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# MODELLING THE IMPACT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE: A CASE OF INDIAN IT COMPANIES

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## Abstract

**Purpose:** This research aims to study the impact of the intellectual capital of selected listed IT companies in India on their financial performance.

**Design/Methodology/Approach:** This study includes a sample of the ten Indian IT companies' constituents of Nifty – IT index from 2011 to 2022. PLS-PM analysis has been employed to identify the intellectual capital components that predict the firm's performance and the effect of intellectual capital components on the firm's financial performance.

**Findings:** The findings suggest that intellectual capital affects company performance and can, to varied degrees, predict it. The path model results validate the model fit and provide compelling evidence for the Intellectual Capital framework's theoretical underpinnings. The study offers evidence from the Indian IT sector that intellectual capital significantly impacts performance.

**Originality/Value:** This study examines the financial performance of selected IT companies in India for investigating the impact of intellectual capital on financial performance. It offers additional insights for intellectual capital in predicating the firm performance.

**Keywords:** IT Companies, Nifty-IT, VAIC, PLS-PM, Intellectual Capital, Firm Performance

**JEL codes**: O34, G30, L25, L86

## Introduction

With the start of the twenty-first century, information, computer technology, and communications have seen rapid invention and popularization, profoundly transforming human lives and economic structures. The Internet revolution altered electronic transactions and economic systems, as well as traditional manufacturing methods and management styles (Barathi Kamath, 2007). The "digital revolution" has caused a "paradigm shift" in the production and delivery of goods and services, including research and development, marketing, manufacturing, design, and transactions. Today, business enterprises focus more on intangible resources than tangible ones, which, in the context of IT and globalization, makes the intangible assets a vital factor in improving the financial performance of the corporate organization (Weqar et al., 2021).

Many industries view value creation as critical to gaining a competitive advantage. Effective management of intellectual capital (IC) has come out to be one of the vital value creation factors for generating value and gaining a competitive edge (Al-Azizah & Wibowo, 2023). Intellectual capital holds immense significance within India's IT industry, serving as the cornerstone of innovation, competitiveness, and growth. In this dynamic sector, characterized by rapid technological advancements and global competition, the collective knowledge, expertise, and creativity of professionals are paramount. India's IT ecosystem thrives on its human capital, boasting a vast pool of skilled professional's adept in various domains such as software development, data analytics, and artificial intelligence. Additionally, intellectual capital encompasses proprietary technologies and innovative solutions, driving the industry's ability to deliver cutting-edge products and services to clients worldwide (Choudhury, 2010). Through continuous knowledge sharing, collaboration, and the protection of intellectual property assets, Indian IT companies maintain their edge in the global market, ensuring adaptability, resilience, and sustained growth in an ever-evolving landscape.

Our study stands out from previous research in two key aspects. Firstly, while past studies have often examined broader market indices or specific sectors, our research uniquely hones in on the NIFTY IT index from 2011 to 2022, specifically within the IT industry encompassing ten prominent companies. By narrowing our focus to this specific index and industry segment, we provide a more targeted and detailed analysis of the factors influencing market trends, investor sentiment, and company performance within the context of the NIFTY IT index. Secondly, our study adopts Partial Least Squares Structural Equation Modeling (PLS-SEM) as the analytical methodology, distinguishing it from conventional

approaches utilized in similar research endeavors. Partial Least Squares Structural Equation Modeling (PLSPM) offers several advantages, including its suitability for analyzing complex relationships among variables with relatively smaller sample sizes, its flexibility in accommodating formative constructs, and its capability to assess both measurement and structural models simultaneously. By leveraging PLS-SEM, our study not only enhances the methodological rigor of our analysis but also provides novel insights into the interplay of factors shaping the performance and dynamics of the NIFTY IT index over the specified period.

Therefore, the current study set out to examine the impact of three antecedent elements of intellectual capital—financial capital, human capital and structural capital—on financial performance. As a result, the following research questions were created to aid in the present study:

RQ – 1: Is there any noteworthy correlation between intellectual capital variables and corporate performance variables?

RQ – 2: Is there an influence and multivariate link between intellectual capital variables and corporate performance and their predictive relevance?

This paper presents a pioneering investigation into the relationship between IC and organizational performance within the Indian IT industry, focusing on the constituents of the Nifty-IT index from 2011 to 2022. By utilizing PLS-SEM as the analytical framework, this study offers a fresh perspective on how IC components—physical, human, and structural capital—affect key performance indicators such as market value to book value ratio, return on assets, return on equity, earnings per share, and market capitalization. The validation of the VAIC model and the methodological advancements in employing PLS-PM contribute significantly to both theoretical understanding and practical applications in assessing organizational success in the knowledge-driven economy. These contributions are essential for scholars, practitioners, and policymakers seeking to enhance strategic decision-making and performance evaluation in the dynamic landscape of the IT sector.

## Literature Review

### IT Industry

The service industry is India's major sector, accounting for 56.9 percent of Gross Domestic Product (GDP) in 2012-2013 (Dutta Gupta et al., 2015). According to Gordon and Gupta (2004), the service sector's rise was driven by factors such as high-income elasticity of demand, the use of services as inputs by other sectors, and increased exports. Aside from these demand-side elements, supply-side ones such as government policy changes have also helped to drive service sector expansion. The study of India's service sector will be incomplete until we highlight the expansion of the Indian IT industry. IT is one of the

fastest-growing industries. India's IT industry has established itself as a major player in the global market. The IT industry encompasses software and IT-enabled services (ITES), such as business process outsourcing (BPO) (Dutta Gupta et al., 2015).

