Intellectual capital efficiency and competitive advantage of firms: an empirical analysis

Eficiência do capital intelectual e vantagem competitiva das empresas: uma análise empírica

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ABSTRACT
This paper empirically tests the strategic importance of intellectual capital for firms and assesses its impact on their market returns. The study builds on the premise that intellectual capital provides a firm competitive advantage over other firms, which then translates into superior market returns. The sampling frame for the study constitutes of Indian firms listed on the Bombay Stock Exchange’s index for medium-sized companies (BSE Midcap). Accordingly, seven-year data is drawn from authentic sources such as the Prowess-IQ database of the Centre for Monitoring Indian Economy (CMIE) and the company annual financial statements. For ascertaining the extent of the intellectual capital efficiency of firms, the Value-Added Intellectual Coefficient (VAIC) model, first proposed and conceptualized by Ante Pulic has been adopted in this study. The excess rate of return that a firm earns above the average rate of return prevalent in the market, alpha (α), is used as an indicator of the firm’s competitive advantage and a measure of superior performance in the market. Results of the analysis provide irrefutable evidence in support of the fundamental premises and affirm that intellectual capital is the root of competitive advantage, which bestows a firm with higher-than-normal returns on investments.

Keywords: intellectual capital, value added intellectual capital, stock market returns, competitive advantage, alpha, price/earnings ratio.

RESUMO
Este artigo testa empiricamente a importância estratégica do capital intelectual para as empresas e avalia seu impacto nos retornos de mercado. O estudo parte da premissa de que o capital intelectual proporciona uma vantagem competitiva firme sobre outras empresas, o que se traduz em retornos de mercado superiores. O quadro de amostragem do estudo é constituído pelas empresas indianas cotadas no índice da Bolsa de Valores de
Bombaim para as médias empresas (BSE Midcap). Assim, os dados de sete anos são extraídos de fontes autênticas, como a base de dados Prowess-IQ do Centro de Monitoramento da Economia Indiana (CMIE) e as demonstrações financeiras anuais da empresa. Para determinar a extensão da eficiência do capital intelectual das empresas, foi adotado neste estudo o modelo de Coeficiente Intelectual de Valor Agregado (VAIC), inicialmente proposto e conceitualizado pela Ante Public. A taxa de retorno excedentária que uma empresa obtém acima da taxa média de retorno prevalente no mercado, alfa (α), é utilizada como um indicador da vantagem competitiva da empresa e uma medida de desempenho superior no mercado. Os resultados da análise fornecem provas irrefutáveis em apoio das premissas fundamentais e afirmam que o capital intelectual é a raiz da vantagem competitiva, o que confere a uma empresa um retorno dos investimentos superior ao normal.

**Palavras-chave:** capital intelectual, capital intelectual de valor agregado, retornos do mercado acionário, vantagem competitiva, alfa, relação preço/lucro.

### 1 INTRODUCTION

The dawn of the twenty-first century has ushered in an era of prompt innovations and lightning growth in the field of information and technology. From making strategic & operating decisions to arranging & utilizing finances, and from producing goods & services to nurturing profitable relationships with suppliers, intermediaries, and customers (both inside and outside), today, business operations throughout the world completely rely on the use of information technology. This has resulted in a knowledge-based economic system where organizational value is driven by accumulation, utilization, and constant enhancement of productive knowledge. In this economic system, the relevance of knowledge-based intangible assets for value creation has witnessed a rapid increase at the expense of traditional physical resources. According to Sveiby, (1997), organizations are now increasingly replacing traditional physical capital with knowledge-based resources, to capture and enhance value for stakeholders. Today, intangible assets contribute more than 50% to the GDP of developing countries and near about 70% of the GDP of developed countries. Intangible assets are believed to be the most important resources of an organization. These knowledge-based resources or intangible assets are also known as intellectual assets or more commonly intellectual capital. Intellectual capital is the sum of knowledge, skills, innovative ideas, infrastructural capabilities, internal and external relationships, and the ability to use the physical and financial resources of the organization. Despite these revolutionary changes in the business environment and organizational resource base, researchers and academicians have clung to the classical theories of competitive advantage. Michael Porter (1985), in his Five
Forces Model, pointed out how organizations can acquire and sustain competitive advantage. Porter identified five forces that determine the level of competition, profitability, and attractiveness of industries and markets. He argues that organizations should adopt those strategies that position these five forces in their favour and endow them with a competitive edge over other firms in their strategic group. On the other hand, the proponents of Resource-Based Theory such as Jay Barney (1991), argue that organizational resources are the main source of competitive advantage. The resource-based view argues that firms are intrinsically heterogeneous as they possess different mixes of resources. As such different firms can adopt different strategies for enhancing their competitiveness and achieving higher performance. While these two philosophies of competitive advantage may seem to choose different means for achieving their ends, they are complementary to each other, M. A (2012). Both the Five Forces model and the Resource-Based View primarily consider the strategic utilization of physical assets critical for leveraging the organization’s worth. This belief appears to be a reflection of the accounting profession’s inability to keep pace with the changing dynamics in the business world.

