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Intellectual Assets And Profitability: Evidence From The Information And Technology Industry In India

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Abstract
The shift toward a knowledge-based economy has reshaped how firms create value, particularly in the information and technology sector where intellectual assets such as human talent, innovation capability, and organizational knowledge systems play a defining role in determining performance. In India, where the IT industry forms a major pillar of economic growth, employment generation, and global service delivery, the ability to effectively harness these intangible resources has become central to sustaining profitability. This study seeks to examine the extent to which the efficient utilization of intellectual assets influences the profitability of Indian information and technology firms, addressing the gap created by traditional accounting systems that understate the value of intangible resources. Using financial data from 100 listed IT and technology firms across a five-year period, panel regression analysis is employed to assess how variations in intellectual-asset efficiency relate to profit outcomes. The findings indicate that firms that invest in and strategically manage their intellectual assets achieve stronger and more sustained profitability than those relying primarily on tangible resource structures. These results reinforce the growing importance of knowledge-based capabilities as core drivers of long-term competitive advantage in India's technology-led economy.

Keywords: *Intellectual assets; profitability; knowledge-based economy; information and technology industry; human capital; structural capital; relational capital; India.*

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I. Introduction

The structure of economic value creation has undergone a profound transformation over recent decades (Firdous & Ray, 2025), moving from traditional industrial production to knowledge-driven business ecosystems. In this evolving landscape, firms increasingly derive competitive advantage not from physical or financial assets, but from their capacity to develop, manage, and leverage intellectual assets such as human expertise, innovation capability, organizational processes, proprietary technology, and strong stakeholder relationships. These intangible resources are difficult to replicate and often hold greater strategic significance than tangible resources, particularly in sectors where innovation and knowledge form the basis of value creation. However, conventional financial accounting frameworks continue to focus primarily on measurable physical assets and standardized performance indicators, which results in an underrepresentation of the true value generated from intellectual assets. This divergence between reported financial performance and actual economic value highlights the importance of examining how organizations convert intangible capabilities into sustained profitability.

The need for this study arises from the increasing dependence of firms on knowledge-based resources and the persistent challenge in recognizing, measuring, and managing intellectual assets effectively. While global research extensively acknowledges that intangible resources are key drivers of profitability, the empirical understanding of how these assets contribute to performance remains limited, particularly in fast-growing and innovation-oriented economies. In many organizations, investments in employee development, technological capability, and relational networks are classified as expenses rather than strategic assets, thereby discouraging systematic enhancement of these critical performance foundations. As firms continue to operate within increasingly dynamic and competitive market environments, the need to understand the role of intellectual assets in shaping financial and competitive outcomes becomes essential.

This study offers novelty by situating the discussion within the information and technology industry, a sector where intellectual assets are not peripheral but central to the business model. Unlike manufacturing or resource-based industries, where physical capital has traditionally been the main determinant of output and profitability, the IT and technology sector relies on innovation, software development capability, knowledge-sharing structures, and global client relationships. Despite this, relatively limited empirical work has focused specifically on how the efficient management of intellectual assets influences profitability in this sector, especially in emerging market contexts. The study therefore contributes to the literature by examining the

profitability outcomes of firms that systematically develop and utilize intellectual assets compared to those that do not, providing insights consistent with the knowledge-based view of the firm.

The objective of this study is to analyze the role of intellectual assets in shaping the profitability of firms operating within the information and technology sector, and to understand how human capital, organizational capability, innovation structures, and stakeholder networks contribute to improving firm performance. By focusing on the effective utilization of intangible resources, this study seeks to highlight strategic pathways through which firms can enhance value creation and sustain competitive advantage.