Using Lithuanian enterprises as examples, Mačerinskienė and Survilaitė (2011) looked into the theory of intellectual capital to show how important it is for each company to have a normal and stable life. They examined the relationship between a company's value contributed and intellectual capital.

A structural model connecting corporate governance, the efficiency of intellectual capital, and financial performance was created by Makki and Lodhi (2014), and it was then confirmed using PLS-SEM. They ascertained the presence of a crucial structural connection between financial success, intellectual capital efficiency, and corporate governance. The study concluded that corporate governors can greatly increase financial performance by utilizing resources related to intellectual capital rather than directly improving it.

Scholars generally agree that, when using a monetary-based approach, assessing IC involves calculating human capital, capital employed, relational capital, and structural capital efficiencies (Barak & Sharma, 2023; Kapoor & Saihjpal, 2022; Kweh et al., 2022; Weqar et al., 2020; Bayraktaroglu et al., 2019; Xu & Wang, 2019; Chowdhury et al., 2018; Smriti and Das 2018; Cohen et al., 2014; Pulic, 1998). Studies have indicated that IC is major in increasing businesses' overall profitability. If a company's IC is appropriately managed, its management can boost the company's financial performance (Kweh et al., 2022; Le et al., 2022; Asare et al., 2021; Khalique et al., 2019; Xu & Li, 2019; Chowdhury et al., 2018).

Because it is easily accessible and allows for efficient comparison across companies or countries, the VAIC model is preferred by most researchers when compared to alternative IC assessments (Kapoor and Saihjpal, 2022; Le et al., 2022; Kasoga, 2020; Soewarno and Tjahjadi, 2020; Tran and Vo, 2020; Poh et al., 2018; Sardo and Serrasqueiro, 2017).

*Intellectual capital and performance of the firm*

Because banks stimulate economic growth, their success is critical to the economy (Mohapatra et al., 2019). Most early studies on the connection between intellectual capital and firm performance were conducted in advanced nations. Studies from emerging economies have increased significantly, nevertheless. Businesses increasingly understand the importance of investing in IC and expertise to maintain and improve their performance. In order to achieve company success, knowledge assets are essential resources. Intellectual capital (IC) is frequently used to describe intellectual assets and is universally acknowledged as a vital source of competitive advantage and value creation (Smriti and Das, 2018).

A few studies have found a significant positive relationship between intellectual capital and firm performance in several empirical investigations (Gupta & Raman, 2021; Innayah et al., 2020; Anifowose et al., 2018; Hamdan, 2018; Dzenopoljac et al., 2017; Alhassan & Asare, 2016).

Furthermore, it has been noted that not all IC components are equally significant in

influencing how well an organization performs (Bontis, 1998). Research from various countries (Le et al., 2022; Weqar et al., 2020; Hamdan, 2018; Nadeem et al., 2018; Poh et al., 2018; Tran & Vo, 2018; Forte et al., 2017; Sardo & Serrasqueiro, 2017; Vishnu and Kumar Gupta, 2014) show that HC and SC are the primary and essential components of intellectual capital that affect firm performance.

Moreover, more research examines how combined intellectual capital (MVAIC) affects firm performance. Research by Maji and Goswami (2017) and Vishnu and Kumar Gupta (2014) show a substantial correlation between intellectual capital and financial performance in Indian companies. Farooque et al. (2023) examined the relationship between the financial performance of conventional and Islamic banking companies listed in the GCC and IC-MVAIC. The results show that VAIC in Islamic banks is less successful than MVAIC in raising the productivity measures of conventional banks. In the South Korean and Vietnamese markets, Tran and Vo (2020) and Xu and Liu (2020) show that intellectual capital positively affects accounting-based firm performance. According to Bayraktaroglu et al. (2019), the various components of IC efficiency moderate the relationship between CE efficiency and profitability. The accounting-based performance of Chinese technology and non-technology enterprises is significantly correlated with the IC-MVAIC, according to Xu and Li (2019).

## Conceptual Framework

Any firm operates on the core concepts of growth and value creation. Researchers and business professionals agree that present measuring methodologies will not produce flawless results for quantifying intellectual capital. As a result, future business models will eventually involve intangible asset appraisal. Ante Pulic and his colleagues at the Austrian IC Research Centre developed the "Value Added Intellectual Coefficient" (VAIC) as an innovative method for quantifying a company's intellectual capital in light of this and the importance of intellectual capital in value creation. This technique is crucial because it assesses how effectively an organization's tangible and intangible assets generate value. One of the most important aspects of the VAIC approach is its ability to evaluate an organization's intellectual capital. This technique takes advantage of the value-creation potential inherent in two major parameters: intellectual and physical capital. It is thought that intellectual capital cannot exist in a vacuum or generate value on its own. It can only add value when linked with tangible assets.

VAIC takes values from the balance sheet and income statement. According to Pulic (2000a, b), an organization's market value is defined by its internal capital and capital employed, with IC consisting of structural and human capital. This method is unique and immediately identifiable since it assesses capital employed efficiency (VACA), human capital efficiency (VAHU), and structural capital efficiency (STVA). These three metrics measure VAIC, or intellectual capital efficiency. A higher VAIC rating shows that the company is producing value more efficiently. The VAIC index compares and tracks improvements in

intellectual capital capability in real time.