Despite the growing importance of intellectual capital for modern organizations, the accounting profession has failed to evolve to capture and report its essence in value creation, as such, accounting statements provide no clue as to which firms have sustainable organizational capabilities. Lief Edvinsson, in his book Intellectual Capital (1997) states that; “the traditional model of accounting which so beautifully described the operations of companies for half millennium is now failing to keep up with the revolution taking place in business.” Thus, there is a need to change the way we measure value and what we perceive as the sources of competitive advantage. Roos and Pike (2018), point out that the rapid evolution of technology and the transformation of business resources calls for recognizing the strategic role that intellectual capital and knowledge-based resources can play in creating superior value. In this direction, the present research endeavour attempts to highlight the causal relationship between intellectual capital and competitive advantage. Accordingly, the authors design an experiment to test the relationship between intellectual capital and the superior returns on the stocks of a firm. It is hypothesized that firms with a competitive advantage, on average earn a higher rate of return on their investments.
2 LITERATURE REVIEW

Early research on intellectual capital apotheosized it as a critical factor for the success of a firm in the modern knowledge economy. Innovation and management theorists such as Schumpeter (1934) and Peter Drucker (1960, 1991) highlighted the role played by intellectual capital in determining organizational performance Pedro et al. (2018). In October 1994, Fortune magazine, on its cover page, described intellectual capital as the most valuable asset of an organization. According to Stewart (1997), intellectual capital uses intangible assets such as knowledge, information, intellectual property, and experience to create wealth for stakeholders and enhance the value of the firm. Pioneers in intellectual capital research, such as Sveiby, (1997), Roos G (1997 & 2007), and Edvinsson and Malone (1997) developed the theoretical foundations of intellectual capital. Their theories established intellectual capital as a strategic resource that must be managed efficiently for creating a sustainable competitive advantage, Pedro et al (2018).

Having acknowledged the role of intellectual capital in the success of a firm, efforts were made to chalk out a measurement model for ascertaining an organization's intellectual capital. At the heart of these efforts was the underlying belief that despite being invisible, most intellectual assets can be measured, if not all. Although several attempts have been made to come up with a comprehensive measurement model, none has been able to synthesize the financial and non-financial value-generating aspects of the organization into one external report, Petty & Guthrie (2000). The profusion of measurement models and methods put forth for identifying and evaluating intellectual capital indicates that there is still no well-established mechanism for measuring intellectual capital. Thomas Stewart in his famous book “Intellectual Capital: The New Wealth of Organisations”, 1997, points out several methods of measuring intellectual capital. The most prominent among these methods are the Market-to-Book Value Ratio, Economic Value Added (EVA), and Tobin’s Q. The market-to-book value ratio is based on the belief that the difference in the book value and market value of a firm is derived from its intellectual capital. The model is too simple and lacks usability from the management's point of view as it does not offer any description of the individual intangible assets, rendering it unsuitable for managing and controlling them. The Economic Value Added or EVA is a measure of accounting performance that is based on the concept of economic profit. Although the concept of economic value added has been there for quite some time, however, its use as a corporate financial measurement system
was publicized by Stern and Stewart Company in 1997. However, like the market-to-book value technique of measuring intellectual capital, the EVA model also fails to specify the components of intellectual capital and thus cannot be considered a viable method for the management of intellectual capital. Another technique proposed by Stern and Stewart for measuring the intellectual capital of the firm was Tobin’s Q. This technique was initially developed by Cambridge economist Nicholas Kaldor and later popularised by Nobel laureate James Tobin to assist investors in their decision-making process. Although Tobin’s Q was not specifically designed as a measure of intellectual capital, Stern and Stewart, 1997, pointed out that a high Q accompanied by a high market-to-book ratio bears witness to the presence of high intellectual capital. According to Stern and Stewart, a change in Q provides a measure of the effectiveness of intellectual capital. But Tobin’s Q method is no different from the market-to-book ratio with the exception that it uses the replacement cost of tangible assets instead of book value and suffers from the same limitations.

