

# INTELLECTUAL CAPITAL EFFICIENCY AND FINANCIAL PERFORMANCE OF S&P BSE POWER INDEX FIRMS

Vadivel Thanikachalam, Bharathidasan University  
Murugesan Selvam, Bharathidasan University  
Balasundram Maniam, Sam Houston State University

## ABSTRACT

*The examination of the effect of intellectual capital efficiency on the financial performance S&P BSE Power Index firms in India has not been paid due attention in the current research. Hence, an attempt has been made in this study to examine the contribution of intellectual capital efficiency to the financial performance across 14 sample Indian companies. Correlation and regression techniques were employed for the analysis of this study. The empirical results strongly confirmed that the intellectual capital efficiency reported a positive contribution to the financial performance of sample companies. Further, the power sector did record the highest intellectual capital efficiency during the study period.*

**Keywords:** Intellectual Capital Efficiency, S&P BSE Power index, Correlation and Regression.

## INTRODUCTION

In the technology enabled era, Indian companies face cut throat competition not only from the domestic market but also from the global market. Usually, physical and financial capital has generally been used as a competitive advantage for traditional companies (Selvam et al., 2020). The capacity to accumulate a plenty of financial capital has become simple and the use of financial information along with science and technology have also emerged as competitive advantage. When companies do have huge physical and financial resources, without a skilled labour force, it is a herculean task for them to be successful in the long run. Thus, intellectual capital plays an important role in creating productivity and efficiency, which are among the key factors in the successful implementation of business strategies (Yusuf, 2013). Having realized this fact, Pulic (1998 and 2000) introduced the VAIC model, covering human capital efficiency, structural capital efficiency and capital employed efficiency to measure the value added from tangible and intangible assets. This framework is taken into account as a standard measurement model, permitting comparisons among different sectors and different countries. Further, owing to its ease of application in the utilization of available data, from financial statements like profit and loss account and balance sheet, this method has broadly been used in several empirical studies (Xu & Wang, 2018).

Multifarious research studies have been undertaken, to measure the effect of intellectual capital efficiency, adopting VAIC method and financial performance in the developed countries (Ozkan et al., 2017). Moreover, many research studies, on effect of Intellectual capital on financial performance have recently been carried out on the economies of emerging countries (Poh et al., 2018; Tran & Vo, 2018). The human capital of India stands at the highest place among middle-income countries, even though there are mismatches between ethnic groups and sectors. According to Global Competitiveness Index Report, the industry-oriented skill set, for graduate students in India is ranked neutral in 2019. This

ranking clearly reveals the lack of efficiency in value added per employee in Indian's performance, compared with other countries (World Bank, 2020). However, the examination of the current literature implies that the contribution of intellectual capital efficiency and its impact on financial performance have intentionally been ignored, particularly in India, and other emerging markets. Selvam et al. (2018) measured the effect of intellectual capital (including human capital, structural capital, capital employed and relational capital) on the financial performance of Indian banking industry. The MVAIC model examined the relationship between intellectual capital efficiency and financial performance in the study. Thanikachalam et al. (2019) found strong impact of intellectual capital (proxy of human capital) on the performance of automobile industry. In addition, Kamath (2007) argued that the banking sector has accumulated a higher level of intellectual capital than other sectors. Vishnu & Gupta (2014) stressed that the employees in the pharmaceutical sector have achieved a higher level of homogeneity than the other sectors. The existing literature focuses on the recognition of staff significance since the intellectual capital has been one of the key drivers for the growth of firms. But companies in power sector operating in India have not been taken up for study, thus leading to different levels of analysing the intellectual capital of power sector companies.

This study would shed light on the theme of intellectual capital efficiency (Smriti & Das, 2018). Besides, an attempt has been made to examine and understand the relationship between intellectual capital efficiency using VAIC model and financial performance across sectors, along with workable suggestions appropriate policy formulations. This research study is structured as follows. Next to Introduction, Section 2 discusses and synthesizes the key findings upon reviewing the earlier literature. Section 3 deals with the research methodology adopted in this study. The results and discussions cum hypothesis testing are presented in Section 4, followed by Key findings, suggestions and conclusion in Section 5.