VAIC is a popular IC measurement technique that offers several advantages. However, using the VAIC methodology helps to alleviate these issues to some extent. The VAIC value and dimensions are calculated using quantitative data from publicly available business financial reports. Because data is collected via audited financial records rather than subjective evaluations such as questionnaires, the VAIC technique provides a standardized and consistent metric (Shiu, 2006). When measuring financial data, it is possible to use "any indicators, relations, or ratios computed may be used for comparison along with traditional financial indicators commonly found in business" (Chan, 2009a, b). Along with the simplicity of data gathering and calculation, as a standardized measurement approach, VAIC permits comparisons between organizations (Maditinos et al., 2011).

Despite its widespread use, VAIC has been criticized in the IC literature (Stahle et al., 2011; Andriessen, 2004). Stahle et al. (2011) argue that the VAIC technique has no influence on IC because it only measures a company's labor and capital investment efficiencies. Another criticism is that Pulic's technique confuses some accounting concepts (such as flow and stock entities) while measuring social and human capital (Andriessen, 2004). To answer these criticisms, Iazzolino and Laise (2013) argue that the VAIC approach does not break any fundamental accounting rules, and that the main reason for the criticism arises from the VAIC's differing interpretations of human and social capital categories. In Pulic's work, for example, human capital is defined as the fraction of VA created by a set of intangible assets' characteristics, rather than a set of intangible assets themselves, while social capital is defined as the amount invested in employees in exchange for a set of employee characteristics. As a result, the VAIC approach "has its logical coherence" after properly comprehending the concepts (Iazzolino & Laise, 2013).

The current study presents a conceptual framework that builds on previous methodologies (Maditinos et al., 2011; Tan et al., 2007; Chen et al., 2005; Firer and Williams, 2003; Riahi-Belkaoui, 2003; Botnis et al., 2000; Pulic 2000a, b) to investigate the relationship between intellectual capital and firm performance, as well as the impact of intellectual capital on firm's financial performance of IT companies listed in Nifty index.

We base this analysis on how stakeholders perceive value added. The value-added amount is computed by adding interest and payroll costs to pre-tax profit. The value-added statement is functionally equivalent to an amended income statement. Value added is the sum of labor, corporation taxes, dividends, interest payments, minority shareholders in subsidiary companies, depreciation, and retained profits. Here, the Gross Value Addition Concept is used. Value addition can be defined as the wealth created by a company's operations.

Value addition, or VA, is the first statistic used to assess the effectiveness of intellectual capital. The equation below has been used to do this:

$$Value\ Addition = Interest\ Expenses + Depreciation\ Expenses + Dividendeds + Taxes + Equity\ of\ Minority\ Shareholders + Employee\ Expenses$$

The second stage is to determine the value-added capital coefficient, commonly known as the value-added efficiency of capital employed. The value-added efficiency of capital utilized refers to the value created by using one unit of physical capital. The calculations below can be used to calculate the value-added efficiency of capital utilized.

$$Value\ Added\ Efficiency\ of\ Capital\ Employed = \frac{Value\ Addition}{Capital\ Employed}$$

If a unit of capital employed in one company generates larger returns in another, the latter has superior capital utilization. This demonstrates how intellectual capital can be better used to boost the capabilities of physical capital.

The third stage involves determining the relationship between value addition and human capital. This is known as the "human capital coefficient," and it assesses how well the value generated by human capital is leveraged. This demonstrates how human capital may offer value to the business. According to Pulic, a company's total pays and wages are a reliable predictor of its healthcare costs. Because the market determines salaries based on performance, relating human capital success to an increase in value addition makes sense.

$$Value\ Added\ Efficiency\ of\ Human\ Capital = \frac{Value\ Addition}{Human\ Capital}$$

The fourth stage involves calculating the structural capital coefficient (STVA), which shows how effective structural capital is in creating value. The Pulic approach measures structural capital as the gap between human capital and value added.

The formula below clearly shows that structural capital is inversely related to human capital and is determined by the value produced. As a result, it has been shown that human capital and structural capital are reciprocal, implying that the greater the participation of human capital (HC) in the development of value addition (VA), the lower the contribution of structure capital. As seen in the following, structural capital's value-added efficiency.

$$Value\ Added\ Efficiency\ of\ Structural\ Capital = \frac{Value\ Addition}{Structural\ Capital}$$

The final process involves calculating the business's value-added intellectual capital efficiency. This can be calculated by adding all of the previously given coefficients. As a result, we have VAIC, a unique indication. The sum of the three separate indicators, or VAIC, is stated as

$$Value\ Added\ Intellectual\ Capital\ Efficiency$$
$$= Val\ \ Added\ Efficiency\ of\ CE$$
$$+ Val\ \ Added\ Efficiency\ of\ Human\ Cap\ + Val\ \ Added\ Efficiency\ of\ Structural\ Cap$$

According to the resource-based view (Marr et al., 2003), organizations are "characterized by their unique resource base," and intellectual capital is becoming an increasingly important component of this base. As a result, in order to improve performance, businesses

must recognize, develop, and effectively use intellectual capital (Marr et al. 2003). Several research on the relationship between intellectual capital and corporate performance have been done in a number of industries and nations. (Sardo and Serrasqueiro, 2017; Dzenopoljac et al., 2017; Wang et al., 2016; Kim and Taylor, 2014; Kianto et al., 2013; Hsu and Wang, 2012; Al-Twaijry, 2009).