Having recognized the relevance of intellectual capital and lamenting the lack of information available in financial reports, Sveiby (1997), developed the Intangible Assets Monitor, for identifying, measuring, and reporting firms’ intellectual capital. Sveiby’s model is based on the belief that a firm’s market value is a function of its equity in tangibles and three kinds of intangible assets; external structures, internal structure, and employee competence. The intangible assets monitor evaluates the performance of these three components of intellectual capital on three parameters; growth and renewal, efficiency, and stability. The performance of an organization on these three parameters is reported in Sveiby’s model, emanating information regarding firms’ most crucial resources and helping investors to make more informed decisions. Robert Kaplan and David Norton in their book, titled, ‘The Balanced Scorecard: Translating Strategy into Action’ (1996), underlined the obsolescence of financial statements as a measure of corporate performance. Their arguments are based on the premise that in the dynamic information age, corporate value cannot be measured by accounting practices developed centuries ago for organizations operating in a fairly static environment and dealing in physical and financial resources only. While prescribing financial measures of past performance to be accompanied by information about future drivers of performance, they introduce the concept of a balanced reporting system, known as the balanced scorecard. A balanced scorecard is a tool in strategic management designed to measure and report the firm’s intellectual capital and compliments its financial statements. Skandia financial
services company, under the leadership of Leif Edvinson, developed and published the world’s first annual report on intellectual capital in 1995. Edvinson established a model for measuring and reporting firms’ intellectual capital and a new accounting taxonomy, known as the Skandia Intellectual Capital Navigator. At the core of the Skandia navigator was the belief that the true value of a company’s performance lies in its ability to create sustainable value. This model involves determining the success factors for each category of resources and identifying key indicators to measure the performance of these factors. Although the intangible assets monitor, the balanced scorecard, and the intellectual capital navigator are based on strong theoretical arguments and provide key insights into the valuation and management of intellectual capital, all three seem to be less popular among researchers and practitioners. Their peculiarity of nature and the lack of generalizability seem to have made them devoid of practicability.

Realizing the inadequacy of the previous models and the need for an adequate measurement technique to integrate the concept of intellectual capital management in the determination of organizational value, Ante Pulic, an Austrian researcher and academician, proposed the Value-Added Intellectual Capital Coefficient (VAIC) model. Pulic maintains that value creation is the ultimate goal of every business organization, and the success of the organization depends on how efficiently it can create value. Pulic contends that this efficiency is itself a measure of the firm's intellectual capital. Accordingly, the VAIC model measures the level of efficiency with which the resources of an organization are utilized to account for and report the firm’s intellectual capital. VAIC is the most popular and widely acknowledged model for measuring the intellectual capital of a firm. A higher VAIC score indicates better and more efficient utilisation of all organizational resources in general and intellectual capital in particular, Marzo (2022). Unlike the other measurement methods, the VAIC model specifies the various components of intellectual capital and measures their contribution toward the organizational value, thus promoting easy comparability besides management and control.

Despite all these efforts, the awareness about the importance of intellectual capital and research in this area has come to a halt. After Skandia AFS published the world's first report (1995) on intellectual capital, several organizations around the world followed their steps and came up with their own IC statements. However, less than a decade after, there has been a demise of IC reporting in the form of statements and a lack of government support and regulations in this regard, Abhayawansa et al. (2019), especially, in
developing and emerging market economies, like India. IC disclosure in India is limited to a few large corporate business houses on a purely voluntary basis, Bhasin, (2015). Organizations failing to report information regarding intellectuals backed by a lack of government regulations can adversely impact the decisions of the investors. Gupta et al. (2018) in a study of 49 Indian companies found out that in India there is little value attached to the information on intellectual capital by shareholders, which points out to a sense of unawareness and lack of knowledge about them. They further argue that the lack of a proper and effective regulatory framework for reporting intellectual capital offers possible explanation for the lack of awareness on part of the investors.