## REVIEW OF LITERATURE

Earlier studies have confirmed the positive relationship between human capital efficiency and firm performance (Firer & Williams, 2003; Kamath, 2007; Clarke et al., 2011; Mondal & Ghosh, 2012; Thanikachalam et al., 2020; Selvam et al., 2020); Thanikachalam (2021) Besides, Opong et al. (2019) found that human capital efficiency has a significant effect on the productivity of insurance firms. Williams (2001) investigated the relationship between their VAIC values and disclosure practices of their intellectual capital and found that human capital efficiency reported positively significant relationship with performance growth. Riahi-Belkaoui (2003), using a sample of US multinational firms, found significantly positive association between intellectual capital and financial performance. Tseng & Goo, (2005) examined the relationship between the intellectual capital and the ROE of sample firms in Taiwan and disclosed the fact that intellectual capital efficiency exercised significantly positive impact on ROE. Ting & Lean (2009) conducted research on Malaysian financial sectors, to measure the effect of intellectual capital on firm performance and concluded that human capital was strongly linked to financial performance. Similarly, Joshi et al. (2010) studied Australian owned banks and identified that intellectual capital efficiency did have significant and positive relationship with financial performance. Al-Musalli & Ismail (2012) examined the correlation between IC components and corporate performance and reported significant and positive relationship of all the VAIC components (HCE, SCE, CEE) with performance measures. Yusuf (2013), using the data of 14 banks on the Nigerian Stock Exchange, for a five-year period, found that intellectual capital efficiency did not report any significant impact on banks' ROE. Smriti & Das (2018) measured the impact of

intellectual capital on financial performance of Indian firms and indicated that human capital efficiency reported major impact on firm productivity.

The aforesaid studies were conducted only on specific sectors in India but there was a research gap, regarding the composite index of Power Sector. The main objective of the present study was to investigate the impact of intellectual capital efficiency on the financial performance of the sample companies. In addition, the disclosure of intellectual resources has become more substantive over time, by providing more profound and coherent forms of publication of relevant information (Makki et al., 2008). As such, on the grounds of various studies, including Parham & Heling (2015), and Hamdan et al. (2017) and others, the null hypothesis (NH-1): There is no relationship between intellectual capital efficiency and financial performance of S&P BSE Power Index Companies, was formulated. Likewise, on considering Net Profit Margin (NPM), the effect of IC on NPM has been proved by (Chang & Hsieh, 2011; Mondal & Ghosh, 2012). Hence, null hypothesis (NH-2) -There is no impact of intellectual capital efficiency on financial performance of S&P BSE Power Index Companies, was posited.

## METHODOLOGY OF THE STUDY

The aim of this study was to investigate the impact of intellectual capital efficiency on the financial performance of the S&P BSE Power index. The study covered all the 14 power companies, as on 1, April 2021. The required data were obtained from Centre for Monitoring Indian Economy (CMIE). A period of ten years was considered for this study (01.04.2011 to 31.03.2020). For conducting the present study, EPS and NPM were considered as dependent variables whereas HCE, SCE and CEE were used as independent variables in addition to VAIC method, developed by Pulic (1997) and control variable, namely, Size. These sample variables were used in this study in the light of many earlier studies, conducted across the Globe. The regression analysis, used to measure the impact of intellectual capital efficiency on the financial performance of sample companies, has two models, as shown in **Table 1**.

<b>Table 1</b>	
<b>FORMULA OF REGRESSION ANALYSIS TO TEST THE ROBUSTNESS OF THE MODEL TO MEASURE THE IMPACT OF INTELLECTUAL CAPITAL PERFORMANCE ON FINANCIAL PERFORMANCE OF S&amp;P BSE POWER INDEX COMPANIES</b>	
Model-1	$EPS_{it} = \beta_0 + \beta_1 EPS_{it} + \beta_2 VAIC_{it} + \beta_3 HCE_{it} + \beta_4 SCE_{it} + \beta_5 CEE_{it} + \beta_6 SIZE_{it} + \epsilon_{it}$
Mdel-2	$NPM_{it} = \beta_0 + \beta_1 NPM_{it} + \beta_2 VAIC_{it} + \beta_3 HCE_{it} + \beta_4 SCE_{it} + \beta_5 CEE_{it} + \beta_6 SIZE_{it} + \epsilon_{it}$
Source: <b>Ngoc Phu Tran &amp; Duc Hong Vo (2020)</b>	

