LINKAGES AMONG INTELLECTUAL CAPITAL AND FIRM PERFORMANCE: AN EMPIRICAL INVESTIGATION ON INDIAN IT COMPANIES.

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Abstract

This paper aims to explore linkages among intellectual capital and firm performance of Indian IT companies which is listed in NSE. The data was collected from the CMIE Prowess database with a long term tenure of ten years. The intellectual capital efficiency is calculated by VAIC. And firm performance refers to financial performance, operational and stock it is measured by a financial performance by (ROE), Operational performance by (ROA), Stock performance by (EPS)For addressing the research question, a group of testable hypotheses have been proposed. For measuring dependent variable which is associated with – Human capital efficiency (HCE), Structural capital efficiency (SCE), Capital employed efficiency (CEE). The sample was data belonging to the NSE IT sector which include 124 computer software companies and 17 IT-enabled services (ITES) companies which were selected based on their market capitalization. were collected by using the CMIE PROWESS database over a long period of 2010-2020. Results show that the Firm's operational performance that is ROA have a significant impact on HCE, SCE, and CEE.

Keywords: **Intellectual Capital, Human Capital, Structural Capital, ROI**

Introduction

The Information technology industry in India predominantly continuous to gain at a higher gait. India is a leading location in the world, showing around 55% market share of the US$ 200-250 billion global services sourcing business in 2019-20. Indian IT companies deliver their services through 1000 centers which belongs to 80 countries across the world. Sooner India has become the IT hub of the world because of 75% of global digital talent present in the country. Every country has some competitive advantageous. Information technology sector is the strength of the country which lead to major investment from different countries in this sector. The computer software and hardware sector in India attracted cumulative Foreign Direct Investment (FDI) inflow worth US$ 44.91 billion between April 2000 and March 2020. Which is the second largest sector in FDI. And also leading Indian IT firms now expanding their services into block chain and artificial intelligence. The IT sector in India has a prover track record in both on-shore and off-shore services for their clients. The IT industry is expected to grow to US$ 350 billion by 2025 (India Brand Equity Foundation, 2020).

The services of IT firms which can possibly use in different sectors in economy. So which can be collectively known as IT enabled services. Which include data processing, voice interaction, BPO's the examples. There are lot of advantageous that boost the IT industry in India. The higher education system is one of the landmark. The existence of Indian Institute of Technology, the proficiency in English language are the pick points (Subramanian, 2006).

Information technology's highest growth in the last decade constitute this sector in a dynamic in nature. It results to attract good quality people in to the sector. It's like after world war II Japan became world's no 1 automobile destination. As such IT industry in India provide a competitive advantage. And also it has strong influences with other sectors too. One of the reason is that software development has a life cycle which includes analysis and specification of requirements, design, coding, testing, installation, maintenance and support majority of these are very font towards Indian workforce. This may be supplied by India's higher education's especially professional colleges which include premium institutions like Indian Institute of Technology.

Intellectual capital is nowadays a mandatory thing for booming the business (Pulic, 2002a). And also the strategic managers identified intellectual capital collectively affect the lower level to top level of a firm. Many countries includes Japan the various performance of firm is attributed into intangible assets. The weakness of various firms is the business performance and productivity is because of inefficient management of their intellectual capital, so the investment on IC is a mandatory thing for competitive advantage. And the problem still exist due to majority firms missing the tool to assess how much they spend and receive on their intellectual capital. On the view point of every firm the intangible assets predominantly increasing every day especially knowledge based industries like Information Technology. So a proper tool or method is essential for measuring the same. Old rated or traditional accounting model not able to express their emotions towards intellectual capital. So a new method is required to calculate the intangible assets in organizations.