3 RESEARCH GAPS AND OBJECTIVES OF THE STUDY

Analysis of the extant literature on intellectual capital reveals its importance for the objectives of firms in the present age of knowledge-driven economies. As Kaplan and Norton (1996) point out, companies in the information age will succeed by investing their time, effort, and resources in and managing intellectual assets. Lev (2001), suggested that the physical and financial assets of the firm can only generate normal earnings, supernormal earnings are a result of proper management of intellectual assets. Thus, in theory, all the researchers agree on the relevance of intellectual capital for gaining sustainable competitive advantage, yet there appears little work on practical grounds to substantiate these theoretical arguments. The plethora of measurement models for intellectual capital highlights the lack of consensus for defining intellectual capital. Consequently, most corporate houses, especially those operating in developing countries, abstain from providing information about their intellectual assets. Failure to impart information regarding the state of intellectual assets of the organization often results in under or overvaluation of securities, Huang & Wang (2008). Besides, the lack of statutory framework and regulatory norms tends to undermine the importance of intellectual capital as the source of sustainable competitive advantage. In light of these gaps in existing literature, the present study puts forth the following objectives to be achieved through this study:

• To ascertain the relevance of intellectual capital as a source of competitive advantage for the firms.
• To evaluate the impact of individual components of intellectual capital on the firms’ competitive advantage.
4 RESEARCH HYPOTHESES

The present study adopts Edvinson's classification of intellectual capital, and accordingly, the hypotheses of the study, in light of the above objectives are as under:

- **Ha1**: Intellectual capital positively impacts the firms’ competitive advantage.
- **Ha2**: Capital Employed positively impacts the firms’ competitive advantage.
- **Ha3**: Human Capital positively impacts the firms’ competitive advantage.
- **Ha4**: Structural Capital positively impacts the firms’ competitive advantage.

5 SAMPLE SELECTION AND METHODOLOGY

The study is based on a panel data set of 70 firms for a period of seven years. The sample for the study has been drawn from the Bombay Stock Exchange’s index for medium-sized companies, the BSE Midcap index. It is an index of 105 firms with a relatively small market capitalization than the BSE 500. BSE 500 is a larger index, representing 93% of the total firms listed on the BSE, however, its movement is biased by companies with large market capitalization. The BSE midcap index represents 15% (80% to 95%) of firms listed on the Bombay Stock Exchange, having the right combination of small and large firms, thus, making it the most optimal choice of sample for the study. From the population of 105 firms, we have excluded those firms which deal in financial products and services to avoid comparing firms governed by different statutory guidelines and market regulators. Firms for which data was found to be unavailable for four or more years also did not form part of the final sample. We arrive at a final sample of 70 firms over 7 years (from 1st March 2013 to 31st March 2020), spreading across 490 firm-year observations. The period between 2013 to 2019 has been chosen to prevent the results from the abnormal bias caused on account of the financial meltdown of 2007-2008 and the subsequent slowdown of the Indian economy during 2011-12 and the effects of the outbreak of Coronavirus pandemic. Data has been drawn from the annual financial reports of the companies and the Prowess IQ database of the Centre for Monitoring the Indian Economy (CMIE). The Centre for Monitoring the Indian Economy is a private and autonomous think tank and one of the most trusted and reliable
financial information providers in India. The database provides research reports and financial data collected from audited financial statements through a well-organized and user-friendly interface.

The Value-Added Intellectual Coefficient (VAIC) methodology developed by Pulic (1998) forms the measurement basis for the independent variables of the study. VAIC is a comprehensive tool in the hands of organizational stakeholders for estimating and controlling the efficiency of value added by a company’s individual and total assets.

