

Dynamics between Intellectual Capital and Corporate Governance: A Study of Indian Listed Firms in Construction, Energy and Information Technology Sector

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Information of Article

Article history:

Received: 01 July 2026

Presented: 22 August 2026 (INSPIRE-2026, GIBS Bengaluru)

Keywords:

Intellectual Capital
Corporate Governance
Board Size
Board Independence
Board Gender Diversity
Board Meeting

ABSTRACT

Purpose – This study examines the influence of Corporate Governance over Intellectual Capital disclosure among BSE500 listed construction, energy and information technology sector firms in India.

Design/methodology/approach – This study analyses data from 70 listed Indian construction, energy and information technology companies using Panel-Corrected Standard Error regression analysis over the year 2014-2021.

Findings – The empirical findings reveal that corporate governance in the Indian publicly listed construction, energy and information technology firms did not exhibit a significant influence on the intellectual capital of the selected firms during the study period.

Originality/Value: This study represents the first comprehensive examination of the relationship between corporate governance and intellectual capital in listed construction, energy and information technology firms. It is also pioneering in its application of Panel Corrected Standard Error regression analysis, alongside VAIC and MVAIC models, to analyse the relationship between corporate governance and intellectual capital.

How to cite: Pankaj Anand, Anindita Adhikary, Jitendra Kumar, Harishankar Vidyarthi & Subhadeep Mukherjee (2026). Dynamics between Intellectual Capital and Corporate Governance: A Study of Indian Listed Firms in Construction, Energy and Information Technology Sector. *Journal of Reproducible Research*, 1(2), Special Issue: INSPIRE-2026, pp. 40–53.

1. Introduction

The impact of Corporate Governance (CG) on Intellectual Capital (IC) is crucial in business studies, especially for construction, energy and information technology sector companies. Effective governance, which involves rules and practices for directing and controlling a firm, is essential. The term "governance" originated from the Egyptian word "gubernet," meaning "to govern or steer." CG refers to directing an organization towards desired goals (Bijalwan, 2012). Makki and Lodhi (2014) describe CG as a mechanism for achieving efficiency and ensuring productivity, sustainability, and profitability. Effective CG, characterized by a sound board structure, transparency, defined procedures, and investor rights protection, is crucial for organizational success (Bijalwan, 2020). Firms with robust CG, through strong boards and ownership structures, tend to perform better and make decisions that enhance shareholder wealth (Weimer and Pape, 1999; Keenan and Aggestam, 2001). CG plays a crucial role in effectively managing companies in India. It encompasses a set of principles and practices that ensure accountability, transparency, and ethical decision-making in how a company is directed and controlled (Wondem & Batra, 2019). Strong CG is key to a company's long-term success and helps build trust among all the key stakeholders (Srivastava et. al., 2019). A well-structured governance framework relies on qualified board members who uphold core values

such as discipline, fairness, responsibility, transparency, shareholder rights, independence and social responsibility (Farag et. al., 2018; Alsagr et. al., 2018).

With the rise of knowledge-based companies, productivity and value creation have shifted from tangible assets (capital, plant, and machinery) to intangible inputs, known as IC (Teece, 2000; Delios & Beamish, 2001; McGaughey, 2002; Goh & Lim, 2004). IC is now a critical factor for competitiveness across all industries (Makki & Lodhi, 2014). Johnson and Kaplan (1987) emphasize that IC can significantly influence company performance. Alipour (2012) defines IC as knowledge-based assets owned or controlled by an organization, essential for creating value for key stakeholders. CG includes human capital, brand name, corporate reputation, intellectual property, customer relations, organizational processes, patents, and innovation. Pulic (2000, 2004) defined it as the sum of human, structural, and physical capital efficiencies. Bontis (1998) added relational capital. Relational capital encompasses costs associated with managing relationships with clients, shareholders, suppliers and government.