Based on the previously mentioned studies on IC's importance to company performance, there is some evidence that IC components and firm performance are related. However, a closer examination of the empirical study data revealed variances in the essential nature of this association, particularly its direction and intensity. According to Kamukama et al. (2010), such disagreements are to be expected because inconsistencies in firm performance might be driven by industry and country-specific factors (how developed the business is, cultural differences, geographical variances, etc.). Furthermore, F-Jardon and Susana Martos (2009) argue that "the existence of some element differential in the companies" may influence how IC influences firm performance.

## Methodology

*Data Collection Methods*

This research focused on analyzing companies listed in the IT industry, which are part of the 'Nifty - IT', serving as a benchmark index for the Indian market's IT sector. Data were sourced from the financial statements of these companies, extracted from the ACE Equity/ CMIE Prowess database, as well as their annual reports. Additionally, information on stock prices was gathered from the official website of the stock exchange, (www.nseindia.com). The study's timeframe spanned from 2011 to 2022, allowing for an investigation into the correlation between intellectual capital and corporate performance.

The hypotheses of the study are presented below.

$H_1$: There is a significant relationship between intellectual capital variables and firm performance variables.

$H_2$: Intellectual capital has a significant impact on firm performance.

$H_3$: Performance of intellectual capital can forecast firm performance.

The first hypothesis of the study analyses correlation, which assesses the relationship between two variables and explains the linear link between them. Pearson's correlation analysis was used for both the dependent and independent variables.

In the final two hypotheses, PLS-PM is used for multivariate analysis. Using this model, the latent variable's $R^2$ value indicates the validity and strength of the model and quantifies the variables' impact on each other.$H_3$ looks at the model's predictive power or the latent variable's applicability in explaining endogenous variables. $H_3$ examines the predictability of the entire model, while $H_2$ evaluates the inner model.

Intellectual capital is assessed through three key variables: the efficiency of capital employed, the efficiency of human capital, and the efficiency of structural capital. On the other

hand, corporate performance is evaluated using metrics such as the Market Value to Book Value Ratio (MV/BV), Return on Assets (RoA), Return on Equity (RoE), Earnings per Share (EPS), and Market Capitalization. To enhance the conceptual model's strength, the correlation between intellectual capital variables and corporate performance variables was examined to address RQ1, and this relationship was tested through $H_1$.

*Variables for Firm Performance*

The existing literature offers a range of accounting and market-based indicators that serve as proxies for assessing a company's financial performance. Consequently, no specific theoretical perspective or empirical evidence strongly favors any single proxy over others. Prior studies have extensively utilized the proxies employed in this investigation. In this research, five financial ratios have been adopted as substitutes for evaluating company performance. The study examines the influence of the market value to book value ratio, return on equity, return on assets, earnings per share, and market capitalization.

Numerous studies in the literature have established connections between VAIC and/or its components and various outcomes. The cited sources of information include: market value to book value (Pal and Soriya, 2012; Shiu, 2006a; Chen et al., 2005; Firer and Williams, 2003), return on equity (Sardo and Serrasqueiro, 2017; Clarke et al., 2011; Chang, 2007), and earnings per share and market capitalization (Venugopal, 2012).

- MV / BV is the ratio of the market value of equity shares to the book value of equity shares (Venugopal, 2012)
- R. O. A. is the ratio of net profit after taxes to average total assets (Joshi and Desai, 2019; Venugopal, 2012)
- R. O. E. is the ratio of net profit after taxes to average shareholders' funds (Joshi and Desai, 2021; Joshi and Desai, 2019; Chan, 2009b)
- E. P. S. is the ratio of net profit available to equity shareholders to the total number of outstanding equity shares (Joshi and Desai, 2021; Venugopal, 2012)
- Market Capitalization is calculated as the total number of outstanding equity shares multiplied by the market price of the share. (Joshi and Desai, 2021)

*Model and Methods*

Partial least squares path modeling (PLSPM) serves as a statistical method aimed at simulating intricate relationships among multiple variables, both latent and observable, within structural equation models. Particularly relevant to this study, PLS-PM offers advantages by generating latent variable scores that serve as proxies for constructs, determined by one or more indicators (manifest variables). Notably, PLS path modeling overcomes challenges associated with limited sample sizes, making it applicable in scenarios where other structural equation modeling (SEM) techniques might not suffice. With its capability to handle numerous latent and manifest variables, PLS path modeling enables the estimation of highly complex models. Furthermore, PLS supports both formative and reflective measurement models, enhancing its versatility in empirical investigations.

Within this study, corporate performance and intellectual capital performance are conceptualized as latent variables. Intellectual capital performance, a latent construct, can be operationalized through manifest variables encompassing physical capital (assessed by VACA), human capital (evaluated by VAHU), and structural capital (quantified by STVA).

Similarly, business performance, another latent variable, is measured through manifest variables including market capitalization (MCAP), earnings per share (EPS), market-to-book value (MV/BV), return on assets (ROA), and return on equity (ROE).

## Results

Table 1 displays the means, variances, and standard deviations of the independent and dependent variables for the final sample. The firms included in the sample demonstrated a notable capacity to generate value from their intellectual capital base over the period from 2011 to 2022, with a mean value of 7.04 for intellectual capital performance measured by Value Added Intellectual Efficiency. The mean values for the three components of intellectual capital, namely capital employed, human capital, and structural capital, were 0.51, 5.89, and 0.64, respectively, suggesting that human capital serves as the primary driver of value creation from the intellectual capital base. Additionally, the mean market-to-book value (MV/BV) of 4.28 indicates that investors typically attribute higher value to the sample sectors than their book value of net assets reported in financial statements. Furthermore, with an EPS figure of 29.78, the overall financial performance of the sample is deemed satisfactory. The means of the other financial performance variables—ROA, ROE, and Market Capitalization—are 0.09, 0.26, and 7.14, respectively.