## RESULTS AND DISCUSSION

### Relationship between Intellectual Capital Efficiency and Financial Performance of S&P BSE Power Index Companies

Table 2 displays the results of correlation analysis, for intellectual capital efficiency and financial performance of the S&P BSE Power Index Companies. As pointed out earlier, the human capital efficiency, structural capital efficiency and capital employed efficiency were used as proxy variables, for measuring the performance of intellectual capital efficiency (independent variable) while Earning Per Share and Net Profit Margin were employed for measuring the firm performance (dependent variables). The Size acted as the control variable for this study. The Pearson Correlation Matrix analysis revealed that values of correlation coefficient were recorded by HCE-NPM at 0.789, EPS-VAIC at 0.907 and NPM-VAIC at 0.932, these values indicated significant positive correlation, at 99% confidence level. These values indicated strong correlation among these variables. The variable sets, namely, VAIC-

HCE with 0.658 and NPM-EPS with 0.711, showed positive relationship, at 95% confidence level. The coefficient values confirmed that large size did not enhance the financial performance of sample firms in the power sector. Therefore, NH-1, namely, there is no relationship between intellectual capital efficiency and financial performance of S&P BSE Power Index Companies, was rejected. According to the results of the Table, some sets of sample variables (SCE-HCE, CEE-HCE, EPS-HCE, CEE-SCE, CEE-SCE, VAIC-HCE, VAIC-SCE, VAIC-CEE, EPS-HCE, EPS-SCE, EPS-CEE, NPM-SCE and NPM-CEE) did not reveal any association with each other, at any confidence level during the study period. But, VAIC had exercised long-term effect on the growth of S&P BSE Power Index Companies.

Variables		HCE	SCE	CEE	VAIC	EPS	NPM	Size
<b>HCE</b>	Pearson Correlation	1						
	Sig. (2-tailed)							
<b>SCE</b>	Pearson Correlation	-0.315	1					
	Sig. (2-tailed)	0.375						
<b>CEE</b>	Pearson Correlation	0.281	0.200	1				
	Sig. (2-tailed)	0.432	0.580					
<b>VAIC</b>	Pearson Correlation	<b>0.658*</b>	0.038	0.023	1			
	Sig. (2-tailed)	<b>0.039</b>	0.918	0.951				
<b>EPS</b>	Pearson Correlation	0.309	0.245	-0.118	<b>0.907**</b>	1		
	Sig. (2-tailed)	0.386	0.495	0.745	<b>0.000</b>			
<b>NPM</b>	Pearson Correlation	<b>0.789**</b>	-0.149	0.079	<b>0.932**</b>	<b>0.711*</b>	1	
	Sig. (2-tailed)	<b>0.007</b>	0.680	0.829	<b>0.000</b>	<b>0.021</b>		
<b>Size</b>	Pearson Correlation	-0.299	-0.117	0.057	-0.266	-0.237	-0.173	1
	Sig. (2-tailed)	0.401	0.748	0.875	0.458	0.509	0.633	
	N	10	10	10	10	10	10	10

**Source:** Data extracted from CMIE Prowess IQ database and computed using IBM SPSS 16.0  
**Note:** \* indicates statistically significant.

### **Impact of Intellectual Capital Performance on Financial Performance of S&P BSE Power Index Companies**

The results of regression analysis, for the intellectual capital efficiency and financial performance of the S&P BSE Power Index Companies based on IC performance, are given in Table 3. As stated earlier, the measurements of the impact of intellectual capital included HCE, SCE, CEE and VAIC while two financial performance measurements included EPS and NPM. And Size was taken as the control variable for this study. The Table revealed that CEE and VAIC earned t-statistic values of 3.312 and 6.096, with coefficients for EPS at 0.713 and 0.907 respectively. While calculating coefficient value of NPM, the intellectual capital variables, namely, HCE and VAIC recorded coefficient values of 0.789 and 0.932, with the t-statistic values of 3.631 and 7.288 respectively. EPS recorded the coefficient value for HCE at 0.490, with t-statistic value of 3.331 and the NPM registered the coefficient value of 0.623, with the t-value of 2.391 for SCE. It is learnt from the analysis that HCE, SCE, CEE and VAIC reported significant impact on EPS and NPM positively, at 99% and 95% confident levels. In other words, the IC of the sample companies did contribute significantly to the financial performance.