Formally, VAIC is a composite sum of the following three indicators:

1. Capital Employed Efficiency (CEE) — which is an indicator of VA efficiency of capital employed;
2. Human Capital Efficiency (HCE) — which is an indicator of the Value-Added efficiency of human capital; &
3. Structural Capital Efficiency (SCE) — which is an indicator of VA efficiency of structural capital. (Refer to Appendix I for the calculations of VAIC and its components.)

Market alpha (α) has been adopted as an indicator of a firm’s competitive advantage over other firms. Alpha represents the ability of a firm to outperform other firms in its league. It is the excess returns that a firm earns on an investment relative to the return on a benchmark index of similar firms. Thus, alpha is also known as the excess rate of return or abnormal rate of return. It is the difference between an investment’s actual rate of return and its expected rate of return. The expected rate of return is the sum of the risk-free rate of return and beta times the market risk premium. It takes the form of the following equation

\[ \alpha = ARR - ERR \]

\[ \Rightarrow ARR - RFRR + (\beta \times MRP) \]

Where:

- ARR is the Average Rate of Return, ERR is the Expected Rate of Return, RFRR is the Risk-Free Rate of Return and MRP is the Market Risk Premium.

Alpha can also serve as a measure of the efficiency of a firm’s business strategy. Drawing a comparison between the firms’ intellectual capital and alpha will, thus, put to
test the theoretical argument that firms rich in intellectual capital earn higher returns in the market.

The Price to Earnings ratio (PE ratio) has been used as a control variable to take into account the impact of investors' perception of the firms’ relative worth. The PE ratio is an important tool in the hands of investors to determine whether a firm’s shares are over or under-priced. This ratio provides a measure of the company’s ability to provide returns at reasonable levels of investment compared to that of the others. The ratio compares the earnings per share of a stock to its current market value, which can help investors to make buy or sell decisions.

\[
\text{Price Earnings Ratio} = \frac{\text{Current Market Price}}{\text{Earnings Per Share}}
\]

5.1 TOOLS OF ANALYSIS

Descriptive statistical tools like mean, standard deviation, and correlation have been applied in this study to delineate the basic characteristics of the variables. Advanced regression analysis techniques for panel data sets have been utilized to draw the average relationship between intellectual capital and stock market returns. For testing the relevance of the average relationship between variables under consideration and the validity of the model, various inferential tools, such as the Analysis of Variance, f-test, t-test, and Chi-square test were also used. While deciding on the technique for estimating the parameters, the impact of endogeneity arising on account of the omitted variable bias and the effect of various macroeconomic factors on the quality of the estimates have been taken into account. As such the two-way fixed effect regression model has been employed to take care of these two common problems of corporate finance research. Besides, line charts, histograms, box plots, and pie diagrams have been used to provide an interactive overview of the average movements in the variables throughout the study (see Appendix II).

6 ANALYSIS OF THE DATA

6.1 STATISTICAL PROPERTIES OF THE VARIABLES

This section, with the help of tables and charts, provides an overview of various statistical properties of the variables under study. Table 6.1 presents the number of observations besides providing the minimum and maximum values for each variable.
along with their means and standard deviations. The observations column of table 1 indicates that the panel data set is balanced, with the same number of observations for each year of the study. Alpha varies from a low of minus 0.97 to a maximum of 1.56, with a mean of 0.243 and a standard deviation of 0.384. VAIC scores acting as a coefficient of intellectual capital point out that on average all the firms in the final sample maintain a good level of intellectual capital. The highest value of VAIC is 23.423 and the lowest is minus 8.335, with a mean and standard deviation of 8.096 and 5.688 respectively. This indicates that on average these firms have a positive level of intellectual capital and earn a rate of return higher than the normal return on investments as well. The average price-earnings ratio is 43.106 which means that to earn a rupee of return on the stocks of these firms in the market, investors on average have to invest Rs 43.106. The Price-earnings ratio ranges from the highest of 123.44 to the lowest value of 3.4, with a standard deviation of 29.689, indicating that the firms in the sample are neither too over-priced nor too under-priced.

Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHA</td>
<td>490</td>
<td>.243</td>
<td>.384</td>
<td>-.97</td>
<td>1.56</td>
</tr>
<tr>
<td>VAIC</td>
<td>490</td>
<td>8.096</td>
<td>5.688</td>
<td>-8.335</td>
<td>23.423</td>
</tr>
<tr>
<td>CEE</td>
<td>490</td>
<td>.626</td>
<td>.444</td>
<td>-1.77</td>
<td>1.749</td>
</tr>
<tr>
<td>HCE</td>
<td>490</td>
<td>6.179</td>
<td>4.251</td>
<td>-6.279</td>
<td>14.901</td>
</tr>
<tr>
<td>SCE</td>
<td>490</td>
<td>.753</td>
<td>.168</td>
<td>.302</td>
<td>1.159</td>
</tr>
<tr>
<td>PE RATIO</td>
<td>490</td>
<td>43.106</td>
<td>29.689</td>
<td>3.4</td>
<td>123.44</td>
</tr>
</tbody>
</table>

Source: Center for Monitoring Indian Economy, CMIE

Mean values of CEE, HCE, and SCE indicate that human capital efficiency contributes the most towards VAIC, followed by structural capital efficiency and capital employed efficiency. Although the minimum and maximum values of coefficients for CEE and HCE vary from negative to positive, the coefficient of structural capital efficiency is positive for all firms.

Figure 1 illustrates the average proportion of the three components of intellectual capital represented by VAIC. Human capital efficiency forms 85% of the overall VAIC score which indicates that on average the intellectual capital of the firms comprises mostly of the human capital. Whereas, Structural Capital Efficiency contributes merely 8% to the total level of intellectual capital followed by Capital Employed Efficiency, which accounts for the remaining 7%.
The correlation matrix in Table 2 depicts the degree of covariation between the variables of interest. Intriguingly, capital-employed efficiency is negatively correlated with the overall level of intellectual capital, however, the intensity of this negative association is very low. On the other hand, both human capital efficiency and structural capital efficiency have a high degree of positive association with the aggregate level of intellectual capital. The level of capital employed efficiency is also negatively related to both human capital efficiency and structural capital efficiency, but again the severity of this relationship happens to be on the lower side. Human capital efficiency is highly correlated with structural capital efficiency, and the nature of this association is positive. The correlation between intellectual capital and investors' perception of actual value represented by the PE ratio is negative. This implies that as the coefficient of intellectual capital increases the PE ratio of the firm will decrease, which is a desirable situation for any firm and reiterates the basic contentions of this research endeavour. The correlation between none of the independent variables is significant enough to pose the risk of multicollinearity.
Table 2: Matrix of correlations

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) VAIC</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) CEE</td>
<td>-0.083</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) HCE</td>
<td>0.967</td>
<td>-0.140</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) SCE</td>
<td>0.757</td>
<td>-0.121</td>
<td>0.805</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>(5) PERATIO</td>
<td>-0.195</td>
<td>-0.017</td>
<td>-0.230</td>
<td>-0.195</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: Center for Monitoring Indian Economy, CMIE

Data for all the variables appear to be normally distributed with a few outliers, here and there (see Appendix II)

Before proceeding to the interpretation of regression analysis and theorizing the findings, it is imperative to keep in mind the underlying macroeconomic conditions to ensure the validity of the generalizations. Figure 2 provides a graphical representation of the average movement of dependent and independent variables of the study. The value of intellectual capital and its components along with the value of alpha experienced a gradual increase during the period 2013-14 to 2015-16. After 2015, the average level of intellectual capital dropped from a coefficient of 12.26 in 2015-16 to 7.65 in 2019-20 and alpha has fallen from a mean score of 0.283 in 2015-16 to 0.094 in 2019-20. Thus, the gradual decline in all the key indicators points toward the underlying systemic changes that the country has gone through. This provides further justifies the utilization of the two-way fixed effect estimator of panel data analysis to eliminate the chance of endogeneity arising on account of omitted variable bias.