Ante Pulic 1993 & 2004 developed a tool for measuring intellectual capital efficiency called VAIC$^{TM.}$ Ante Pulic's VAIC™ model has definite merit over other methods of measuring Intellectual Capital. Majority model used for measuring IC which faces several problems like subjectivity. But VAIC is free from it because the calculation of this method- the data used for VAIC analysis is taken from audited financial data. Which is available for any stakeholders that means which is publically available. Hence, apart from managers internal to the organization, external stakeholders desirous of assessing Intellectual Capital efficiency can also use this model.

Financial performance analysis is a diagnosing technique because from the statements or results we may reach some conclusion about the position of the firms. Which also show the efficiency of the firms. There are three modes of firm performance discussed in this study. They are financial performance (measured by ROE) operational performance (measured ROA), and stock performance (measured by EPS) (Ahmad and Hamadan 2015).

The primary objective of this paper is to identify and dimensions of linkage between intellectual capital efficiency and performance of Indian IT sector. The sample consist of 141 companies listed in NSE which is selected on the basis of market capitalization by using PROWESS IQ database.

The term Intellectual Capital got definition from different scientist some as follows:

Author	**Definition**
Itami (1991)	Intangible assets are invisible assets that include a wide range of activities such as technology, consumer trust, brand image, corporate culture and management skills.
Stewart (1997)	Intellectual capital as knowledge, information, intellectual property and experience that can be put to use to create wealth.
Bontis(2000)	defines intellectual capital means individual workers' and organizational knowledge that contributed to sustainable competitive advantage
Pulic (2001)	Includes all employees, their organization and their abilities to create value added that is evaluated on market into intellectual capital.

Methodology

Hypothesis Development

This study is analysing the relationship among intellectual capital efficiency and performance of the firm. The intellectual capital efficiency is calculating by VAIC. And firm performance refers financial performance, operational and stock it is measured by

1. Financial performance by (ROE)
2. Operational performance by (ROA)
3. Stock performance by (EPS)

For addressing the research question, a group of testable hypotheses have been proposed. For measuring depended variable which is associated with – Human capital efficiency (HCE), Structural capital efficiency (SCE), Capital employed efficiency (CEE). To study the impact the following hypotheses proposed:

H_1: The VAIC is positively associated with Performance of the firm.

H_{1a}: The VAIC is positively associated with financial Performance of the firm.

$H1_{aa:}$ The CEE is positively associated with financial performance measured by ROE.

$H1_{ab:}$ The HCE is positively associated with financial performance measured ROE.

$H1_{ac}$: The SCE is positively associated with financial performance measured ROE.

$H1_{b}$: The VAIC is positively associated with operational Performance of the firm.

$H1_{ba:}$ The CEE is positively associated with operational performance measured by ROA.

$H1_{bb:}$ The HCE is positively associated with operational performance measured by ROA.

$H1_{bc:}$ The SCE is positively associated with operational performance measured by ROA.

$H1_{c}$: The VAIC is positively associated with stock performance measured by EPS.

$H1_{ca:}$ The CEE is positively associated with stock performance measured by EPS.

$H1_{cb:}$ The HCE is positively associated with stock performance measured by EPS.

H_{1cc}: The SCE is positively associated with stock performance measured by EPS.

Sampling and Regression equations

The sample was data belonging to NSE IT sector which include 124 computer software companies and 17 IT enabled services (ITES) companies which was selected based on their market capitalization. were collected by using CMIE PROWESS database over a long period of 2010-2020. Usually a long period tenure gives more efficient results especially for this type of researches. Different researchers already used these tenure for their research like Kamath, (2008), and Pal and Soriya (2012) Abdulsalam et al. (2011), Chen et al. (2005).