**Table 1**: Descriptive Statistics

| Variables | Number of Observations | Mean | Variance | S. D. |
|---|---|---|---|---|
| Value Added Capital Employed | 110 | 0.51 | 0.12 | 0.346 |
| Value Added Efficiency of Human Capital | 110 | 5.89 | 38.27 | 6.186 |
| Value Added Efficiency of Structural Capital | 110 | 0.64 | 0.03 | 0.173 |
| Value-Added Intellectual Capital Efficiency | 110 | 7.04 | 28.73 | 5.36 |
| M. V./B. V. | 110 | 4.28 | 67.58 | 8.22 |
| E. P. S. | 110 | 29.78 | 105.25 | 10.259 |
| R. O. A. | 110 | 0.09 | 0.06 | 0.245 |
| R. O. E. | 110 | 0.26 | 0.09 | 0.3 |
| Market Capitalization | 110 | 7.14 | 3.83 | 1.957 |

For this study, a formative model tailored to its requirements has been devised, treating

corporate and intellectual capital performance as latent variables linked with manifest variables (indicators). Three indicators are employed to gauge intellectual capital performance, namely, value-added capital employed, value-added efficiency of human capital, and value-added efficiency of structural capital. Corporate performance is evaluated using metrics such as M.V./B.V., R.O.E., R.O.A., E.P.S., and M.CAP. Each industry is analyzed separately, and the results are assessed accordingly.Top of Form

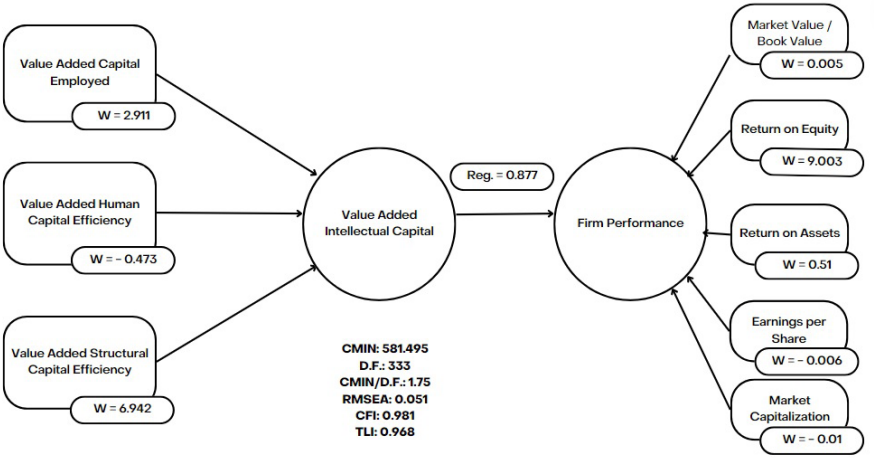


**Figure 1**: PLS-PM model for Impact of Intellectual Capital on Firm Performance

A CMIN value of 581.495 with 333 degrees of freedom was revealed by confirmatory factor analysis (see Figure 1), and the ratio of the CMIN value to the degrees of freedom was 1.75. The CFA model has an acceptable fit since the normed CMIN value was less than 5. The root mean square error of approximation (RMSEA) value was 0.051 without going beyond 0.08, and the p-value was 0.0000. Furthermore, 0.981 was the comparative fit index (CFI) score, indicating a satisfactory model fit. The Tucker-Lewis index's (TLI) computed value was 0.968. Overall, the findings demonstrated satisfactory measurement model indicators. Figure 1 shows the structure of the measurement model.

Value-added efficiency of capital employed has a negative association (-0.102) with market capitalization, but a strong positive relationship (0.384) with R.O.E. and R.O.A. (0.171). This illustrates how profitability would be impacted by physical capital's higher value generating efficiency. The market capitalization and value-added efficiency of human capital are significantly positively correlated (0.111), but not with R.O.E. (-0.153) or R.O.A. (-0.338). Value-added efficiency of structural capital is adversely connected with ROA (-0.375) and R.O.E. (0-.093), but it exhibits a strong positive relationship with Market Capitalization (0.280) and E.P.S. (0.150). Therefore, it can be inferred that there is a

significant positive correlation between structural capital and E.P.S. and Market Capitalization, a significant positive correlation between human capital and market capitalization, and a significant positive correlation between physical capital and R.O.E. and R.O.A. Thus, H1 stands partly accepted.

The relationship between intellectual capital variables and firm performance variables are depicted in Table 2. The Pearson's Correlation analysis for the dependent and independent variables are shown below.