CG encompasses intangible assets like knowledge, skills, and innovation. Empirical studies show that CG significantly influences the development of CG within organizations. Additionally, previous research (Safieddine et. al., 2009) highlights the importance of recognizing and understanding CG's role in maintaining and effectively utilizing CG. According to Adesina (2019), IC consists of Human Capital Efficiency (HCE), Physical Capital Efficiency (PCE), and Structural Capital Efficiency (SCE). Vishnu and Gupta (2015) and Sharabati et. al. (2010) identifies IC components as Human Capital (HC), Structural Capital (SC), and Relational Capital (RC). Makki (2014) emphasizes that HC is the most significant asset, enhancing operational effectiveness and generating intangible assets. Many studies have independently examined CG and IC (Abeysekera and Guthrie, 2005), but fewer have explored their interplay. In this research, CG refers to the structures, systems, and processes that ensure organizational direction, control, and accountability (Chambers and Cornforth, 2010).

The current study aims to study the association among CG and IC, building on previous research. Hypotheses are developed regarding the associations between different CG mechanisms (such as Board Size, Board Independence, Board Gender Diversity, and Board Meetings) and IC components (HCE, CEE, SCE, and RCE). Panel corrected standard error regression analysis is employed using data from 70 firms listed under BSE 500 index and working under the Construction, Energy and Information Technology firm during the year 2014-2021, extracted from the selected firm's annual reports. Numerous previous studies have explored the topics of CG and IC (Abeysekera and Guthrie, 2005). However, Keenan and Aggestam (2001) highlighted that limited attention has been paid to the relationship between IC and CG, as prior research predominantly emphasized the dependencies of CG on financial and physical capital. Previous empirical studies demonstrate how CG affects the way IC develops inside an organisation. Additionally, several recent studies (Safieddine et. al., 2009; La Rocca et. al., 2008) underscore the necessity to recognise and comprehend the function of CG in preserving, effectively deploying, and keeping IC in business organisations. The study's findings will greatly benefit senior management in Indian construction, energy and information technology sector companies, aiding them in enhancing governance to attain a competitive edge. Additionally, it offers insights into the broader CG landscape in India among the three selected sector firms. CG mechanisms are shaped by factors such as the prevailing legal and regulatory framework, capital strength, business culture, and the socio-political environment of each country.

Construction sector was chosen for the study as in India still a large number of unskilled labours work in this sector and thus good CG in this sector can uplift the lives of poor and needy. Again, Energy sector was chosen for the current study as this sector is an asset heavy sector, wherein a lot of capital is used and thus proper governance among these companies becomes imperative. Similarly, Information Technology sector was chosen for the study as this sector currently accounts for 7-8% of Indian GDP, and thus proper governance among these companies is very necessary. Thus, we see that all the selected sectors play a big role in boosting the Indian Economy.

The current study contributes significantly to existing literature in various ways. First, the study seeks to add to the body of literature of IC by investigating further regarding the dynamics between IC and CG. Second, this is a preliminary study to assess the correlation between IC and CG efficiency among Indian companies working in

construction, energy and information technology sector. Third, we have incorporated the modified VAIC - MVAIC model by adding Relational Capital (RC) to the existing ones. It is argued that the MVAIC model is significantly better than the VAIC model to compute the IC (Tiwari *et. al.*, 2023; Xu & Li, 2020; Ge & Xu, 2020; Vidyarthi, 2019). Fourth, the application of panel-corrected standard error regression analysis generates more reliable results by accounting for cross-sectional dependency, heteroskedasticity, and serial correlation, inherent in multi-sectoral panel data. Fifth, prior research underscores the country-specific nature of CG and its varied impact on decisions related to IC (Vafeas and Theodorou, 1998; Weimer and Pape, 1999; Keenan and Aggestam, 2001). Therefore, it is crucial to analyze different governance measures and their effects on IC individually for each country. This study presents a novel examination of the dynamics between CG and IC within the Indian context.

The study is structured as follows: Section 2 reviews key prior studies to contextualize the current research. Section 3 outlines the methodology, including sample data, time frame, variable descriptions, and analytical approaches. Section 4 presents the study's results, along with discussions on theoretical, managerial, and academic implications. Section 5 presents the study's concluding remarks, discusses its limitations, and identifies potential directions for future research.

