VOL. 05 NO. 2,
AUGUST, 2024
E-ISSN 3027-1533
P-ISSN 3026-8648

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of African Innovation & Advanced Studies (JAIAS)

# Assessing the Relationship between Corporate Governance and Intellectual Capital in Nigeria: Firm Size as the Moderating Role

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## *Abstract*

This study aims to examine the moderating role of firm size on the relationship between corporate governance and intellectual capital efficiency in Nigeria. The methodology was pooled data for three years (2021-2013) for 120 listed companies. The findings revealed that the inclusion of firm size as a moderating variable has influenced positively only the relationship between corporate governance principles and capital employed efficiency (CEE). Further, the finding showed that the two intellectual capital components, namely, human capital efficiency and structural capital efficiency, tend to be higher in companies with high corporate governance adoption. However, CEE tends to be higher in companies with lower corporate governance adoption levels. Other findings show that the corporate governance index was significant regarding the three intellectual capital components. Such information will help stakeholders, investors, decision-makers, regulators, policymakers, and scholars improve their intellectual capital knowledge. Furthermore, it will be helpful for companies to place their priorities regarding the internal system and financial plans for effective and efficient use of corporate governance and intellectual capital.

**Keywords:** Nigeria, Corporate Governance, Intellectual capital, Agency theory, Resources-based theory.

## Introduction

Rechberg and Syed (2013) assert that in a competitive world, Knowledge is power, and aphorism has increased by the beginning of the twenty-first century. Nowadays, researchers focus on intellectual capital, which consists of the Knowledge and experience of an employee, database and information systems, business relationships,

goodwill, and alliances (Saunders & Brynjolfsson, 2016). Singh et al. (2016) claim that intellectual capital adds value to companies by improving the exchange of Knowledge and creating new Knowledge. It also can improve the efficiency of both capital and labor markets. Researchers also find that intellectual capital positively influences the performance and wealth of companies (Celenza & Rossi, 2014; Singh et al., 2016; and Inkinen, 2015). Knowledge and intellectual capital are essential for shareholders and investors to ensure that managerial decisions are made to enhance shareholders' wealth (Appuhami & Bhuyan, 2015).

Even though intellectual capital is a competitive strategic resource and increases performance, there are problems with managing and controlling intellectual capital in corporations. If intellectual capital is not properly managed, it will be sub-optimal; its value-added capacity will not be fully used. Managing intellectual capital remains one of the vital challenges for the accounting profession due to its complexity and diversity (Van der Meer-Kooistra & Zijlstra, 2019). Several researchers argue in support of the need to understand the role of corporate governance in effectively protecting and managing intellectual capital in corporations (La Rocca et al., 2018; Safieddine et al., 2019). Corporate governance ensures that managers make decisions to enhance shareholders' interest through the efficient use of intellectual capital..

Because of the importance of corporate governance and intellectual capital to stakeholders, factors affecting the relationship between corporate governance and intellectual capital need to be identified. This study contributes to the literature in several ways. First, it sheds light on the few prior corporate governance – -intellectual capital research by considering all sectors of the Nigerian economy. Previous studies have examined corporate governance and intellectual capital separately. Second, it provides empirical evidence on the relationship between corporate governance principles and intellectual capital by using data from listed corporations of the biggest country in African Countries. Thus, the results are expected to broaden the understanding of corporate governance and its impact on intellectual capital, eventually affecting companies' performance in African economies. Third, this study contributes to the third stage of intellectual capital research by investigating the effect of corporate governance principles, which influence the board of directors and managers' behavior regarding intellectual capital efficiency. Fourth, this study uses a third variable, the moderated model, to enhance and strengthen the relationship between corporate governance and intellectual capital. Fifth, this study uses the VAIC model by using three coefficients: capital, structural capital, and capital employed. Finally, such information will help the stakeholders, investors, decision-makers, regulators, policymakers, and scholars to improve their Knowledge about intellectual capital. Furthermore, it will be helpful for corporations to place their priorities regarding the internal system and financial plans for effective and efficient use of corporate governance and intellectual capital.