The improvement of financial performance of firms would generate the wealth of the country and hence, this result is in line with the resource-based theory. The tangible assets,

supporting the financial performance, proved the positive association between CEE and financial performance. These significant values supported the organization learning theory, which explains the effective use of organization's internal resources, through employee training and the resultant effect on innovation. The positive effect of VAIC on financial performance indicators demonstrated the sound knowledge and skill of employees, who could contribute to the financial performance. It is to be noted that Adjusted R-squared value was used to test the robustness of the regression model. With the R-squared values being recorded by independent variables for EPS with the value of 0.974 and for NPM with 0.869, the regression model was perfectly fitted. Hence, null hypothesis (NH-2) - There is no impact of intellectual capital efficiency on financial performance of S&P BSE Power Index Companies, was rejected.

Dependent Variables	Constant	Independent Variables				Control Variable
		HCE	SCE	CEE	VAIC	Size
EPS	0.008***	0.029**	0.716	0.010***	0.000***	0.509
	- (3.546)	0.490 (3.331)	0.041 (0.390)	0.713 (3.312)	0.907 (6.096)	0.388 (-0.691)
NPM	0.008***	0.007***	0.041**	0.495	0.000***	0.633
	- (3.546)	0.789 (3.631)	0.623 (2.391)	-0.107 (-0.735)	0.932 (7.288)	-0.173 (-0.496)
Adjusted R <sup>2</sup> Value		EPS	0.974	Number of Observations		10
		NPM	0.869			
<b>Source:</b> Data extracted from CMIE Prowess IQ database and computed using IBM SPSS 16.0						
<b>Note:</b> * indicates statistically significant.						

### SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSION

The significance of intellectual capital efficiency to the financial performance of sample companies in India has not been properly studied. Employing an unbalanced panel dataset, this study provides empirical witness with respect to the impact of intellectual capital efficiency on EPS and NPM for the sample companies from 2011 to 2020, using the regression analysis. The findings of this paper substantially confirm the generally accepted fact that the intellectual capital efficiency and its intensity was higher in the S&P BSE Power companies (Xu & Liu, 2019; Dzenopoljac et al., 2019; Liu et al., 2021).

It was found that intellectual capital efficiency was higher in the power sector. Further, using the widely used VAIC method, it was observed that the intellectual capital efficiency stimulated positively the financial performance of sample companies. This finding is in line with the results of many previous studies (Kennedy, 1998; Kharal & Zia-ur-Rehman, 2014; Maditinos, 2011; Erickson & Rothberg, 2013). It is to be noted that the impact of intellectual capital efficiency of the power sector in India was found to be higher than in other countries. Hence, sample companies need to give more attention towards accumulation process of intellectual capital. Measures such as attractive salaries for staff and creating opportunities for promotion and career development could improve productivity and contribute to financial performance, through intellectual capital accumulation (Tran & Vo, 2020). This study was limited to focusing only on the impact of intellectual capital efficiency on the financial performance. But the scope of research may be extended to other components of intellectual capital, such as relational capital and social capital. It is also necessary to

understand how intellectual capital efficiency could be improved and which factors should be addressed, to maintain intangible assets at the desirable level.