2. Literature Review

2.1 Theoretical framework

The current study explores the intricate relationship among IC and CG, recognizing IC as a critical requirement for sustained competitive advantage in the contemporary knowledge-based economy. While exploring IC and CG, several key theories are commonly referenced, and these perspectives collectively offer meaningful insights into the various components of IC and CG.

2.1.1 Agency Theory

Agency Theory explores the potential conflicts between shareholders (principals) and managers (agents) arising from differing interests. In certain circumstances, managers may prioritize their personal interests over the maximization of shareholders' wealth, thereby giving rise to agency costs. Effective CG, including independent board oversight, performance-based executive compensation, and enhanced transparency, mitigates these issues by keeping in line managerial actions with shareholder interests (Meckling & Jensen, 1976; Fama & Jensen, 1983; Healy & Palepu, 2001).

2.1.2 Resource Dependence Theory

Resource Dependence Theory explains that companies depend on external resources to sustain operations and gain a competitive edge. CG plays a crucial role in reducing this dependency by strategically structuring boards with members who have valuable external connections. This approach ensures access to critical resources and enhances firm performance by minimizing environmental uncertainty (Hillman *et. al.*, 2000).

2.1.3 Stakeholder Theory

Stakeholder Theory implies that for a firm to achieve sustained success, it must generate value not only for its shareholders but also for a broader network of stakeholders, including employees, customers, suppliers, and the community. By addressing the interests of all stakeholders, organizations can foster trust, enhance corporate reputation, and build a more resilient and sustainable business model (Carroll & Shabana, 2010). Together, these theories offer an integrated framework for understanding the different dimensions of CG and its relationship with CG.

A detailed review of the previous literature demonstrates that the importance of knowledge-based assets such as human capital, customer relationships, brand value, organisational procedures, corporate partnerships, patents, innovation, and so on is gradually increasing in developing or growing economies like India. CG provides us with several ways in which company stakeholders control management decisions in a way that serves their interests (John & Senbet, 1998). Countries having good CG mechanism have experienced growth in their corporate sector and thus

have always attracted more capital and investment. *Bonn et. al., 2004* emphasized that the most important element in maintaining shareholder confidence in CG is the role of the board structure, which can ultimately result in the highest level of financial performance and market growth. Various researchers reported a positive influence of various CG practices on IC in developing/emerging economies (*Ciftci et. al., 2019; Mardnly et. al., 2018; Paniagua et. al., 2018; Darko et. al., 2016*).

IC and CG are associated with each other due to their significant role to attain the objective of the organization, and it assures survival and growth (*Saeed et. al., 2015*). The board of directors in firms is liable to constitute strategies to use human and structural resources efficiently to improve banking performance (*Nawaz & Haniffa, 2017*). Thus, the combination of IC and CG has become a keystone for companies to generate good profit and sustainable growth (*Nawaz, 2019*). In India, the principles of CG are similar to those in other countries but with a few unique characteristics due to the country's regulatory environment and business culture. These principles include:

a. Transparency: Firms are expected to maintain transparency in their business operations, financial disclosures, and decision-making processes by providing stakeholders with accurate, reliable, and timely information. Transparency helps to build trust and confidence in the company and its management (*Bijalwan, 2020*).

b. Accountability: Companies are expected to ensure responsibility for their actions and decisions. This implies that they must be accountable for their actions and be answerable to stakeholders. Accountability helps to ensure that companies act in the best interests of their stakeholders and that they are held responsible for any misconduct (*Srivastava et. al., 2019*).

c. Board of Directors: The board of directors plays a pivotal role in supervising the company's management, formulating its strategic objectives, and ensuring that corporate strategies align with stakeholders' interests. It is also responsible for monitoring managerial performance, promoting effective organizational governance, and ensuring that potential risks are identified, assessed, and managed appropriately. In India, the board of directors is required to have at least one-woman director and an independent director, depending on the size and nature of the company (*Bijalwan, 2020*).