Figure 2: Average Movement of Intellectual Capital and its Components Over Time

Source: Center for Monitoring Indian Economy, CMIE
6.2 RESULTS, DISCUSSIONS, AND FINDINGS

This section contains the narration of the findings of the study, interpretation, and discussion of the results along with their significance. For testing the plausibility of the hypotheses of the study, student’s t-test has been used. The t-test is a univariate hypothesis test used to determine the statistical significance of a sample statistic when the standard deviation of the population parameter is unknown and the sample size is relatively small. To check for the First-order autocorrelation Wooldridge’s test for serial correlation was performed. The test is based on the null hypothesis that there is no first-order autocorrelation between error terms. Results of the test indicate the presence of serial correlation among the error terms as the p-value fails to provide enough support in favour of the null hypothesis. Besides autocorrelation, the modified Wald test is used for testing the group-wise heteroscedasticity of the error terms. The Wald test is a t-test, which is based on the assumption that there is no heteroscedasticity among the error terms. Again, the P-value came out to be too low to accept the null hypothesis, thus establishing heteroscedasticity. As such clustered standard errors are used to take care of the heteroscedasticity as well as the problem of autocorrelation. Besides, the f-test statistics and their significant probability values validate the goodness of fit of the models.

Results of the regression analysis on the relation between the VAIC and market alpha are presented in table 3. The VAIC coefficient of 0.18 indicates that on an average alpha of a firm increases by 18% when the efficiency of intellectual capital increases by one. An $R^2$ of 0.226 indicates that the independent variable explains a 22.6% variation in the dependent variable, which is significant at a 10% level of significance. Thus, the overall level of intellectual capital has a positive and significant impact on the market alpha of the firms and gives sufficient evidence in support of hypothesis $Ha_1$.

![Table 3](image)

As per table 4, CEE, which is the ability of the organization to efficiently manage its tangible and financial resources, on average brings 0.329 or nearly 33% change in the
alpha of the firm. The results are highly significant in light of the P-value of less than 5% and the coefficient of determination of more than 24%. Therefore, we have ample statistical evidence in support of hypothesis \( \text{Ha2} \), that capital employed efficiency has a positive impact on the competitive advantage of the firms.

There appears to be a positive association between the level of human capital efficiency and the superior market returns of a firm as well. The results in table 5 reveal that alpha increases by 0.034 (3.4%) when the coefficient of human capital efficiency raises by one. The results of this regression analysis are again significant at a 5% level of significance and explain a total variation of 25% in the dependent variable.

The affiliation between the coefficient of structural capital efficiency and alpha also comes out to be positive and significant. The coefficient of SCE for an alpha, given in table 6, reveals that alpha is expected to rise by 0.728 (almost 73%) with one unit increase in the level of SCE. The results are statistically significant at all levels of significance and the proportion of variance in alpha explained by SCE is more than 25%. This provides conclusive evidence in favor of the fourth hypothesis (\( \text{Ha4} \)), that structural capital efficiency has a positive and significant impact on the firm’s competitive advantage.
Table 6

<table>
<thead>
<tr>
<th>ALPHA</th>
<th>Coef.</th>
<th>St. Err.</th>
<th>t-value</th>
<th>p-value</th>
<th>[95% Conf Interval]</th>
<th>Int</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCE</td>
<td>.728</td>
<td>.197</td>
<td>3.69</td>
<td>0</td>
<td>.335</td>
<td>1.122***</td>
</tr>
<tr>
<td>PERATIO</td>
<td>.002</td>
<td>.001</td>
<td>2.26</td>
<td>.027</td>
<td>0</td>
<td>.004**</td>
</tr>
<tr>
<td>Constant</td>
<td>-.238</td>
<td>.157</td>
<td>-1.52</td>
<td>.133</td>
<td>-.551</td>
<td>.074</td>
</tr>
</tbody>
</table>