Model	Regression Equation
1	ROA = α + ß1 VAIC + ß2 FL+ ß3 FA + ß4 log net sales + μ
2	ROA = α + ß1 HCE + ß2 SCE + ß3 CEE + ß4 FL +ß5 FA+ ß6 log net sales + μ
3	ROE = α + ß1 VAIC + ß2 FL+ ß3 FA + ß4 log net sales + μ
4	ROE = α + ß1 HCE + ß2 SCE + ß3 CEE + ß4 FL +ß5 FA+ ß6 log net sales + μ
5	EPS = α + ß1 VAIC + ß2 FL+ ß3 FA + ß4 log net sales + μ
6	EPS = α + ß1 HCE + ß2 SCE + ß3 CEE + ß4 FL +ß5 FA+ ß6 log net sales + μ

Regression model 1 to model 6 examines linkage between ROA, ROE, EPS and VAIC. In order to examine the linkage size of the firm, age of the firm and leverage of the firm taken as control variables.

Description about variables

There are three tools using for finding firms performance. They are financial performance (measured by ROE) operational performance (measured ROA), and stock performance (measured by EPS) (Ahmad and Hamadan 2015).

1. *Return on assets (ROA).* Most common accounting tool used to measure Return on assets (ROA) is an indicator of how profitable a company is relative to its total assets. ROA gives a manager, investor, or analyst an idea as to how efficient a company's management is at using its assets to generate earnings. Return on assets is displayed as a percentage and its calculated as:

ROA = Net Income / Total Assets

2. *Return on equity (ROE)* is the amount of net income returned as a percentage of shareholders equity. Return on equity (also known as "return on net worth" [RONW]) measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.

3. *Earnings per share (EPS).* It is a profit attribute calculated by dividing the number of equity shareholders by the number of ordinary shares. Most commonly used to evaluate a firm's performance, EPS measures performance from an investors' point of view. Gompers et al. (2003) found that around 85-90 % of the related accounting data is measured in terms of net profit and EPS.

Control variables

Firm size

Firm size is one of the most important control variables in the current study. Firm Size is calculated by taking the natural log of net sales.

Firm leverage

Weill (2003) investigated "the relationship between leverage and corporate performance". He concluded that there is a negative relationship between leverage and firm performance.

Firm age

Sami *et al.* (2011) Indicated that both financial growth and the capital structure of firms are impacted with age.

Intellectual Capital Measurement

VAIC – Value added intellectual capital coefficient, a measure developed by Ante Pulic (2000, 2003 and 2005), which is going to use in this study to estimate intellectual capital efficiency.

According to Pulic (2003), two key resources that create value-added in companies are: Capital Employed and IC. Capital employed includes physical capital and financial capital, whereas IC consists of human and structural capital. It is assumed that value-added is the output minus the input of a firm. Considering output is the sales revenue, the input is each resource that came from outside the company to create a product or service. In traditional approaches to accounting the main focus is on controlling costs. Instead, Pulic (2000) moved the focus to value creation. He noted that in order to be able to manage value creation, there is the need to measure it. The main assumption of the VAIC methodology is that it intends to calculate economic income, which Pulic (2000) labels as value-added, in a different way by treating labour expense as an asset, not as a cost. Pulic (2000) calculates value-added and the value of three types of intellectual capital: human capital, structural capital, and capital employed. He noted that the value of human capital can be expressed by the labor expense. Structural capital equals the book value of the net assets of the firm (Firer and Williams, 2003). Pulic (2002) then calculated the ratio between each of the three forms of capital and value-added, resulting in capital employed efficiency (CEE) , human capital efficiency (HCE) , and structural capital efficiency (SCE).

The procedures for computing VAIC is as follows: First calculate Value Added, which is derived from the difference between outputs and input.

The overall efficiency is measured with three efficiency measures namely capital employed efficiency, human capital efficiency and structural capital efficiency (Pulic 2002)

- Capital employed Efficiency (CEE) = efficiency rate of capital employed
- Human Capital efficiency (HCE) = The rate of the effectiveness of human capital
- Structural Capital efficiency (SCE) = the rate of structural capital efficiency

Value added is expressed as:

VA = OP + EC + D + A (1)

Where, OP = Operating Profit;

EC = Employee Cost;

D = Depreciation; and,

A = Amortization

Pulic (1998) states that CEE is:

CE x = book value of the net assets for firm x;

Edvinsson and Malone (1997) and Pulic (1998) stressed that total salary and wage costs are an indicator of a firm‟s HC, as such,

HCx = total investment in salary and wages for firm x;

To derive the value of SCE, Under Pulic‟s model, we will get SC from subtraction of HC from VA.