## REFERENCES

- Abdullah, N. N., & Othman, M. B. (2019). Examining the effects of intellectual capital on the performance of Malaysian food and beverage small and medium-sized enterprises. *Technology (IJCIET)*, 10(2), 135-143.
- Al-Musalli, M. A. K., & Ismail, K. N. I. K. (2012). Intellectual capital performance and board characteristics of GCC banks. *Procedia Economics and Finance*, 2, 219-226.
- Chang, W. S., & Hsieh, J. (2011). The dynamics of intellectual capital in organizational development. *African Journal of Business Management*, 5(6), 2345-2355.
- Clarke, M., Seng, D., & Whiting, R. H. (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*.
- Dženopoljac, V., Muhammed, S., & Janošević, S. (2019). Intangibles and performance in oil and gas industry. *Management Decision*.
- Erickson, G. S., & Rothberg, H. N. (2015). A longitudinal look at strategy, intellectual capital and profit pools. *Journal of Intelligence Studies in Business*, 5(2).
- Firer, S., & Williams, S.M. (2003). Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital*.
- Hamdan, A. M., Buallay, A. M., & Alareeni, B. A. (2017). The moderating role of corporate governance on the relationship between intellectual capital efficiency and firm's performance: evidence from Saudi Arabia. *International Journal of Learning and Intellectual Capital*, 14(4), 295-318.
- Huang, Y. C., & Wu, Y. C. J. (2010). Intellectual capital and knowledge productivity: the Taiwan biotech industry. *Management Decision*.
- Joshi, M., Cahill, D., & Sidhu, J. (2010). Intellectual capital performance in the banking sector: An assessment of Australian owned banks. *Journal of Human Resource Costing & Accounting*.
- Kamath, G.B. (2007). Intellectual capital statements: what do they measure and report?. *The IUP Journal of Accounting Research and Audit Practices*, 6(4), 52-64.
- Kennedy, F. (1998). Intellectual capital in valuing intangible assets. *Team Performance Management: An International Journal*.
- Kharal, M., Zia ur Rehman, D., Abrar, M., Khan, M. S., & Kharal, M. (2014). Intellectual Capital & Firm Performance: An Empirical Study on the Oil & Gas Sector of Pakistan. *International Journal of Accounting and Financial Reporting*, 4(1), 238.
- Liu, S., Yu, Q., Zhang, L., Xu, J., & Jin, Z. (2021). Does intellectual capital investment improve financial competitiveness and green innovation performance? Evidence from renewable energy companies in China. *Mathematical Problems in Engineering*, 2021.
- Maditinos, D., Chatzoudes, D., Tsairidis, C., & Theriou, G. (2011). The impact of intellectual capital on firms' market value and financial performance. *Journal of Intellectual Capital*.
- Makki, M. A. M., & Lodhi, S. A. (2008). Impact of intellectual capital efficiency on profitability (a case study of LSE25 companies). *The Lahore Journal of Economics*, 13(2), 81-98.
- Mondal, A., & Ghosh, S. K. (2012). Intellectual capital and financial performance of Indian banks. *Journal of Intellectual Capital*.
- Murugesan, S., Vadivel, T., Chinnadurai, K., & Dhamotharan, D. (2018). Intellectual capital: Its effect on financial performance of Indian private sector banks. *International Journal of Advanced Scientific Research and Management*, 3(11), 116-123
- Opong, G. K., Pattanayak, J. K., & Irfan, M. (2019). Impact of intellectual capital on productivity of insurance companies in Ghana: A panel data analysis with system GMM estimation. *Journal of Intellectual Capital*.
- Parham S., & Heling G.(2015). The relationship between human capital efficiency and financial performance of Dutch production companies. *Research Journal of Finance and Accounting*, 6(8), 188-201
- Poh, L. T., Kilicman, A., & Ibrahim, S. N. I. (2018). On intellectual capital and financial performances of banks in Malaysia. *Cogent Economics & Finance*, 6(1), 1453574.
- Pulic, A. (1998). "Measuring the performance of intellectual potential in the knowledge economy" available at: [www.measuring-ip.at](http://www.measuring-ip.at).
- Pulic, A. (2000). VAICTM – an Accounting Tool for IC Management. *International Journal Technology Management*, 20(5/6/7/8), 702-714.
- Pulic, A., & Bornemann, M. (1997). The physical and intellectual capital of Austrian banks.
- Riahi-Belkaoui, A. (2003). Intellectual capital and firm performance of US multinational firms: A study of the resource-based and stakeholder views. *Journal of Intellectual Capital*.