**Table 2**: Correlation Analysis of Variables

| Variables | Value Added Capital Employed | Value Added Efficiency of Human Capital | Value Added Efficiency of Structural Capital | M. V./ B. V. | R. O. E. | R. O. A. | E. P. S. | Market Capitalization |
|---|---|---|---|---|---|---|---|---|
| Value Added Capital Employed | 1 | -0.091 | -0.312 | 0.063 | 0.384 | 0.171 | 0.057 | -0.102 |
| Value Added Efficiency of Human Capital | -0.091 | 1 | 0.681 | -0.081 | -0.153 | -0.338 | -0.051 | 0.111 |
| Value Added Efficiency of Structural Capital | -0.312 | 0.681 | 1 | -0.091 | -0.093 | -0.375 | 0.150 | 0.280 |
| M. V./B. V. | 0.063 | -0.081 | -0.091 | 1 | 0.212 | 0.240 | 0.009 | 0.253 |
| R. O. E. | 0.384 | -0.153 | -0.093 | 0.212 | 1 | 0.702 | 0.333 | 0.126 |
| R. O. A. | 0.171 | -0.338 | -0.375 | 0.240 | 0.702 | 1 | 0.195 | 0.077 |
| E. P. S. | 0.057 | -0.051 | 0.150 | 0.009 | 0.333 | 0.195 | 1 | 0.325 |
| Market Capitalization | -0.102 | 0.111 | 0.280 | 0.253 | 0.126 | 0.077 | 0.325 | 1 |

In contrast to reflective models, formative measurement models reverse the direction of causality regarding the indicators composing the latent variables. Formative models cannot undergo direct statistical evaluation criteria applied to reflective models (Diamantopoulos, 1999, p. 453). In formative models, significant multicollinearity among variables can render an indicator meaningless. Therefore, the initial step in assessing any formative model is determining whether multicollinearity affects the variables in question. If an indicator is multicollinear, its information becomes redundant. Multicollinearity tests should be conducted on the manifest variables within the formative block (Diamantopoulos & Winklhofer, 2001; Cassel, Hackl, & Westlund, 2000).

**Table 3**: Multicollinearity Analysis

| **Variables** | **$R^2$** | **Tolerance** | **VIF** |
|---|---|---|---|
| Value Added Capital Employed | 0.39 | 0.69 | 1.62 |
| Value Added Efficiency of Human Capital | 0.54 | 0.55 | 2.12 |
| Value Added Efficiency of Structural Capital | 0.67 | 0.41 | 2.83 |
| M. V./B. V. | 0.18 | 0.93 | 1.22 |
| E. P. S. | 0.25 | 0.84 | 1.36 |
| R. O. A. | 0.67 | 0.39 | 2.78 |
| R. O. E. | 0.72 | 0.41 | 3.02 |
| Market Capitalization | 0.27 | 0.81 | 1.35 |

In the PLS-PM framework, validation of every component of the model is imperative, encompassing the overall model, the structural model, and the measurement model. The Redundancy Index and the Community Index elucidate the measurement and structural models. Although PLS-Path Modeling lacks a comprehensive fit indicator, Tenenhaus et al. (2005) introduced the goodness-of-fit index as a global criterion. This index measures both the structural and measurement performance of the model, providing a unified assessment of the model's predictive capability. Consequently, the geometric mean of the average R2 and the average community index are employed to compute the goodness-of-fit index.

Goodness-of-fit models, traditionally used for reflective models, can also be interpreted within formative models. This interpretation stems from their provision of an overall fit measure. Esposito et al. (2007) note that the goodness-of-fit index ranges between 0 and 1, with no established threshold for statistical significance. These indices are descriptive and lack inferential value. However, relative goodness-of-fit values nearing or exceeding 0.9 strongly support the hypothesis.

**Table 4**: Goodness-of-Fit Index Analysis

| | Goodness-of-Fit | Goodness-of-Fit (Bootstrap) | S. E. |
|---|---|---|---|
| Relative | 0.693 | 0.711 | 0.018 |
| Outer Model | 0.693 | 0.711 | 0.018 |

Table 5 serves to assess the mono-factorial nature of manifest variables, indicating the strength of the relationship between latent and manifest variables. A well-defined model is characterized by a stronger association between manifest variables and latent variables compared to other variables.

**Table 5**: Cross-loadings

| Variables | Intellectual Capital | Firm Performance |
|---|---|---|
| Value Added Capital Employed | **0.765** | 0.612 |
| Value Added Efficiency of Human Capital | **-0.090** | -0.072 |
| Value Added Efficiency of Structural Capital | **-0.078** | -0.069 |
| M. V./B. V. | 0.181 | **0.213** |
| E. P. S. | 0.312 | **0.344** |
| R. O. A. | 0.717 | **0.827** |
| R. O. E. | 0.835 | **0.991** |
| Market Capitalization | 0.147 | **0.153** |

The findings reveal that, in comparison to firm performance, variables such as Value-Added Capital Employed, Value-Added Efficiency of Human Capital, and Value-Added Efficiency of Structural Capital demonstrate stronger loading on their respective latent variable, intellectual capital. A similar pattern is observed for corporate performance, where more manifest variables are loaded on firm performance than intellectual capital, encompassing earnings per share, market capitalization, return on equity, return on assets, and the M.V./B.V. ratio. Hence, it can be inferred that the model is adequately specified, with manifest variables effectively capturing the essence of the latent variables.

An outer model's validity facilitates the assessment of the inner model. The coefficient of determination, known as R2, for the endogenous latent variable serves as the evaluation benchmark. According to Chin (1998), R2 values of 0.67, 0.33, and 0.19 in PLS path models are considered substantial, moderate, and weak, respectively.

The table below outlines the inner model specification. With an $R^2$ value of 0.772, the proximity to the significant values mentioned earlier is notable. This unequivocally underscores the theory's robustness, indicating that the theoretical underpinnings are sound and that the model can effectively elucidate the endogenous latent variables, particularly corporate performance. Consequently, it has been established that Intellectual Capital explains 77.2% of the variance in Firm Performance.