**Literature review**

Corporate governance is a combination of policies, laws, and instructions influencing the way a corporation is managed and controlled; it consists of a framework of rules to grant transparency and fairness in the relationship between corporations and their shareholders; the framework of corporate governance consists of both external and internal contracts between

employees and the shareholders, it includes distribution of rewards and responsibilities and conditions to avoid conflicting interests (Klapper & Love, 2014). Over two decades, corporate governance and IC literature have exposed the significance to stakeholders and management prospects of developing the topic of corporate governance, which are considered along with areas for future research (Turnbull, 2017). Corporate governance and intellectual capital are considered the main value driver of the company's performance; it has become a significant factor for those corporations in enhancing their competitive advantage and reducing agency problems.

Intellectual capital needs to be clarified as corporate governance, and like many other intangible assets, it might not be easy to identify and report in financial statements. The difficulty in identifying and reporting in financial statements leads to a gap between companys' value as reported in the financial statement and actual market value (Rahman, 2012). The need for intellectual capital valuation has increased; different methods to calculate the value of intellectual capital and its efficiency have been developed, such as Skandia IC Report Method (Edvinsson & Malone, 2017), Intangible Asset Monitor Approach (Sveiby, 2017) and Value-Added Intellectual Coefficient (VAIC) (Pubic, 1998). VAIC is widely used to calculate the IC among intellectual capital valuation methods.

Only some studies have discussed the linkage between corporate governance and intellectual capital. However, most of these studies have been carried out in developed countries. Al-Musalli and Ismail (2012) examine the level of the intellectual capital of listed banks in Gulf Council Countries using VAIC and investigate the possible impact of several corporate governance variables, bank-specific characteristics, and banking industry characteristics on intellectual capital. They found that board size, board independence, family ownership, and institutional Ownership have a significant relationship with intellectual capital. Moving from Gulf Council countries to Middle Eastern countries, Alizadeh et al. (2014) examine the association between corporate governance and intellectual capital in the pharmaceutical companies in the Tehran Stock Exchange for five years from 2004 to 2009, using a regression model. The independent variable was corporate governance (i.e., board size, duality of CEO and BOD, and auditing committee). The results found that board size has a negative impact on companies' intellectual capital, while dualities of CEO and BOD and auditing committee have no effects on intellectual capital. Another study was conducted in different stock exchanges by Saeed et al. (2015) to explore the role of IC as a mediator between corporate governance and companies' performance relationships. This study uses five corporate governance measures that can contribute to the IC, and IC leads to corporate performance. The results show that companies' corporate governance measures and intellectual capital yield higher corporate performance.

The literature shows that the direct relationship between corporate governance principles and intellectual capital components is ambiguous. To fill this gap in the literature, a moderated model is used to enhance the relationship. The study is adopted, as it depends on both the Agency theory developed by Jensen and Meckling (2016), who addresses problems that arise due to the conflict between management and shareholders' interest, and the resources-based theory developed by Grant (2019), considers that intellectual capital is the principal strategic asset in creating and maintaining companies' competitive advantage. Therefore, it is interesting to explore further the effect of firm size on the relationship between corporate governance and the intellectual capital of listed corporations in Nigeria.

Firm size is constructed to positively enhance the linkage between corporate governance and intellectual capital. Therefore, the main hypothesis can be divided into three sub-hypotheses:

$H_1$. Firm size positively moderates the relationship between corporate governance and the human capital efficiency of Nigerian listed corporations.

$H_2$. Firm size positively moderates the relationship between corporate governance and structural capital efficiency of Nigerian listed corporations.

$H_3$. Firm size positively moderates the relationship between corporate governance and capital employed efficiency of Nigerian listed corporations

**Methodology**

The study is based on the selected sample of 120 listed companies in Nigeria's Stock Exchange for three years from 2021 to 2023. The Data used in this study were collected from the Nigeria Stock Exchange. Companies used in the sample were selected based on data availability and have not been closed down or merged with other companies during the research period. Pooled data, which combined time series and cross-sectional data, were used.

The study aimed to investigate whether corporate governance practices influence the efficiency of the intellectual capital of Nigeria-listed companies. Thus, the study used the VAIC Model developed by Pulic (1998) to measure the relationship between corporate governance and intellectual capital efficiency. More interestingly, the study used firm size as a moderating variable and the other two control variables to examine their influences on the relationship between corporate governance and intellectual capital efficiency.

**Dependent variables**: The dependent variable (intellectual capital) is measured using Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE).

**Independent variables**: The independent variables (Corporate Governance) are measured using the Ownership of the largest shareholder, the size of the BOD, and the independence of the BOD.