- Selvam, M., Thanikachalam, V., Dhanasekar, D., Amirdhavasani, S (2020). Efficiency of Intellectual Capital Performance of Public Sector Banks and Private Sectors Banks in India using MVAIC. *Journal of Advanced Research in Dynamical and Control Systems*, 12(6 Special Issue), 205-211.
- Selvam, M., Thanikachalam, V., Dhanasekar, D., Amirdhavasani, S., Saremi, H. (2020) Intellectual capital and profitability ratios of foreign banks operating in India: A structural equation model approach. *Journal of Advanced Research in Dynamical and Control Systems*, 12(6 Special Issue), 212-219.
- Selvam, M., Thanikachalam, V., Kathiravan, C., Sankarkumar, A. V., & Dhamotharan, D. (2019). Intellectual Capital Performance and its Impact on Indian Commercial Banking Industry. *Journal of Engineering and Applied Sciences*, 14(8).
- Smriti, N., & Das, N. (2018). The impact of intellectual capital on firm performance: a study of Indian firms listed in COSPI. *Journal of Intellectual Capital*.
- Thanikachalam, V., Muninarayanappa, M., & Prabakaran, V. (2018). Impact of intellectual capital on the financial performance of Indian Pharmaceutical Companies. *SMART Journal of Business Management Studies*, 14(2), 86-98.
- Ting, I. W. K., & Lean, H. H. (2009). Intellectual capital performance of financial institutions in Malaysia. *Journal of Intellectual Capital*.
- Tran, N. P., & Vo, D. H. (2020). Do banks accumulate a higher level of intellectual capital? Evidence from an emerging market. *Journal of Intellectual Capital*.
- Tran, N. P., Van, L. T. H., & Vo, D. H. (2020). The nexus between corporate governance and intellectual capital in Vietnam. *Journal of Asia Business Studies*.
- Tseng, C. Y., & James Goo, Y. J. (2005). Intellectual capital and corporate value in an emerging economy: empirical study of Taiwanese manufacturers. *R&D Management*, 35(2), 187-201.
- Thanikachalam, V., Selvam, M., & Maniam, B. (2020). Measuring the Intellectual Capital Efficiency of Indian Hotels Listed in National Stock Exchange of India Ltd using E-VAIC Model. *Journal of International Finance and Economics*, 20(1), 65-72
- Thanikachalam, V., Selvam, M., Maniam, B., Kathiravan, C., & Dhanasekar, D. (2021). Effect of Intellectual Capital on Sustainable Corporate Performance of Nifty Financial Services Companies. *Academy of Strategic Management Journal*, 20(S3).
- Thanikachalam, V., Selvam, M., Dhanasekar, D., Raja, M., & Bhuvaneshwari, P. (2020). Effect of Intellectual Capital on the Performance Indicators of Indian Metal Firms Listed in National Stock Exchange of India Limited. *International Journal of Advanced Science and Technology*, 29(8), 1757-1765.
- Vadivel, T., Murugesan, S., Pavithran, A., & Gayathri Jayapal, G. (2019). The influence of intellectual capital on firm's performance of Indian automobile industry. *International Journal of Recent Technology and Engineering*, 8, 2277-3878.
- Vadivel, T., Selvam, M., Subramaniam, P., & Maniam, B. (2019). The nexus between intellectual capital and value of the firms: A study on BSE S&P IT Firms in India. *Journal of Critical Reviews*, 6(5).
- Vishnu, S., & Gupta, V. K. (2014). Intellectual capital and performance of pharmaceutical firms in India. *Journal of Intellectual Capital*.
- Williams, S. M. (2001). Is intellectual capital performance and disclosure practices related?. *Journal of Intellectual Capital*.
- Xu, J., & Wang, B. (2018). Intellectual capital, financial performance and companies' sustainable growth: Evidence from the Korean manufacturing industry. *Sustainability*, 10(12), 4651.
- Yusuf, I. (2013). The relationship between human capital efficiency and financial performance: An empirical investigation of quoted Nigerian banks. *Research Journal of Finance and Accounting*, 4(4).