d. Ethics and Values: Companies must operate with a strong sense of ethics and values. This means that they must act with integrity, honesty, and fairness in all their operations. Companies are required to operate in accordance with all relevant legal provisions and regulatory requirements, and must not engage in any unethical or illegal activities. In India, companies must also adhere to the principles of corporate social responsibility (CSR) and report their CSR activities to stakeholders (*Srivastava et. al., 2019*).

e. Risk Management: Companies must adhere to effective risk management systems. This means that they must identify and manage risks effectively to ensure that the firm's exposure to unnecessary risks is minimized. Effective risk management helps to protect the company and its stakeholders from potential losses. In India, companies must also comply with the regulations and guidelines issued by the Securities and Exchange Board of India (SEBI) on risk management (**Wondem & Batra, 2019).

To apply the principles of CG in India, companies must develop regulations and practices that are aligned with the CG principles. For example, companies must ensure that they have an effective way for financial reporting, risk management, and ethics & values. They must also ensure that their board of directors is independent, diverse, and possess skills and expertise necessary to effectively oversee the management of the company. In India, companies must also comply with the regulations and guidelines issued by SEBI on CG (*Srivastava et. al., 2019*). Good CG parameters as suggested by *Bijalwan, (2020)*: A good CG in an organisation can be characterized by transparency inside the organisation, a sound board structure, well defined board procedures, investor's rights protection and a good CG strategy.

Safieddine et. al., (2009) examined the correlation between IC and CG in academic institutions. They tested the ideas of all the faculties at the American university of Beirut. And the results suggested that there is a connection between IC and CG, and faculty members believe that CG attracts IC. Also, *Halder et. al., (2016)* examined how two

knowledge-based industries' levels of international competitiveness and CG flexibility relate to one another, i.e. I.T and Pharma in India during the period from 2006 to 2014. The researchers found that flexibility in CG significantly affects IC. *Keenan and Aggestam (2001)* also concludes that “the responsibility for the prudent investment of IC resides with CG”. *Bijalwan, (2012)* concludes that an efficient CG, reduces risks on the organisation, improves performance of employees, improves access of firms to various capital markets, enhances the visibility of goods and services of the firm, improves leadership in the organisation, demonstrates transparency inside the organisation and improves social influence and accountability.

Not many recent studies have focused on both the topics together and have also examined the influence of different CG mechanisms on the disclosure of CG (*Cerbioni & Parbonetti, 2007*). A broad review of literature shows that the researchers are yet to reach any unanimity and certain research found that, IC has a major impact on CG. (*Gemmill & Thomas, 2004; Alves & Mendes, 2002 and Drobetz et. al., 2004*) while others demonstrate almost no association between IC and CG (*Sueyoshi et. al., 2010; Aboagye & Otieku, 2010; and Bauer et. al., 2010*).

Table 1: Literature review:

Sl. No.	Author & Year	Findings	Research Gap
1	Smriti N. and Das N., (2021)	The present study found that the firm's CG is significantly enhanced by presence of diverse gender on board.	This research is focused only on the Indian listed firms.
2	Dalwai T. & Mohammadi S. S., (2020)	The findings indicate that board size and number of audit committee meetings have a significant association with the IC efficiency. CG of banks effectively engages in utilizing the potential of IC efficiency.	The sample size is small as the study is limited to the listed financial sector of Oman.
3	Kumar Singla, H. (2019),	According to the study, IC is a critical asset for Infrastructure firms looking to enhance their corporate performance.	The research is done only on Quantitative VAIC Model, further Qualitative Models can also be used.
4	Kamath B. (2019),	According to the study, only large-cap enterprises' IC performance is significantly influenced by the board's features. The board's size and independence have a significant detrimental and positive impact, respectively. Industry type and company age also have an impact on IC performance.	The paper has limitations like: some aspects of CG, such as duality, diversity, and de-classified ownership patterns and board structure, could not be incorporated into the model.
5	Nadeem, M., Farooq, M. B., & Ahmed, A. (2019),	The results reveal a significant positive relationship among representation of female on boards and IC efficiency.	The study was based on top 500 listed firms in the UK, and the findings may be difficult to apply in other firms.
6	Hamdan et. al., (2017),	The relationship among IC and firm performance was found to be positively impacted by CG, which was shown to be significant.	Only 2-year data of firms listed on Saudi Stock Exchange were considered for the study.
7	Haldar, A., Rao, S. V. D., & Momaya, K. S., (2016).	Flexibility in CG has a big impact on IC.	The non-financial components of firm performance such as enterprise and stakeholders were not considered.
8	Appuhami, R. and Bhuyan, M., 2015.	Researchers found out that CEO duality, board composition and remuneration committee composition have significant impact on IC.	Further research is required in the area of measurement of IC to measure IC in firms both in quantitative and qualitative manner.
9	Mubaraq S. & Haji A. A., (2014)	The results imply that CG plays an important role in amplifying IC information.	Current study only considers the Nigerian listed banks.
10	Safieddine, A., Jamali, D. and Nouredine, S., 2009.	The findings imply that CG and IC are really related, and the faculties consider CG to be a key attractiveness element for IC.	Further research is required to gain a more comprehensive understanding of the nature and dynamics of the relationship between IC and CG across a broader range of knowledge-intensive firms.