**Table 6**: Dimensions of Inner Model

| $R^2$ | F Stat. | Pr > F | $R^2$ (Bootstrap) | S. E. | Critical Ratio | Lower Bound (95%) | Upper Bound (95%) |
|---|---|---|---|---|---|---|---|
| 0.772 | 445.159 | 0.0000 | 0.78 | 0.039 | 21.489 | 0.702 | 0.857 |

Table 6 displays the regression weights of the paths. The influence of size is assessed by f2, utilizing Cohen's (1998) f2 metric. According to Cohen (1998), f2 values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects, respectively. The significance of the path coefficient and the $f^2$ values are depicted in Table 7.

The t-statistics of the path coefficient, shown in Table 7, is 23.977, surpassing the required threshold of 1.96. Therefore, the validity of the approach at the p <.05 level has been confirmed. Elevated $f^2$ values indicate a substantial structural impact stemming from the predictor latent variable or intellectual capital.

**Table 7**: Path Coefficients

| Latent Variable | Coefficient | Value | S. E. | t – statistic | p-value | $f^2$ |
|---|---|---|---|---|---|---|
| Intellectual Capital | 2.592<br>IC → FP | 0.877 | 0.045 | 23.977 | 0.0000 | 3.117 |

The cross-validated redundancy obtained through a blindfolding procedure seamlessly complements the PLS path modeling approach, as described by Wold (1982). Analogous to $f^2$, redundancy values offer insights into the relative predictive relevance. Values of 0.02, 0.15, and 0.35 signify minor, moderate, and substantial predictive relevance of the latent variable explaining the endogenous latent variable.

**Table 8**: Predictive Ability with Blind Folding Redundancies

| Latent Variable | Type | $R^2$ | Adjusted $R^2$ | Mean Redundancies |
|---|---|---|---|---|
| Intellectual Capital | Exogeneous | | | |
| Firm Performance | Endogenous | 0.761 | 0.761 | 0.282 |
| Mean | | 0.761 | | 0.282 |

As depicted in Table 8, the mean redundancy for the endogenous variable stands at 0.282. This indicates a medium level of predictive relevance for the model. Furthermore, it elucidates the latent variable that explains the endogenous variable of business performance.

## Discussion

The primary objective of this research is to examine the correlation between intellectual capital (IC) and firm performance within the Indian IT sector. Given the evolving economic landscape, it is imperative to accord intellectual capital the same significance as other resources like land, capital, and tangible assets. In this study, IC is assessed through an index that reflects the value added or wealth generated by companies utilizing IC resources such as financial, structural, and human capital. It's important to note that this assessment does not yield an absolute value but rather serves as an indicator of the efficiency of IC in creating value across various components, as quantified by the VAIC method employed in this research.

The study aims to assess the predictive significance of intellectual capital and its impact on corporate performance. According to the PLS-PM findings, intellectual capital indeed influences company performance and can predict it to varying extents. With an R2 value of 0.772, the IT industry showed significant variance explanation, with intellectual capital contributing to 77.2% of the variance in firm performance. The results of the path model validate the model's fit and offer compelling evidence supporting the theoretical foundations of the Intellectual Capital framework. The study provides empirical backing for the relationship between business success and the intellectual capital measures (VAICTM) proposed by the Ante Pulic model. Moreover, the path coefficients in each path model are notably substantial, confirming both the model's fit and the impact of intellectual capital on firm performance.

This study makes little contribution to the concept's advancement inside the Indian technology industry. For a long-term competitive edge, managers must begin monitoring and controlling their intellectual capital immediately. As they say in management, "you can't manage what you cannot measure." Policymakers, government officials, and other stakeholders will find it easier to examine the reasons why there is no correlation between IC and financial performance after reading this report. Employers are required to require their staff to participate in training programs regularly. In the technology industry, employee talent and skills are crucial for reducing production costs and raising profitability. Organizations must also use the VAIC approach to measure and manage their intellectual capital effectively and compare it to the top competitors in the market. Indian businesses may begin adding a supplemental report on intellectual capital to their yearly financial accounts. Academics and government representatives should be more involved in the development of IC. The government must educate business managers and other stakeholders on the value of information sharing.

The study provides compelling evidence from the Indian IT sector indicating that intellectual capital substantially influences performance in service-based industries such as IT. As a result, we fully support hypotheses $H_2$ and $H_3$, which assert that intellectual capital impacts firm performance and holds predictive significance.

## Future Implications

The extensive analysis presented in the paper offers valuable insights into the managerial, theoretical, and policy implications concerning intellectual capital (IC) within the Indian IT industry and broader organizational contexts. This study delved into the financial intricacies of Indian IT firms listed on the Nifty-IT index, shedding light on the strategic shift adopted by the Indian government concerning associated intellectual property. Despite the robustness of the financial frameworks scrutinized, forthcoming competitive pressures are poised to necessitate heightened emphasis on intellectual capital by Indian IT enterprises.

The knowledge stock derived from intellectual capital serves as a proxy variable offering a comprehensive view of IT intellectual capital on a global scale, constituting the most substantial scientific evidence in the information technology industry. While traditionally categorized into human, structural, and relational capital, these intellectual properties (IPs) stem from the intricate interplay between human and structural capital, with relational capital potentially also exerting influence.

In holistically assessing intellectual capital, it is crucial to recognize that technology may emerge as the primary driver of financial stability in this context. From a managerial standpoint, the governance and leadership of Indian IT enterprises will likely prioritize research and development (R&D) efforts focused on pioneering innovations. The objective is to establish new business paradigms and broaden revenue streams beyond conventional models. Moreover, given India's vast population, potential challenges related to equitable access to services may arise, posing obstacles for managers and entrepreneurs in terms of corporate social responsibility within the contextual framework. In this milieu, intellectual capital, particularly social and relational capital, plays a pivotal role in ensuring financial stability, underscoring the need for a comprehensive analysis of the IT industry.