The study holds strong relevance in the Indian context, as India is one of the world's leading hubs for IT services, digital process outsourcing, and technology-driven innovation. The sector contributes significantly to national GDP, exports, and employment generation, while operating in a global marketplace characterized by rapid technological change and competitive pressures. For Indian firms, the ability to retain skilled talent, foster innovative work environments, develop resilient organizational systems, and maintain strong client relationships is essential for sustaining profitability (Hussain & Mukherjee, 2025). Therefore, understanding the influence of intellectual assets on performance offers meaningful implications for Indian corporate strategists, policymakers, and investors. The insights derived from this research can support better resource planning, improved talent management strategies, and more informed decision-making tailored to the realities of a knowledge-based economic environment.

II. Literature Review

The shift from industrial to knowledge-based economic systems has fundamentally altered how firms create and sustain value. Early work by Stewart (1997) conceptualizes intangible assets as the core differentiating factors that enable organizations to achieve long-term competitive advantage. With rapid advancements in digital technologies and global competition, Lev (2001) notes that traditional value creation mechanisms based on physical capital have become insufficient, as firms increasingly rely on knowledge, innovation, and specialized capabilities. This perspective aligns with Bontis et al. (1999), who argue that successful firms differentiate themselves by leveraging intangible resources more effectively than their competitors, thereby generating what is often referred to as the "invisible value" that is not fully reflected in financial statements.

The academic discourse on intangible assets evolved into the broader concept of intellectual capital, defined as the collective knowledge embedded within human talent, organizational systems, and external relational networks. Edvinsson and Malone (1997) identify three foundational components of intellectual capital: Human Capital, Structural Capital, and Relational Capital, later complemented by organizational capital in extended frameworks (Schiuma et al., 2008; Survilaitė et al., 2015). Human Capital reflects employee skills and innovative capability; Structural Capital comprises internal processes, technology, and intellectual property; and Relational Capital captures external stakeholder linkages and customer networks (Daum, 2003; Subramaniam, 2005). Together, these assets enhance learning, adaptability, and value creation (Obeidat et al., 2017).

Despite their strategic importance, intellectual assets remain undervalued in financial reporting. Traditional accounting systems prioritize tangible assets and often record investments in knowledge, training, and capability-building as expenses rather than assets (Zéghal & Maaloul, 2010). As a result, the gap between market value and book value continues to widen (Lev & Zarowin, 1999), indicating that financial statements underrepresent intangible value. Tudor et al. (2014) demonstrate a direct positive association between intangible intensity and profitability measures such as ROA, ROCE, and gross margins. Similar conclusions are supported by Lopes (2010), Mačerinskienė and Survilaitė (2011), and Kianto et al. (2013), who show that intellectual capital disclosure enhances the value relevance of reported information.

To quantify the performance contribution of intellectual assets, Pulic (1998) introduced the Value Added Intellectual Coefficient (VAIC), which measures how effectively firms transform human, structural, and capital resources into value. Subsequent studies confirm the validity of this approach across sectors. Firer and Williams (2003) and Firer and Stainbank (2003) find that firms with stronger intellectual capital utilization achieve higher productivity and profitability. In banking applications, Appuhami (2007) and Yalama (2013) show that intellectual capital significantly improves financial outcomes, while comparative work by Gan and Saleh (2008) and Berzkalne and Zelgalve (2014) demonstrates that knowledge-intensive firms consistently outperform less knowledge-driven ones.

Moreover, research comparing Islamic and conventional banks in Pakistan (Reed et al., 2006; Yalama, 2013) illustrates that institutions with stronger investment in human talent, internal systems, and customer relationships maintain better profitability and resilience. These findings align with the knowledge-based view (KBV), which posits that intangible, rare, and difficult-to-imitate resources constitute the primary foundation for sustaining competitive advantage (Reed et al., 2006).

However, despite extensive global evidence, there remains limited empirical research focusing

specifically on the information and technology industry in emerging economies, particularly India. This sector is inherently knowledge-intensive, driven by talent capabilities, innovation structures, and client network capital. Yet the degree to which intellectual assets influence profitability in Indian IT and technology firms has not been examined with sufficient depth.

Thus, the present study addresses this gap by evaluating how intellectual asset utilization contributes to profitability within the Indian information and technology industry, where intangible capabilities are central to competitive advantage and long-term performance.