The above studies indicate that the relationship between these two variables may be complex and potentially influenced by sector-specific factors. In summary, while there is evidence to suggest that IC can have an impact on CG, the nature of this relationship appears to be multifaceted and may vary across different sectors and contexts. The studies reviewed do not provide a consensus, with results ranging from positive to negligible impacts. For a research paper focused on Indian listed companies in the energy sector, it would be essential to consider these diverse findings and explore whether the patterns observed in other markets and sectors hold true in the Indian context. Further empirical research would be required to establish a clearer understanding of this relationship within the specific

framework of the Indian construction, energy and information technology sector. The results obtained from several studies also reveal that IC and CG are an important field for researchers and studies, nevertheless, that number has substantially reduced. It might be attributed to the struggles in obtaining relevant data and also a lack of uniformity and consistency persists among all the proposed analysis methods.

3. Methodology

3.1 Sample and data collection

In line with past studies, the researchers have studied the trends and composition of IC in the listed energy sector companies in India. Secondary data for IC was extracted from CMIIE – ProwessIQ database, whereas CG data was extracted from the annual reports of each selected company. The study uses the data of 8 years, 2014-2021 of 70 companies working in the construction, energy and information technology sector in India, listed under BSE 500. The researchers have used the data of listed companies due to data reliability and availability. Also, factors of IC, Human Capital Efficiency, Structural Capital Efficiency, Capital Employed Efficiency, and Relational Capital Efficiency have been studied. Leverage, Size and Age are used as Control variables. VAIC and MVAIC methods have been used to calculate the IC component of the companies considered for study. The researchers have done a preliminary study using descriptive statistics like: Mean, Median, Range and Standard Deviation of the Variables. Further, correlation matrix along with Panel corrected standard error regression analysis is also used to study the IC and CG dynamics.

Table 2: Variables Used Description:

Sl. No.	Variables Used	Description	Reference	
1	Value-added intellectual coefficient (VAIC)	$VAIC = HCE + SCE + CEE$	Kamath, 2019; Appuhami & Bhuyan, 2015	
2	Modified Value-added intellectual coefficient (M-VAIC)	$M-VAIC = HCE + SCE + CEE + RCE$	Tran et. al., 2020;	
3	Human capital efficiency (HCE)	$HCE = VA / HC$. Human capital efficiency coefficient for the firm (HCE); VA, value added; HC, total salary and wage costs for the firm.	Tran et. al., 2020; Nadeem et. al., 2019; Kamath, 2019;	
4	Capital employed efficiency (CEE)	$CEE = VA / CE$, Capital employed efficiency coefficient for firm (CEE); VA, value added for the firm; CE, book value of the net assets for firm.	Tran et. al., 2020; Nadeem et. al., 2019; Kamath, 2019;	
5	Structural capital efficiency (SCE)	$SCE = SC / VA$, $SC = VA - HC$, Structural capital efficiency for the firm (SCE); VA, Value added for the firm; HC, total salary and wage costs for the firm.	Tran et. al., 2020; Nadeem et. al., 2019; Kamath, 2019;	
6	Relational Capital Efficiency (RCE)	$RCE = RC / VA$, $RC = \text{Marketing, Selling or Advertising expenses}$; VA, Value added.	Tran et. al., 2020;	Smriti & Das, 2018, 2021; Vidyarthi, 2019; Alipour, 2012; Xu & Li, 2020.
7	Board size (BSIZE)	Number of members on the board of the firm.	Tran et. al., 2020; Nadeem et. al., 2019; Appuhami & Bhuyan, 2015; Mubaraq & Haji, 2014.	
8	Board Independence (BIND)	Number of Independent Directors divided by total number of directors on the board.	Tran et. al., 2020; Nadeem et. al., 2019; Appuhami & Bhuyan, 2015.	
9	Board Gender Diversity (BGEND)	Percentage of Female Directors to total number of directors on the board.	Nadeem et. al., 2019;	
10	Frequency of Board meetings (BMET)	Number of board meetings held for the financial year.	Nadeem et. al., 2019; Mubaraq & Haji, 2014	
11	Leverage (LEV)	$LEV = \text{Total Debt} / \text{Total Equity}$	Tran et. al., 2020; Nadeem et. al., 2019.	
12	SIZE	Log of total assets	Tran et. al., 2020.; Nadeem et. al., 2019;	
13	AGE	Natural logarithm of number of years since the firm's inception.	Dalwai & Mohammadi, 2020; Zaid et. al., 2020; Mohapatra et. al., 2019.	

3.2 Conceptual Framework

The diagrammatic representation of the research conceptual model is as given below:

model is as given below:

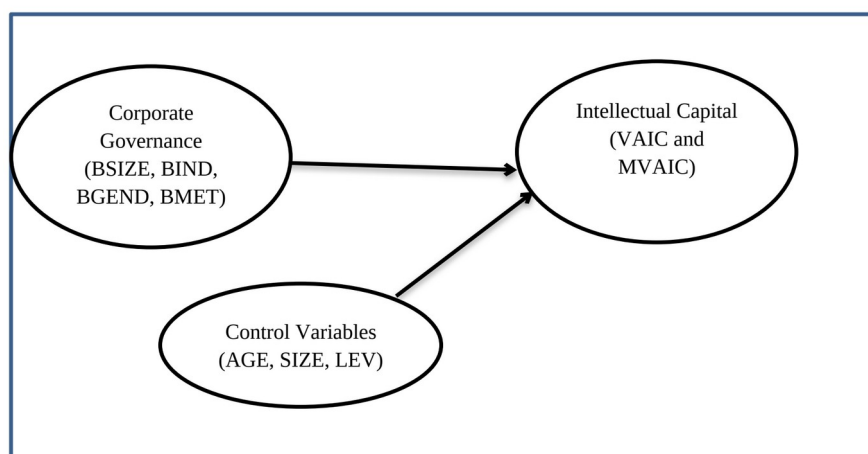


Fig 1: Impact of CG on IC using Age, Size and Leverage as Control variables.

3.3 Regression Models

1. $VAIC_{it} = \beta_1 + \beta_2 BSIZE_{it} + \beta_3 BCOM_{it} + \beta_4 BIND_{it} + \beta_5 BGEND_{it} + \beta_6 BMET_{it} + \beta_7 AGE_{it} + \beta_8 SIZE_{it} + \beta_9 LEV_{it} + \epsilon_{it}$
2. $MVAIC_{it} = \beta_1 + \beta_2 BSIZE_{it} + \beta_3 BCOM_{it} + \beta_4 BIND_{it} + \beta_5 BGEND_{it} + \beta_6 BMET_{it} + \beta_7 AGE_{it} + \beta_8 SIZE_{it} + \beta_9 LEV_{it} + \epsilon_{it}$

Where, VAIC, MVAIC, BSIZE, BIND, BGEND, BMET, LEV, SIZE and AGE, represents Value Added Intellectual Capital Coefficient, Modified - Value Added Intellectual Capital Coefficient, Board Size, Board independence, Board Gender Diversity, Board Meeting, leverage, Size and Age respectively. Also, β_1 is the constant term, “ ϵ_{it} ” denotes the error term for firm i at time t .