Pulic proposes calculating SC as:

VA=HC+SC (2)

SCx = VAx – HCx; (3) structural capital for firm x.

The final step is to compute physical capital employed efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE). These values are derived using the formulae given below:

CEEx = VAx/CEx; VA capital employed coefficient for firm x.

HCEx = VAx/HCx; VA human capital coefficient for firm x.

SCEx = SCx/VAx; VA structural capital coefficient for firm x.

VAIC=ICE+CEE (4)

ICE=HCE+SCE (5)

VAIC = HCE + SCE + CEE (6)

1. Capital employed efficiency (CEE) = VA/CE
2. Human capital efficiency (HCE) = VA/HC;
3. Structural capital efficiency (SCE) = SC/VA.

Data Analysis

Analysis was carried out by pooled data regression by using Jamovi.

Table 1 : Descriptive statistics for selected variables of Indian IT Sector

	HCE	SCE	CEE	VAIC	EPS	ROA	ROE
N	141	141	141	141	141	141	141
Mean	1.82	0.374	0.398	2.59	86.4	0.0953	4.70
Standard deviation	10.4	0.937	0.362	10.5	357	0.118	13.4
Minimum	-71.4	-4.20	-0.165	-70.6	-1837	-0.169	-2.60
Maximum	54.5	7.33	1.95	55.6	1899	0.661	118

The table shows the descriptive statistics of depended, independent and control variables of Indian IT sector from the period from 2010 to 2020. The results shows that HCE have an average of 182% with SD 104% where as other components of Intellectual capital such as SCE and CEE shows an average of 37.4 % and 39.8% respectively along with SD 93.7% and 36.2%.the overall VAIC has an average of 259% with SD of 105%. In the case of minimum and maximum values the variables such as HCE and VAIC shows a remarkable variation and SCE and CEE shows consistency.

The firm performance variables EPS shows an average of 864% with SD of 357% where as ROA shows only a mean value of 9.53% with SD 11.8%. while ROE shows an average of 470% with SD 134%. In the case of minimum and maximum values variables such as EPS and ROA shows remarkable variation and variable ROA shows consistency.

Table II: Karl-Pearson Correlation Matrix – Independent and depended variables of Indian IT sector.

		HCE	SCE	CEE	VAIC	EPS	ROA	ROE
HCE	Pearson's r	—						
	p-value	—						
SCE	Pearson's r	0.015	—					
	p-value	0.861	—					
CEE	Pearson's r	0.070	-0.060	—				
	p-value	0.411	0.479	—				
VAIC	Pearson's r	0.996	0.102	0.099	—			
	p-value	< .001	0.228	0.246	—			
EPS	Pearson's r	-0.017	-0.036	0.355	-0.008	—		
	p-value	0.841	0.669	< .001	0.927	—		
ROA	Pearson's r	0.258	0.104	0.752	0.291	0.401	—	
	p-value	0.002	0.220	< .001	< .001	< .001	—	
ROE	Pearson's r	0.000	0.041	0.250	0.013	0.408	0.329	—
	p-value	0.997	0.630	0.003	0.881	< .001	< .001	—

Correlation Analysis

In order to identify the depth of Relationship among the variables Karl-Pearson correlation were conducted. It shows in Table no II. Results shows that Human Capital Efficiency shows a positive correlation with Operational Performance of the firm. Human Capital Efficiency has a negative correlation with stock performance where it has zero correlation with firm performance.