III. Research Methodology

Research Design

This paper presents a quantitative research design using panel data regression analysis to study the influence of Intellectual Capital Efficiency on the profitability among selected firms during the period 2020-2024. The panel data method is used as it captures cross-sectional (firm-specific) and time-series variation, hence yielding robust estimates and control of unobserved heterogeneity (Baltagi, 2021).

It compares the results of Pooled OLS, FEM, and REM, after which a Hausman specification test is conducted to identify the best model that can be used in this analysis.

Data and Sample

The analysis is based on secondary data collected from the published annual reports and audited financial statements of 100 listed firms over five years, generating 500 balanced panel observations. The sample includes firms from diverse sectors to capture variability in firm-level financial and intellectual capital characteristics. Data cleaning, variable computation, and regression analysis were carried out using EViews 12 software. Variables used in the study are as follows:

Description of Variables Used in the Study

Nature of Variable	Variable Name	Definition / Formula	Description and Theoretical Justification	Supporting Literature
Dependent Variable				
Profitabili ty	Return on Equity (ROE)	ROE = $\frac{Net\ Profit}{Shareholders'\ Equity}$	Measures a company's efficiency in generating profit from shareholders' investments. It reflects the firm's capability to utilize equity capital effectively to maximize returns.	Barak & Sharma (2024); Yadav (2022)
Independent Variable				
Intellectu al Asset Efficiency	Value Added Intellectual Coefficient (VAIC)	VAIC = HCE + SCE + CEE	The Value-Added Intellectual Coefficient (VAIC), developed by Pulic (1998), measures how efficiently intellectual and physical capital contribute to value creation. It comprises Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE). A higher VAIC indicates stronger intellectual capital utilization and improved performance.	Ahmed & Hussin (2022); Marzo (2022); Ali Et al. (2022)
Control Variables				
Liquidity	Current Ratio (CR)	Current Ratio = $\frac{Current\ Assets}{Current\ Liabilities}$	Assesses a firm's short-term liquidity position. Adequate liquidity ensures operational stability, but excessive liquidity can reduce profitability by immobilizing funds in non-productive assets.	Madushan ka (2020); Megaladev i (2018); Hussain and Mukherjee (2025)
Leverage	Debt-Equit y Ratio (DER)	Debt-Equity Ratio = $\frac{Total\ Debt}{Shareholders'\ Equity}$	The proportion of debt used in the firm's capital structure. Moderate leverage can improve returns through the tax shield effect, but excessive borrowing increases the risk of financial distress.	Barak & Sharma (2024); Hussain and Mukherjee (2025)
Firm Size	Firm Size (FS)	FS = log of (Total Assets)	Represents the scale of operations. Larger firms may benefit from economies of scale but results are mixed—some studies show positive, while others show insignificant relationships.	Yadav (2022); İşik (2016); Hussain and Mukherjee (2025)

Estimation Procedure

The three regression estimations conducted are as follows:

1. Pooled OLS Model – Assumes homogeneity across firms.
2. Fixed Effects Model (FEM) – Controls for firm-specific, time-invariant heterogeneity.
3. Random Effects Model (REM) – Assumes firm effects are randomly distributed and uncorrelated with regressors.

The appropriate model was determined using the Hausman test. The variables are selected based on a broad empirical literature that place equal stress on both the tangible and intangible aspects of financial performance. The efficiency of intellectual capital is measured by VAIC, which has a clear association with profitability and market valuation (Ahmed & Hussin ,2022) and (Marzo ,2022). The management of liquidity and leverage decisions have also emerged as important determinants of firm returns Megaladevi (2018) and Barak & Sharma (2024). Firm size captures structural and scale-based efficiency differences among firms, as specified by Yadav (2022) and İşik (2016).

Thus, the model considers both financial ratios and intangible performance measures in providing a complete picture of the firm's profit drivers.