4. Empirical Results

4.1 Descriptive Statistics

Table 3 presents the summary statistics, giving a brief overview of the data. The researchers observed that the mean of VAIC and MVAIC are 6.926 and 6.99, respectively, which implies that on an average, the selected companies created between 6.926 and 6.99 INR for every INR 1.00 spent, and the mean for HCE is 5.423, which is significantly greater than other factors of VAIC and MVAIC, such as SCE (0.641), CEE (0.862), and RCE (0.063). This comparison indicates that the selected company's focus on HCE is greater than the remaining components of CG. It also illustrates that the selected companies generate the majority of their money from their Human Capital Efficiency.

Table 3: Summary Statistics of the selected sample

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	546	.0756	.0875	-.4723	.35
ROE	546	.0148	2.8063	-65.3146	1.0069
ATO	546	.6685	.4968	0	3.1781
VAIC	546	6.9268	8.2164	-5.4589	123.4513
MVAIC	546	6.9902	8.2035	-5.0023	123.4992
HCE	546	5.4231	6.3871	-6.0735	44.2791
SCE	546	.6415	.5523	-5.6087	6.0163
CEE	546	.8622	5.0592	-8.4782	116.9231
RCE	546	.0634	.2321	-3.0552	1.2845
LEV	546	.1033	.1335	0	.7939
SIZE	546	8.7164	1.7964	-2.8134	13.7872
AGE	546	3.176	.7259	0	4.7185

Mean of ATO (0.668) highlights that the selected companies are not efficiently using their assets to gain revenue. The aggregate of mean values of HCE, SCE and RCE (6.127) is greater than the mean of CEE (0.862), suggesting that the selected firms generate more value by employing CG rather than their physical and financial capital, which corresponds to prior research findings (*Smriti & Das, 2018; Xu & Li, 2020; Ge & Xu, 2020*). Also, the control variables LEV, SIZE and AGE have a mean value of 0.103, 8.716 and 3.176 respectively.

4.2 Correlation Matrix

Table 4: Matrix of correlations of the selected sample

Variables	ROA	ROE	ATO	VAIC	MVAIC	HCE	SCE	CEE	RCE	LEV	SIZE	AGE
ROA	1.000											
ROE	0.261	1.000										
ATO	0.407	0.062	1.000									
VAIC	0.094	0.035	0.111	1.000								
MVAIC	0.092	0.031	0.112	0.999	1.000							
HCE	-0.014	0.024	0.012	0.786	0.786	1.000						
SCE	-0.105	0.021	-0.146	0.267	0.250	0.269	1.000					
CEE	0.182	0.024	0.182	0.603	0.603	-0.015	-0.015	1.000				
RCE	-0.071	-0.140	0.036	-0.070	-0.042	-0.035	-0.602	-0.003	1.000			
LEV	-0.426	-0.135	-0.283	0.136	0.135	0.216	0.157	-0.069	-0.067	1.000		
SIZE	-0.092	-0.027	-0.252	0.037	0.036	0.136	0.152	-0.127	-0.060	0.332	1.000	
AGE	0.117	0.013	-0.131	-0.022	-0.021	0.001	0.011	-0.038	0.023	-0.226	0.330	1.000

Table 4 demonstrates how the factors are correlated among each other. Here the researchers observed that the two coefficients of CG, VAIC and MVAIC are perfectly correlated with each other. Also, we see that out of all the measures of CG, HCE is highly linked with VAIC and MVAIC, followed by CEE and the remaining variables of CG, viz. SCE and RCE have a very weak correlation with the CG coefficients, i.e. VAIC and MVAIC, however RCE is having a negative correlation with both VAIC and MVAIC.