**Moderator variable**: Firm size was included in the model to analyze whether adding a third variable (firm size) will influence the relationships between Corporate Governance and intellectual capital components.

**Control variables**: Two control variables will be discussed for all estimated models of the study. They are firm in age and sectors.

**Study model**: In order to measure the relationship between corporate governance and intellectual capital, the study estimates the moderator model as follows;

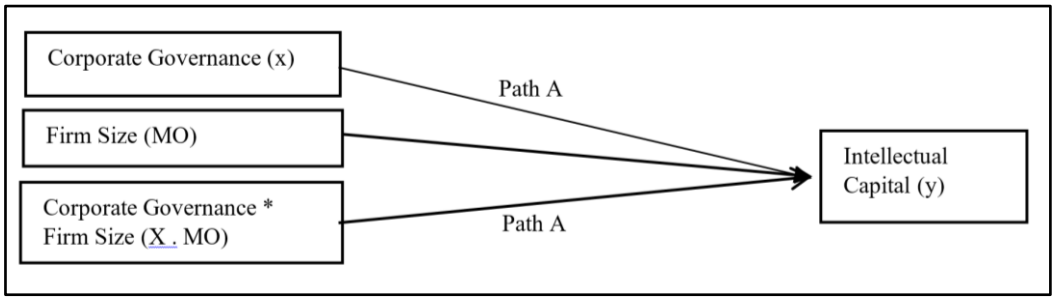



**Figure 1.** The study model

The moderator variable – firm size – in fact, acts like the second independent variable. When the moderator variable is launched, the firm size has to maintain a causal relationship with intellectual capital and plays the same function as corporate governance (Namazi & Namazi, 2016).

In order to measure the moderating role of firm size on the relationship between CG and IC, the study created an interaction variable (Corporate Governance Index*firm size), which was included as an independent variable. Hence, the study regression model is presented as the following:

$$IC_{it} = \beta_0 + \beta_1 CG1_{it} + \beta_2 CG2_{it} + \beta_3 CG3_{it} + \beta_4 CG4_{it} + \beta_5 (CGindex * firm\ size)it + \beta_6 Age + \beta_7 Sectorit + \varepsilon_{it}.$$

Where: $IC_{it}$ is a continuous variable; the dependent variable is the intellectual capital components measured by three models (HCE model, SCE model, and CEE model). $HCE_{it}$ is the ratio of value added, divided by human capital, of the company (*i*) in the period (*t*). $SCE_{it}$: is the ratio of structural capital divided by value added for the company (*i*) in the period (*t*). $CEE_{it}$: is the ratio of value added divided by capital employed for the company (i) in the period (t). $\beta_0$: is the constant. $\beta_1$–7: is the slope of the controls and independent variables. $CG1_{it}$: is a dummy variable, 0 if a shareholder has shares more than 20 percent and 1 otherwise, for the company (*i*), in the period (*t*). $CG2_{it}$: is a dummy variable, 0 if the shareholders have shares more than 50 percent and 1 otherwise, for the company (*i*), in the period (*t*). $CG3_{it}$: is a dummy variable, 0 if the board members are not between 7 and 13 members and 1 otherwise, for the company (*i*), in the period (*t*). $CG4_{it}$: is a dummy variable, 0 if the boards of director members are not controlled by greater than 50 percent independent outside directors and 1 otherwise, for the company (*i*), in the period (*t*). $Age_{it}$: the number of years since the company was established, for the company (*i*), in the period (*t*). $Sector_{it}$: is a dummy variable, the area of the economy in which companies work in the same field or have related product or service, for the company (*i*), in the period (*t*). « $_{it}$ is a random error.

**Discussion of results**

The Corporate Governance level was divided into two categories: companies with high corporate governance and companies with low corporate governance, as shown in Table I. The path analysis based on the value of the calculated median of corporate governance index (60 per cent). To identify the significance in the variance between the means of the two samples t-statistic test and z-statistic tests were used. The two Intellectual Capital components namely, Human Capital Employed and Structural Capital Employed tend to be higher with companies that have high corporate governance level. However, the corporate governance level found to be higher with companies that have low Capital Employed Efficiency.