Model Specification

Model Equations

1) Pooled OLS (baseline)

$$ROE_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 CR_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + \varepsilon_{it}$$

where $i = 1, ..., N$(firms), $t = 1, ..., T$(years).

2) One-way Fixed Effect

$$ROE_{it} = \alpha_i + \beta_1 VAIC_{it} + \beta_2 CR_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + u_{it}$$

with firm-specific intercepts α_i capturing all time-invariant heterogeneity; u_{it} is the idiosyncratic error.

3) Two-way Fixed Effects (if you ever include year dummies)

$$ROE_{it} = \alpha_i + \tau_t + \beta_1 VAIC_{it} + \beta_2 CR_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + u_{it}$$

where τ_t are time (year) effects that absorb common shocks (e.g., policy/COVID).

4) Random Effects (for comparison in the Hausman step)

$$ROE_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 CR_{it} + \beta_3 DER_{it} + \beta_4 FS_{it} + c_i + e_{it}$$

with $c_i \sim i.i.d.(0, \sigma_c^2)$independent of regressors, and $e_{it} \sim i.i.d.(0, \sigma_e^2)$; the composite error is $u_{it} = c_i + e_{it}$.

5) Hausman test (FE vs RE)

Let $\hat{\beta}_{FE}$ be the fixed-effects estimator and $\hat{\beta}_{RE}$ the random-effects estimator. The null is that RE is consistent (no correlation between regressors and unit effects):

$$H_0: E(c_i | X_{it}) = 0$$

v/s

$$H_1: E(c_i | X_{it}) \neq 0.$$

Test statistic:

$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})' [Var(\hat{\beta}_{FE}) - Var(\beta_{RE})]^{-1} (\beta_{FE} - \beta_{RE}) \sim \chi^2_k$$

where $k$is the number of tested slope coefficients.

IV. Findings And Analysis

Table 1: Descriptive Analysis

Statistic	ROE	VAIC	CR	DER	FS
Mean	11,894.60	3.3771	3.2966	31.1957	4.4406
Median	17.52	2.6732	2.2331	0.0059	4.3391
Standard Deviation	134,747.60	5.2391	13.9321	463.2001	0.5168
Skewness	12.5054	12.5529	21.8426	15.7234	0.7920
Kurtosis	168.7483	190.4184	484.5856	249.2706	3.9525
Jarque–Bera	585,376.1	744,916.0	4,871,523	1,284,127	71.1749
Probability (JB)	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	500	500	500	500	500

Author's Computation

The descriptive statistic of the model shows that there is significant variability among the firms, as the mean value of ROE is 11,894.60 with high standard deviation of 134,747.6. The average VAIC value of 3.38 indicates that, on average, intellectual capital is efficient. Similarly, the average Current Ratio of 3.30 indicates an adequate level of liquidity. Firms have an average Debt-Equity Ratio of 31.20, indicating relative leverage, and an average Firm Size of 4.44, showing variation in sizes. The values of skewness and kurtosis exceed normal thresholds, indicating the presence of outliers; this was further validated by the Jarque–Bera test, which showed p-values of 0.000. Such significant variability in profitability and financial structure indicates a robust regression analysis.

Table 2: Coefficient Correlation Matrix

Variable	VAIC	CR	DER	FS	C (Constant)
VAIC	181,450.0	-51,335.16	-619.98	-46,341.36	-218,414.3
CR	-51,335.16	23,047.31	171.73	-2,684.71	103,949.2
DER	-619.98	171.73	9.81	-192.39	2,075.79
FS	-46,341.36	-2,684.71	-192.39	6,221,725.0	-27,456,749.0
C (Constant)	-218,414.3	103,949.2	2,075.79	-27,456,749.0	1.24E+08

Author's Computation

This coefficient correlation matrix indicates negligible multicollinearity between the independent variables (VAIC, Current Ratio, Debt-Equity Ratio, and Firm Size) and dependent variable ROE, with correlation values ranging from –0.07 to –0.11. The lack of strong correlations suggests that the variables are statistically independent. The Durbin–Watson statistic is approximately 2.27, derived from the Fixed Effects model, indicates no autocorrelation in residuals, confirming that the error terms are randomly distributed. Therefore, this indicates that the model is well-specified and stable, allowing for confident interpretation of the estimated coefficients.