CEE is positively correlated with all the firm's financial performance indicators, i.e. ROA, ROE and ATO which implies that CEE of the selected companies contribute more to the firm's productivity and market value and that the physical and financial capital is still a major component in a firm's financial performance. Also, HCE is found to

have a beneficial relationship with ATO, which demonstrates that Human Capital can enhance the value of the available assets. No independent variable has a substantial coefficient of correlation greater than 0.90, implying that there is no multi-collinearity (Smriti & Das, 2018). Annual VAIC and MVAIC of selected Companies and Average Annual VAIC and MVAIC of the selected companies indicate significant variability in the values of Average, minimum and maximum values across. The minimum and maximum values for VAIC are (-5.459, 123.451) and MVAIC (-5.002, 123.499).

4.3 Corporate Governance and Intellectual Capital Dynamics

Evaluating the impact of CG on CG, VAIC and MVAIC are taken as the Dependent variables, whereas BSIZE, BIND, BGEND and BMET are taken as independent variables and LEV, SIZE and AGE are considered as control variables. The results show that VAIC and MVAIC have an insignificant impact over the CG measures – BSIZE, BIND, BGEND and BMET.

Table 5: Result of panel corrected standard error regression analysis.

	VAIC	MVAIC
BSIZE	-0.029	0.0001
BIND	-1.887	-2.521
BGEND	-0.721	-0.590
BMET	-0.047	-0.042
LEV	4.270***	4.395***
SIZE	-1.071***	-1.118***
AGE	0.284	0.292
_cons	17.486***	17.953***
Observations	546	546
R-squared	0.196	0.201

The term “ ϵ_{it} ” denotes the error term for firm i at time t .

Among the control variables, LEV is found to have a positive and significant impact over both VAIC and MVAIC, whereas SIZE is found to have a significant but negative impact over both VAIC and MVAIC at 1% confidence level. And, AGE has an insignificant impact over VAIC and MVAIC.

4.4 Robustness Check

VAIC is employed as a measure of IC in the current study, and to double check with the robustness of the results, the researchers have additionally employed the MVAIC model using the additional RCE (Relational Capital efficiency). The sample was additionally examined for multi-collinearity using the Variance Inflation Factor (VIF), which was less than 2. As a result, multi-collinearity is not a major issue in the selected sample. Control variables comprise of LEV (Leverage), SIZE, and AGE.

5. Conclusion

For the current study, 70 companies working in the construction, energy and information technology sector and listed under the BSE500 index during the financial year 2014–2021 were used to examine the effects of CG on CG. VAIC and MVAIC were used as measures of IC and Board Size, Board Independence, Board gender diversity and Board meetings are used as measures of CG and Leverage, Size and Age are used as control variables.

Average of VAIC and MVAIC are 6.94 and 7.003 respectively. And the main contributor to these is the HCE, which is followed by CEE, SCE and RCE respectively. The results clearly support and advocates for fuller and comprehensive use of Human Capital and Financial Capital to cope up with the ever changing and advancing industrial requirements. Human Capital can be further improved by adopting Industrial best practices to enhance the

capabilities of employees, by continuously up-skilling and re-skilling the employees in order to remain abreast with the latest market trends. The researchers also observed that the firms on an average generate between 6.94 and 7.003 INR for every INR 1.00 Invested. Results of the current study shows CG to have almost no impact over CG, which may be since many of the relevant changes took place after the Companies Act, 2013, such as presence of one female board member was made mandatory. At least 50% of the board members should be independent directors and others. Most of these companies have slowly but successfully adopted these changes, whereas there are still few companies, which are yet to oblige with these regulations.

Implications: This study has various implications such as, for managers – it was found that firms need to focus more on better and transparent CG by having greater number of independent directors and female directors, which will ultimately provide the firms a competitive advantage. Also, for the policymakers, the focus on CG should be increased, as it directly impacts the country's GDP and livelihood of poor and needy.

Research limitations – In India, little research has been done in the emerging area of CG and IC. As a result, there haven't been many studies devoted to comprehending CG and IC dynamics in the Indian construction, energy and information technology sector firms.

Future Scope of Study: The relationship between CG and company performance, capital structure, corporate value, and social responsibility can be assessed through further research. Future research should broaden the sample and/or compare variations across industries or nations.

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