By using the *t*-statistic, the path analysis of corporate governance found to be significance in the variance between the means Human Capital Employed and Structural Capital Employed while it was insignificant in Capital Employed Efficiency; similar results were found by using the z-statistic. The results indicate that the strict adoption of corporate governance leads to

inefficient use of capital employed whereas it has significantly affected the efficiency of human capital and structural capital as well.

**Table 1**: Path analysis between corporate governance and intellectual capital

| | Corporate Governance Level | | | | Difference tests | |
|---|---|---|---|---|---|---|
| | High | | Low | | | |
| **Intellectual Capital** | **Mean** | **SD** | **Mean** | **SD** | ***t*-statistic** | ***z*-statistic** |
| HCE | 0.816 | 1.479 | 0.628 | 0.302 | 2.315** (0.021) | 1.910** (0.037) |
| SCE | 0.158 | 0.374 | 0.131 | 0.135 | 2.203** (0.023) | 2.482** (0.014) |
| CEE | 4.902 | 7.936 | 6.145 | 12.580 | -1.342 (0.180) | -1.114 (0.265) |

Notes: The t-statistic is based on parametric test Two-Independent Sample t-test and z-statistic is based on non-parametric test Mann–Whitney z-test. The upper value is for t-statistic test or z-statistic and the lower value in brackets (p-value) is the probability value for this test. The difference Significance at: *10; **5; ***1 per cent levels

The study used GLM to test the moderating effect of firm size on the relationship between corporate governance and intellectual capital. Therefore, several tests were run to check whether data of this study could meet the conditions of the GLM. For the strength of the GLM basically depends on the hypothesis that every variable from the independent ones is by itself independent. If this condition is not realized, the GLM will then be inapplicable. It can never be considered good for parameters' evaluation. To actualize this, Collinearity Diagnostics Standard used incessant Tolerance quotient for every variable of the independent ones. Variance inflation factor (VIF) has to be found afterward. This test is the standard that measures the effect of independent variables. Gujarati, (2003) stated that getting a VIF higher than 10 indicates that there is a multicollinearity problem for the independent variable of concern. As presented in Table III, it can be noticed that the VIF values for all independent variables is less than 10, which means that there is no any collinearity problems in the study models.

To test the autocorrelation problem in the study models, the Durbin–Watson (D-W) test was used. Table III shows that the D-W values of the HCE, SCE and CEE models are beyond the (1.5-2.5) range. This indicates the presence of a positive autocorrelation in this model. To overcome this problem (Lag 1) has to be considered when testing these models.

Empirical studies in finance face many measurement problems, including relationship study between corporate governance and intellectual capital; many internal variables are related to a random error of regression models. As this study is longitudinal corporate data (panel data) during a period, heterogeneity, simultaneity, and reverse causality problems might exist between these units (Adams et al., 2020; Wintoki et al., 2012). The problem of unobserved heterogeneity appears when a set of latent variables drives the relationship between corporate governance and intellectual capital. The firm fixed-effect (FE) approach was used to reach accurate results and avoid different measurement problems on the relationship between corporate governance and intellectual capital, the firm fixed-effect (FE) approach was used. Table III shows the empirical results:

**Table 2:** Granger causality test

| Intellectual Capital | Corporate Governance Index |
|---|---|
| HCE | 3.110*** (0.009) |
| SCE | 3.304*** (0.000) |
| CEE | 1.694* (0.067) |

Notes: The null hypothesis states that there is no causal relationship between the slow factor (independent variables in the horizontal side: CG index) and (dependent variable in the vertical side: IC variables) of the table. The upper value is for "Fisher" F-Statistic test and the lower value in brackets (p-value) is the probability value for this test. Symbols mean: that there is a causal effect for independent variable to dependent variable at *** 1, ** 5, * 10 per cent, respectively