R-squared 0.255
F-test 7.410
Number of obs 490.000
Prob > F 0.000

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

Source: Center for Monitoring Indian Economy, CMIE

7 CONCLUSION AND IMPLICATIONS

Results of the empirical analysis offer convincing evidence in support of the underlying contentions and testify that intellectual capital is the root of competitive advantage, which bestows a firm with higher-than-normal returns on investments. Despite the data indicating a general decline in the level of intellectual capital and the average rate of return on investments, the association of the overall level of intellectual capital and its components with superior market returns remains positive. These results highlight the criticality of intellectual capital for the survival of business organizations in today’s highly competitive knowledge-based economies. Management practitioners and academicians must cast away their misplaced faith in outdated traditional physical resources and acknowledge intellectual capital as a tool for creating and maintaining competitive advantage. Intellectual capital is undeniably the most valuable resource in the hands of business organizations and it is the management’s duty to recognize, measure, manage, protect, and utilize these resources for the attainment of organizational objectives. This becomes all the more important for firms belonging to developing and emerging market economies like India, which are threatened by irrelevance in their backyard at the hands of more resourceful and experienced competitors from developed countries. Although globalization has opened new opportunities for the corporate world but at the same time, it has choked the space of business. Facing saturation and stiff competition at home, organizations are looking beyond their geographical boundaries to find new markets. Capturing these markets demands continuous innovation and a sustainable competitive advantage. However, in a world where information is easily accessible and competitors can emulate each other instantly, this can only be achieved by employing effectively and efficiently the organization-specific intellectual capital resources.
Having empirically tested and verified the significance of intellectual capital for the competitive advantage of the firm the study also cautions to the inadequacy of present accounting and reporting systems. The accounting system has failed to assimilate the information about the firms’ intellectual capital and the financial reports overemphasize the utility of physical resources. Failure to measure and disclose the information relating to the intellectual capital of the firm can have negative consequences, both internally and externally. The absence of such information results in the management focusing their precious time and efforts on relatively less important resources. This may create delusions about the strengths and weaknesses of the firm and lead to strategic miscalculations of the available opportunities and threats. On the other hand, the unavailability of relevant data pertaining to the intellectual capital of the firm forces the stakeholder in the external environment to base their decision on irrelevant indicators, thus, widening the information asymmetry and increasing the chances of stock manipulation and insider trading.

Thus, efforts should be made to develop a comprehensive measurement model to incorporate information regarding intellectual capital in the firms’ financial reports. Such efforts should be globally driven and backed by statutory regulations for ensuring uniformity of practice and promoting comparability. Moreover, there is a need to carry out further research in the field of intellectual capital to inculcate the materiality of intellectual capital in management theory and practice besides creating awareness among the general masses, especially the investors.
REFERENCES


APPENDIX

APPENDIX 1:

According to Pulic, there are five steps in the VAIC computation:

1. Calculating a firm’s value-added is the first stage (VA). The formula for value-added is typically \( VA = \text{TOTAL OUTPUT} - \text{INPUT} \).

   Alternatively, we can compute VA as follows: \( VA = \text{Operating Profit} + \text{Employee Cost} + \text{Depreciation} + \text{Amortization} \).

2. The next step is to calculate the efficiency scores for each category of organizational resource and then add them. We first calculate the efficiency scores for the physical capital used by the businesses using value-added, also known as Capital Employed Efficiency (CEE). Calculating capital employed efficiency is as follows:

\[
\text{CEE} = \frac{VA}{\text{Capital Employed}}
\]

   Every physical capital unit's value addition is provided by CEE (capital employed). In other words, it symbolizes a company's capacity to make use of physical capital and turn it into profit.

3. The third phase entails figuring out how much human resources, or value added by human capital or human capital efficiency, contribute to firms’ value-added. \( \text{HCE} \).

\[
\text{HCE} = \frac{VA}{\text{(Human Capital)}}
\]

   Our accounting system does not permit companies to designate their human resources as an asset on the balance sheet. In order to represent human capital, we substitute personnel costs.

4. The fourth phase entails calculating the contribution of structural capital to the firms’ value-added. The total of all resources, excluding physical capital and human capital, is structural capital. A company’s internal and external ties as well as its organizational structures, patents, and other legal agreements are all included in this. According to Pulic, structural capital is the difference between the firm's human capital and value-added (VA).

\[
\text{SC} = VA - HC
\]
The link between structural capital and human capital is thus inverse, and the formula for calculating structural capital is somewhat different as a result.

SCE represents the structural capital equivalent of SC divided by value added.

5. The values obtained in the second, third, and fourth processes are added to determine the Value-Added Intellectual Coefficient in the final step.

\[
\text{VAIC} = \text{CEE} + \text{HCE} + \text{SCE}
\]

APPENDIX 2

Figure 2 (a): Histogram under the normal distribution curve for the control variable

Figure 2 (b): Histogram under the normal distribution curve for the independent variable
Figure 2 (c): Histogram under the normal distribution curve for the Residuals of regression analysis

Figure 2 (d): Box plot for capturing the variation in the data for variables under the study.