The Structural Capital efficiency has a positive correlation with firm performance and operational performance. But it has a negative correlation with stock performance. While in the case of Capital Employed Efficiency it has a positive correlation with all the variables of performance.

Multiple Regression Results

Table III: Model Fit Measures

Model	R	R^2
1	0.792	0.627

Model Coefficients – ROA – HCE, SCE, CEE

Predictor	Estimate	SE	t	p
Intercept	-0.01282	0.00966	-1.33	0.187
HCE	0.00230	5.95e-4	3.87	< .001
SCE	0.01835	0.00658	2.79	0.006
CEE	0.24252	0.01720	14.10	< .001

Table IV: Model Fit Measures

Model	R	R^2
1	0.291	0.0847

Model Coefficients – ROA-VAIC™

Predictor	Estimate	SE	t	p
Intercept	0.08757	0.00984	8.90	< .001
VAIC	0.00327	9.14e-4	3.57	< .001

Table V: Model Fit Measures

Model	R	R^2
1	0.255	0.0649

Model Coefficients – ROE- HCE,SCE,CEE

Predictor	Estimate	SE	t	p
Intercept	0.7010	1.751	0.400	0.689
HCE	-0.0235	0.108	-0.218	0.828
SCE	0.8182	1.193	0.686	0.494
CEE	9.4019	3.117	3.016	0.003

Table VI: Model Fit Measures

Model	R	R^2
1	0.0127	1.62e-4

Model Coefficients – ROE-VAIC™

Predictor	Estimate	SE	t	p
Intercept	4.6936	1.173	4.000	< .001
VAIC	0.0163	0.109	0.150	0.881

Table VII: Model Fit Measures

Model	R	R^2
1	0.357	0.127

Model Coefficients – EPS- HCE, SCE, CEE

Predictor	Estimate	SE	t	p
Intercept	-52.76	44.67	-1.181	0.240
HCE	-1.42	2.75	-0.518	0.605
SCE	-5.62	30.44	-0.185	0.854
CEE	350.82	79.54	4.411	< .001

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Table VIII: Model Fit Measures

Model	R	R^2
1	0.00777	6.04e-5

Model Coefficients – EPS- VAIC™

Predictor	Estimate	SE	t	p
Intercept	87.905	31.29	2.8094	0.006
VAIC	-0.265	2.91	-0.0913	0.927

Results and Discussions

The present study explores the relationship among Intellectual Capital efficiency and performance of Indian IT Companies. For finding Intellectual capital efficiency Ante Pulic VAIC™ model was applied. A sample of 141 companies from NSE for a period of 10 years from 2010 to 2020 were selected.

Firm's operational performance that is ROA have a significant impact on HCE, SCE, and CEE with R^2 value of 0.627. But when we take VAIC™ collectively it doesn't have that much influence with R^2 value 0.0847. When we consider about financial performance (ROE) with different variables of intellectual capital HCE, SCE, CEE the relation is considerably negligible with value of 0.0649 and also when we compare the ROE with VAIC it is also doesn't show any relation with R^2 value 0.000162.

In the case of stock performance (EPS) it has a moderate linkage with the components of VAIC i.e., HCE, SCE, CEE with R^2value of 0.127 and it doesn't show any remarkable relation with VAIC™ with R^2 value of 0.000604.

Conclusion

The study contributing to the research in way that the data used for this study was an updated one from 2010 to 2020 tenure. And also the study were conducted on Indian IT companies – it is one of the industry in India predominantly continuous to gain at a higher gait. India is a leading location in the world, showing around 55% market share of the US$ 200-250 billion global services sourcing business in 2021-22. (India Brand Equity Foundation, 2009). And also the sample selected from NSE 141 IT companies these much of samples give accurate results.

Limitations and Future Research

Especially the long time in the case of companies their structure, policies or market conditions may change which will effect on company's performance.May be new researchers can use a different toll for intellectual capital efficiency measurement.

There are no sources in the current document.

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