .077). CEO gender is positive but not significant (coeff = .017, p-val = .835). CEO tenure is positively and significantly related to IC (coeff = .202, p-val = .010). However, CEO turnover is negative but not significant (coeff = -.122, p-val = .126). CEO share ownership is positively and significantly related to IC (coeff = .226, p-val = .004).

In terms of the control variables, leverage is positive and significantly related to IC (coeff = .228, p-val = .004). Listing age is negatively and significantly related to IC (coeff = -.156, p-val = .048). Firm size is positive but not significant (coeff = .056, p-val = .481). Finally, firm growth is negative but not significant (coeff = -.027, p-val = .734).

The next phase of the discussion covers the regression results. From the results in Table 5, all the variables show significant influence on intellectual capital. These results are consistent with virtually all the empirical works that were reviewed under empirical literature, too many to list here.

**6. Conclusions**

Based on the results obtained through this study, the main objective of the study has been achieved. Also, the specific objectives have been achieved. The hypotheses have been tested and accepted, confirming that CEO influences intellectual capital. However, as with all empirical studies this study is subject to a number of limitations. First of all, the choice of sector (non-

financial services) is open to debate, as other sectors are readily available. Also, the results depend on the model, methods, data, variables, and sectors, sources of data and methods of analysis. Perhaps, using broader set of variables may produce different results.

Table 2. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) VAIC	1.000										
(2) CDUAL	-0.235* (0.003)	1.000									
(3) CNATI	-0.140 (0.077)	0.177* (0.025)	1.000								
(4) CGEND	0.017 (0.835)	0.041 (0.606)	-0.082 (0.300)	1.000							
(5) CTENU	0.202* (0.010)	-0.007 (0.929)	-0.049 (0.537)	-0.202* (0.010)	1.000						
(6) CTURN	-0.122 (0.126)	0.146 (0.066)	0.031 (0.697)	0.282* (0.000)	-0.649* (0.000)	1.000					
(7) COWNE	0.226* (0.004)	0.112 (0.158)	-0.225* (0.004)	-0.052 (0.512)	0.229* (0.004)	-0.167* (0.035)	1.000				
(8) LEV	0.228* (0.004)	-0.102 (0.198)	-0.135 (0.089)	0.044 (0.584)	-0.020 (0.803)	0.021 (0.790)	0.368* (0.000)	1.000			
(9) LAGE	-0.156* (0.048)	-0.118 (0.137)	-0.057 (0.472)	0.059 (0.455)	0.130 (0.102)	-0.142 (0.072)	0.055 (0.493)	-0.065 (0.417)	1.000		
(10) FSIZE	0.056 (0.481)	0.141 (0.074)	-0.035 (0.660)	0.175* (0.027)	0.045 (0.576)	-0.006 (0.938)	-0.089 (0.261)	-0.076 (0.338)	0.389* (0.000)	1.000	
(11) GROWT	-0.027 (0.734)	-0.089 (0.262)	0.012 (0.884)	-0.058 (0.469)	0.141 (0.076)	-0.099 (0.211)	0.116 (0.143)	-0.013 (0.866)	-0.058 (0.467)	-0.026 (0.745)	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 3. Linear regression

VAIC	Coef.	St.Err.	t-val	p-val	[95% Con	Interval]	Sig
CDUAL	-1.939	.444	-4.37	0	-2.817	-1.062	***
CNATI	-.031	.263	-0.12	.905	-.552	.489	
CGEND	.484	.859	0.56	.574	-1.214	2.181	
CTENU	.797	.316	2.52	.013	.172	1.422	**
CTURN	.198	.379	0.52	.601	-.55	.947	
COWNE	.054	.019	2.80	.006	.016	.092	***
LEV	.737	.553	1.33	.185	-.355	1.829	
LAGE	-.043	.01	-4.15	0	-.064	-.023	***
FSIZE	.738	.246	3.01	.003	.253	1.224	***
GROWT	-.009	.005	-1.69	.092	-.019	.001	*
Constant	-.37	1.823	-0.20	.84	-3.973	3.234	
R-squared		0.269	Number of obs			160	
F-test		5.475	Prob > F			0.000	

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

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