**Table 3:** FE Results

| | | | HCE model | | SCE model | | CEE model | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | | **VIF** | **β** | **t-statistic** | **β** | **t-statistic** | **β** | **t-statistic** |
| **Panel A: CG variables:** | | | | | | | | |
| Ownership of largest shareholder | CG1 | 1.569 | -1.402 | -0.61<br>0.39 | -1.882 | -3.461***<br>0.012 | 0.48 | 6.604***<br>0.000 |
| Size of BOD | CG2 | 1.076 | 0.271 | 0.117<br>0.907 | 1.673 | 2.596**<br>0.031 | 0.491 | 6.673***<br>0.000 |
| Independence of BOD | CG3 | 1.105 | 1.949 | 0.854<br>0.393 | 3.351 | 3.351***<br>0.001 | 0.487 | 6.71***<br>0.000 |
| CG index | CG Index | 4.55 | 0.48 | 3.537***<br>0.000 | 7.008 | 5.61***<br>0.000 | 1.801 | 6.017***<br>0.000 |
| **Panel B: Moderator variable:** | | | | | | | | |
| Firm Size*Governance index | Size | 3.678 | 0.42 | 0.566<br>0.572 | -0.42 | -0.566<br>0.572 | 0.145 | 6.127***<br>0.000 |
| **Panel C: Control variables:** | | | | | | | | |
| Firm age | Age | 1.057 | -0.023 | -1.108<br>0.268 | -0.023 | -1.108<br>0.268 | 0.005 | 7.274***<br>0.000 |
| Sector | Sctr | 3.578 | -0.238 | -3.533***<br>0.000 | -0.257 | -3.55***<br>0.000 | 0.009 | 3.751***<br>0.000 |
| $R^2$ | | | | 0.021 | | 0.016 | | 0.121 |
| Adj. $R^2$ | | | | 0.015 | | 0.014 | | 0.116 |
| F-Statistic | | | | 3.55*** | | 10.897*** | | 23.821*** |
| P-value | | | | 0.001 | | 0.000 | | 0.000 |
| Hausman test ($X^2$ ) | | | | 5.557*** | | 8.983*** | | 10.997*** |
| P-value | | | | 0.000 | | 0.000 | | 0.000 |
| Durbin–Watson stat | | | | 2.087 | | 1.589 | | 2.472 |

Notes: This table reports the regression results using the ordinary-least-squares with firm and year fixed-effects (FE). All regressions are estimated with robust standard errors clustered at the firm level. *t*-critical: at df 489 and a confidence level of 99 per cent is 2.326 and level of 95 per cent is 1.645 and level of 90 per cent is 1.282. F-critical (df for denominator n-b -1 = 489-8-1 = 480) and (df for numerator = b = 8 and confidence level of 99 per cent is 2.79 and confidence level of 95 per cent is 2.09 and confidence level of 10 per cent is 1.77. The upper

value is for t-statistic test and the lower value in brackets (p-value) is the probability value for this test. Symbols mean Significance at: *10; **5; ***1 per cent levels

When time-series and cross-sectional data are merged, we get longitudinal data that gives more data information with more disparity, less internal correlation between variables, more degrees of freedom and more efficiency (Gujarat, 2015). Longitudinal regression models are divided into FE and random-effect (RE) approaches. The trade-off between the two approaches depends on the assumptions set on possible correlation between cross-sectional units (companies), the amount of $\varepsilon_i$ error (other factors affecting companies' IC) and regressed variables X's (CG). If assumed that $\varepsilon_i$ and X's are not correlated, a RE approach is best, otherwise FE approach is best. This study can only assume a correlation between error and independent variables of the study sample. This was confirmed by "Hausman Test" where a H0 assumes that capabilities of FE and FE approaches are same, but if a *H0* is rejected then this indicates that random-effect approach is inappropriate, and it is, therefore, preferable to use FE approach. "Houseman chi-squared" model shown in Tables III statistically significant, which mean that capabilities of the FE model (FE) is best representing the relationship, confirming our assumption that $\varepsilon_i$ and X's are correlated.

**The moderating role of firm size**

Human capital efficiency model results: As shown in Table III, the slope coefficient of interaction term 0.420 indicates that the moderating impact of firm size is insignificant on HCE as evident from the coefficient and p-value (0.572).

The results specify that the inclusion of firm size as a moderating variable has not influenced the relationship between CG practices and HCE, which is not significant at 5 per cent. Therefore, $H_1$ is rejected. However, the results specify that the inclusion of firm size as a moderating variable has influenced the relationship between HCE and CG index, which is significant at 5 per cent (0.000). This indicates that the BOD and managers of Nigerian companies are not able to realize the full potential of the governance adoption to maximize their HCE.

Based on these results, managers should pay huge attention to their human resources and adopting CG to invest in employee knowledge, skills and capabilities or by attracting highly knowledgeable and skilled employees. Also, companies should motivate the BOD to strictly adopt the code of governance for better employee performance because as noted earlier, companies with more CG tend to have a better HCE. Besides that, BOD and managers of Nigerian companies should consider the governance practices to structure relevant strategies and policies on how to obtain; best utilize, develop and retain their employees for better IC efficiency.