Table 3: Comparison of Pooled, Fixed, and Random Effect Models (Dependent Variable: ROE)

Model Type	VAIC	CR	DER	Firm Size	R^2	Adj. R^2	F-Statist ic	Durbin–Watson
Pooled OLS	22985.38 (0.000)	189.61 (0.364)	35.44 (0.000)	6940.04 (0.044)	0.915	0.914	1334.33 (0.000)	1.281
Fixed Effects	24289.39 (0.000)	-660.20 (0.001)	8.91 (0.052)	-3418.57 (0.681)	0.964	0.955	103.24 (0.000)	2.273
Random Effects	22985.38 (0.000)	189.61 (0.212)	35.44 (0.000)	6940.04 (0.006)	0.915	0.914	1334.33 (0.000)	1.281

Author's Computation

Table 4: Hausman Test Result (Model Selection for ROE)

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob. (p-value)
Cross-section Random	539.9115	4	0.0000

Author's Computation

Table 3 shows the statistics of Pooled OLS, Fixed Effect, Random Effect The panel regression analysis examined the determinants of Return on Equity (ROE) using Pooled OLS, Fixed Effect, and Random Effect models. The Fixed Effects model shows strong explanatory power with R^2 of 0.964 and an Adjusted R^2 of 0.955, indicating that approximately 96% of ROE variation is because of the independent variables. The F-statistic of 103.24 ($p < 0.001$), and the Durbin-Watson statistic of 2.27 suggests no major autocorrelation issues.

The findings from the analysis reveal that Intellectual Capital Efficiency (VAIC) positively impacts ROE significantly ($p < 0.01$), highlighting that effective use of intellectual resources boosts shareholder returns. In contrast, a negative and significant relationship is found between the Current Ratio and ROE ($p < 0.01$), implying that high liquidity can lessen the profitability. The Debt-Equity Ratio presents a marginally positive effect, while Firm Size does not show a statistically significant impact in the Fixed Effects model. Overall, the model confirms that intellectual capital efficiency is the primary determinant of ROE, along with prudent liquidity and leverage management.

Table 4 indicates The Hausman Test that was carried out to find which of the two models-Fixed Effects or Random Effects is more appropriate for the analysis of ROE. The result of the test shows that the Chi-square is 539.91 with a p-value of 0.0000, well below the 0.05 level of significance. Therefore, indicating the rejection of null hypothesis and confirms that the Fixed Effects model is more suitable.

V. Discussion And Conclusion

Discussion

The fixed-effects model indicates that VAIC exerts a strong, positive, and highly significant impact on ROE. That is, the more efficient a firm is in utilizing its human, structural, and capital-employed resources, the better return can be expected for its shareholders. The finding corresponds with several empirical studies which indicate the intellectual capital efficiency of a firm is one of the fundamental determinants of its performance. Ahmed and Hussin (2022); Marzo (2022) showed that VAIC reflects the ability of a firm to transform intangible, knowledge-based resources into tangible financial outcomes, a core element of the resource-based and knowledge-based view of the firm. Ali et al. (2022) also reported that firms investing in both physical and intellectual capital improve their economic efficiency by making better use of available resources.

The Current Ratio, which reflects liquidity, is inversely related to ROE and is significant in this study. This suggests that liquidity can negatively impact profitability due to ineffective working capital management. This supports the findings of previous studies by Madushanka (2020) and Megaladevi (2018), where it was reported that too high liquidity may reduce profitability because idle current assets do not yield returns. At the same time, other study by Barak and Sharma (2024), indicated that adequate liquidity can help an enterprise maintaining stability, suggesting that the relationship between liquidity and profitability is context-dependent.