The contribution of this effort to the current cutting-edge knowledge base was methodically examined to determine how intellectual capital and financial performance are related. In addition to advancing evaluation and development, it is firmly believed that the knowledge gained can assist academics and scholars in identifying the relevant intellectual property indicators that can serve as better indicators of an organization's success in competitive markets. Furthermore, this study found that the antecedent elements related to intellectual property significantly impacted the financial success of Indian IT companies. The results of this study broaden our knowledge of the policies and procedures that should be implemented to improve intellectual capital in the Indian IT industry.

The majority of prior research has focused on the institutions of developed countries, which may limit its applicability to developing countries. On the other hand, this study concentrated on the characteristics that developing economies have in common, like institutions that support the market, lax regulations, and quick changes in the context of developing nations in various situations.

Intellectual capital can facilitate robust performance in the IT sector. This study will

provide practitioners, academics, and policymakers with a useful framework to follow by analyzing the logical aspects of intellectual property that can point to causes for imperfect correlations between intellectual capital and performance that significantly influence national economic policy.

Furthermore, this study offered some general support for the idea that academics, regional company executives, and government representatives should be more actively involved in promoting the growth of intellectual property or capital within their respective organizations. With the help of the suggested conceptual framework, they would be able to obtain reliable and useful metrics to determine intellectual property in multidimensional relationships. The findings were integrated into this notion, indicating that financial organizations can obtain certain standards for recognizing and enhancing their strategic resources and skills.

Policy implications underscore the importance of incentivizing intellectual property protection, promoting knowledge exchange platforms, investing in human capital development, and standardizing intellectual capital reporting practices to foster innovation, competitiveness, and sustainable growth in the IT sector and beyond. By addressing these implications, stakeholders can create an environment conducive to intellectual capital development, innovation, and long-term success in the dynamic landscape of the knowledge-based economy.

## Limitations and Future Research of the Study

The limitations of the study primarily revolve around the scope and methodology employed. Firstly, the study focused exclusively on the Indian IT sector, potentially limiting the generalizability of the findings to other industries or geographical regions. Additionally, the use of a specific index, such as the Nifty-IT index, might not fully capture the diversity within the IT sector, overlooking smaller or niche companies. Furthermore, the reliance on secondary data sources, such as financial statements and databases, might overlook nuanced qualitative aspects of intellectual capital that could provide deeper insights.

Future research could address these limitations by adopting a more comprehensive approach. Firstly, studies could explore intellectual capital and its impact on firm performance across various industries to ascertain the universality of the findings. Moreover, incorporating qualitative research methods, such as interviews or case studies, could provide a richer understanding of how intellectual capital is managed and leveraged within organizations. Additionally, longitudinal studies could track changes in intellectual capital and performance over time, offering insights into the dynamic nature of these relationships. Finally, comparative studies across different countries or regions could shed light on how contextual factors influence the relationship between intellectual capital and firm performance.

Furthermore, the study highlights the unclear measurement techniques and infancy

of intellectual capital asset valuation and reporting. Improved reporting in this area could provide future research with more clarity and direction. Additionally, exploring the relationship between intellectual capital and company performance using statistical techniques like fuzzy logic and neural networks could offer further insights.

In conclusion, this study employs the Partial Least Squares Path Modeling (PLS-PM) approach to offer a fresh perspective on examining intellectual capital. Demonstrating the impact of intellectual capital on company performance and its predictive relevance, the study underscores the value of the VAICTM as a reliable instrument for assessing intellectual capital. It solidifies the notion that intellectual capital is now an indispensable component of contemporary organizations. To excel and maintain a competitive edge, businesses must prioritize the cultivation and valuation of innovation.

## Conclusion

In conclusion, this study sheds light on the crucial relationship between intellectual capital and firm performance within the Indian IT sector. Through the application of the Partial Least Squares Path Modeling (PLS-PM) approach, we have empirically demonstrated the significant impact of intellectual capital on company performance and its predictive relevance. Our findings underscore the importance of intellectual capital as a fundamental driver of success in modern organizations, particularly in service-based industries like IT.

Moving forward, businesses in the Indian IT sector and beyond must recognize the importance of nurturing and leveraging their intellectual capital to maintain a competitive edge in today's dynamic market environment. Cultivating innovation, investing in human capital development, and fostering a culture of knowledge sharing are essential strategies for harnessing the full potential of intellectual capital.

In conclusion, our study underscores the imperative for organizations to prioritize intellectual capital as a strategic asset and emphasizes the need for further research to deepen our understanding of its multifaceted impact on firm performance across various industries and contexts.

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**List of Abbreviations:**

BPO: Business Process Outsourcing.
EPS: Earnings per Share.
GDP: Gross Domestic Product.
HC: Human Capital.
IC: Intellectual Capital.
IT: Information Technology.
ITES: IT-enabled services.
MV/BV: Market Value to Book Value Ratio.
PLSPM: Partial Least Squares Path Modeling
PLS-SEM: Partial Least Squares Structural Equation Modeling.
RoA: Return on Assets.
RoE: Return on Equity.
STVA: Structural Capital Efficiency.
VA: Value Addition.
VACA: Capital Employed Efficiency.
VAHU: Human Capital Efficiency.
VAIC: Value-Added Intellectual Coefficient.