Structural capital efficiency model results: As shown in Table III, the slope coefficient of interaction term -0.42 indicates that the moderating impact of firm size is on SCE as evident from the coefficient and p-value (0.572).

Capital employed efficiency model results: The results of the CEE Model presents the best adjusted $R^2$ (0.121), thus, as shown in the Table III, the IC models are significant at 0.000 and 0.01. This means that the inclusion of firm size as a moderating variable has significantly influenced the interaction between CG principles and CEE, which is significant at 1 per cent (0.000).

Table III shows that the CG practices have a positive impact with CEE at 1 per cent significant level (0.000), therefore, $H_3$ is accepted. These results indicate that the adoption of CG practices is significantly contributed to a physical asset's market value and its replacement value. Based

on these results, companies in Nigeria should increase their CEE by concentrating more on corporate decisions that are related to tangible and financial assets and invest in their capital, not the employees or the systems.
In conclusion, CEE in Nigeria is a driving factor behind investment decisions and stock valuation. Companies should motivate the BOD to adopt the code of governance strictly for better CEE efficiency. Thus, Nigeria is moving on the right track as the companies have a highly experienced and educated BOD, which is expected to lead to a bright economy shortly and, therefore, experience higher growth and a deep and valued IC culture.

**Control Variables**

**As** shown in Table III, firm age was found to be significant with the CEE models; as the number of years increased since the companies were established, it positively affected the CEE in the companies. The results align with those founded by Buallay et al. (2017), who found that firm age as a control variable is significant for the efficiency of assets in relation to governance practices.
It positively affects the sector's CEE models at a 1 percent level. However, the HCE and SCE models are negatively significant at a 1 percent level; thus, the sector type has negatively contributed to the HCE and SCE models.

**Conclusion**

This study is to measure the relationship between corporate governance (CG) and intellectual capital (IC) of listed companies in the Nigeria Exchange Group (NGX). This paper is to contribute to IC literature in terms of examining the relationship between the CG and IC, the IC, which was measured by using Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE) and the CG has been measured by using the Ownership of the largest shareholder, size of the BOD, and in-dependency of BOD. In addition to that, the study also used two control variables such as firm age and the sectors, as discussed in the literature review. Therefore, theoretically, this study is to fill the gap in the literature review, the researchers used the moderator role of firm size model to enhance the relationship between CG and IC and this was depending on the agency theory, which addresses the problems that arise due to the conflict between management and shareholders interest and the resources-based theory, which considers that IC is the main strategic asset in creating and maintaining companies' competitive advantage. However, the study answered the research question, whether the CG index can cause or encourage IC? This step is to determine the causal direction of "Granger". The results confirm a moderating effect of Firm size on the relationship between CG and CEE. These results showed that a combination of the CG index with the firm size will enhance a firm's CEE, although, neither the HCE nor the SCE should be considered. Thus, the results of this study can be a starting point for similar research to the relationship between CG and IC and other factors related to this matter in African Countries.
The descriptive analysis results, on one hand, showed that the HCE and SCE tend to be higher with companies that have high CG level. However, the CG level found to be higher with companies that have low CEE.
The regression models results showed that the firm size is significant and has a positive impact on the relationship between CG and CEE. This evidenced that firm size has a moderating role on the relationship between CG and IC. Based on this, Nigerian companies should motivate the BOD to strictly adopt the code of governance for better CEE efficiency. In addition, the results showed that CG has no significant impact on HCE. The analysis evidenced that the CEE model is the best model in explaining the moderating role of firm size on the relationship

between CG and IC. Also, the CEE model was found to be highly significant in the three components of the IC.

Value of IC would be realized through the interaction of CG index and firm size as these two components are highly correlated. In spite of the strong existing theoretical argument for the contribution of CG to company's success, the current IC do not seem to provide a good proxy that would assist users in predicting the link between IC and firm's success. Future researchers need to find better proxies of IC than what is discussed in previous research studies.

On a general note, it is suggested that organizers such as capital market authority, the ministry of finance, external auditors and stock exchange organizer to take the IC into consideration to assure more reliable financial information to all business parties.

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