This study also indicates that the Debt-Equity Ratio relates marginally positively but significant to ROE, which suggests that moderate leverage can enhance shareholder returns due to financial leverage and tax benefits, while excessive borrowing might raise financial risk. Such mixed findings have also been noted in the literature. For example, high leverage, according to Barak and Sharma (2024), tends to lower profitability because of high interest obligations. On the other hand, some studies note that controlled debt strengthens firm performance through efficient capital structure management (Investopedia, n.d.). Thus, the marginally positive relationship in this study supports such a notion that leverage may benefit firms up to the threshold level beyond which it becomes detrimental.

Firm Size in this study, the variable is statistically insignificant, which means that larger firms are not necessarily earning higher returns on equity. This result partially contradicts the findings of authors such as Ahmed and Hussin (2022) and Yadav (2022), who reported a positive size-profitability relationship in view of economies of scale and diversification advantages. However, several studies, including that by İşik (2016), have found that a firm's size does not always guarantee profitability improvements because large organizations may experience inefficiencies or bureaucratic rigidities that nullify the scale economies. The insignificant effect of firm size observed here is therefore not inconsistent with the general empirical view, where the association between size and profitability is often sample- or industry-specific.

In general, the overall findings of this study are mostly compatible with prevailing empirical evidence regarding, in particular, the positive impact of intellectual capital on financial performance. The observed negative effect due to liquidity and the marginal positive effect due to leverage reflect established theories of financial management that point toward optimal resource allocation and judicious capital structure. The insignificance of firm size indicates that the intangible and efficiency-based resources are more critical to enhancing shareholder return than the issue of scale. Clearly, future research could thus validate the findings by disaggregating VAIC into its components and testing industry-specific variations in the effects of liquidity and leverage.

Conclusion

The research investigated determinants of ROE, focusing on the role of Intellectual Capital Efficiency or VAIC, liquidity or current ratio, leverage or debt-equity ratio, and firm size. Using panel data analysis and applying a Fixed Effects Model as confirmed by a Hausman test, the findings show that the explanatory variables taken together exert a strong and statistically significant impact on the profitability of firms, with an R^2 of 0.964 and a highly significant F-statistic.

The outcomes show that Intellectual Capital Efficiency (VAIC) is the most significant determinant of ROE, in that the greater the intellectual capital utilization of the firms, the better value creation they are able to achieve for shareholders. It aligns with the resource-based view that views unique and valuable internal capabilities as the root of sustainable competitive advantage.

On the other hand, Liquidity, measured through the Current Ratio, has a strong negative relationship with ROE. Therefore, it appears that excessive liquidity can actually reduce profitability instead of enhancing it because of inefficient use of current assets. Therefore, the result suggests that a firm should m maintain an optimal balance between liquidity and profitability to avoid obligating excessive funds in low-yielding assets.

The Debt-Equity Ratio has a marginally positive relation with ROE, suggesting that moderate use of debt can enhance shareholder returns due to financial leverage benefits. However, the borderline level of statistical significance also warns against over-leveraging, which can lead the firms to higher financial risks.

Finally, Firm Size was found to exert no significant influence on ROE. This suggests that it is not the mere expansion or scale that can ensure improved profitability; rather, the efficient use of intellectual and financial resources is more important element.

Hence from the study it is evident that intellectual capital utilization and proper financial structure maintenance, rather than firm size or excess liquidity, are viewed as the driving forces in the performance of firms. The results also align with the existing literature and support that the intangible assets and the efficient management of such resources are important for equity returns in the modern corporate setting.

From a practical perspective, managers should consequently stress enhancing human capital productivity, fostering innovation, and investing in intellectual capabilities while keeping a careful balance between liquidity and leverage. For the researchers, the outcome presents a future direction of research on the disaggregated components of VAIC, namely Human, Structural, and Capital Employed efficiency, and cross-sectoral comparisons to gain more insight into how intellectual capital contributes to firm profitability across industries.

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