

An Empirical Study of the Impact of Intellectual Capital on the Financial Performance of the Indian IT Sector

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Abstract

In the present scenario, intellectual capital has been established as an important corporate asset because conventional performance measurement techniques are incapable of measuring the intangible dimensions of corporate performance. It is a challenge, especially for knowledge driven firms, to measure the impact of intangibles on their financial performance. The main objective of this study is to show the impact of intellectual capital on the financial performance of the Indian IT sector. In order to conduct the study, the sample was drawn from the IT sector for which the sector index of BSE, namely the BSE IT, had been selected. In all, data from 51 companies from the Information Technology (IT) sector for the financial years ranging from 2006 to 2016 were taken. The data used in this study was extracted from the CMIE's Prowess.

The VAICTM was used to measure the intangibility of these firms. The results show that only the VAICTM had a significant positive association with profitability of the Indian IT sector, while it had an insignificant relationship with productivity and market valuation. The CEE had a significant positive relationship with productivity and profitability in the IT sector, while, in the case of market valuation, it had an insignificant impact. The HCE had an insignificant impact on profitability and productivity, while, in the case of market valuation, it had a negative significant impact. The SCE had a significant positive association with market valuation only while it had an insignificant relationship with the productivity and profitability of the Indian IT sector.

Keywords: Intellectual Capital, Financial Performance, Value Added Intellectual Coefficient™, Capital Employed Efficiency, Human Capital Efficiency, Structural Capital Efficiency, Profitability, Productivity, Market Valuation.

JEL: C1, C4, C5, G3, Z0

Introduction

With the dawn of the 21st century, the information, communications, and computer technologies have undergone swift innovation and popularization, intensely altering human lifestyles and economic configurations. The Internet revolution, which resulted in the transformation of electronic transactions and monetary regimes, has transformed the traditional industrial production process and management style. The digital revolution has initiated a paradigm shift in the production and supply of goods and services, in research and development, design, manufacturing, marketing, and transactions [Hsu, 2001]. In this era, land, labor, and physical capital have been replaced by knowledge, which is considered the most important factor for production [Drucker, 1988]. Different researchers have consensually agreed that knowledge is the decisive factor in this cut-throat, competitive era. Knowledge is also the most important factor in value creation and for a sustainable competitive advantage [Drucker, 1993; Stewart, 1997]. Some of the most successful companies in the world like Apple, Microsoft, Infosys and TATA have successfully managed their knowledge and intellectual capital resources. In today's economy, it has become more important to devise new approaches to understand and measure organizational performance from the perspective of creating value with the knowledge-based assets of the company. When knowledge is measured and reported from a value creation perspective, it is widely known as intellectual capital (IC) [Kianto et al., 2013]. IC is comprised of valuable knowledge based assets / resources and the management activities associated with managing these resources. These assets are mainly intangible in nature and are comprised of various components such as human resources, structural capital, and relational networks, along with the management activities related to strategy making, policy formation and implementation plans to optimally utilize these resources [Bontis, Nikitopoulos, 2001; Edvinsson, Malone, 1997; Guthrie, 2001; Itami, 1991].

The problem that businesses have to deal with is to understand and communicate the difference between the value or market capitalization of a company and its accounting book value [Edvinsson, Malone, 1997]. It can also be assumed that the difference is caused by some undeclared

intangible assets and that about 80% of a company's market value remains unexplained in traditional financial statements [Gu, Lev, 2001]. The rise of the new economy based on information and knowledge has promoted the prominence of intellectual capital. It has become a major construct in explaining the difference between market capitalization and book value [Firer, Stainbank, 2003].

The information technology (IT) sector in India is one of the most promising sectors in terms of growth, contribution to GDP, employment and providing primary services [India Brand Equity Foundation, 2017]. The Indian IT industry is a 150 billion USD industry. It has a share of 9.5% in the country's GDP, which has grown three fold in the last ten years and a 24% share in the country's exports, which has increased five times in the last ten years. The IT sector provides 3.5 million direct employment positions and over 10 million indirect employment positions yearly and it is one of the largest organized, private sector employers in India. In the Global Sourcing Market, the top position is occupied by the Indian IT sector, which holds 55% of the shares [NASSCOM, 2015]. In the service sector, IT companies are identified as intellectual, capital-intensive companies [Alhassan, Asare, 2013; Vale et al., 2016]. Hence, the identifying, reporting, measuring and managing of intellectual capital has become an important task for the management of these organizations [Chen Goh, 2005; Mavridis, 2004a; Mondal, Ghosh, 2012].

Thus, the main goal of this paper is to reveal the existence and nature of the relationship between intellectual capital and financial performance of firms in the IT sector in India. The present analysis is based on a sample of 51 companies listed on the Bombay Stock Exchange (BSE) IT Index.

The remaining parts of this paper include a brief summary of the relevant literature (2), objectives of the study (3), methodology (4), data analysis (5), results and discussion (6), conclusion (7) and limitations and future research (8).

Literature Review

The term, intellectual capital, has been defined by different researchers in many ways. Some of these definitions are as follows:

Author	Definition
Mouritsen et al. (2002)	IC is not a conventional accounting or economic term. It may be an effect, it may be a departmental strategy, it may be a mathematical formula
Stewart (1997)	Any intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth
Edvinsson, Malone (1997)	Knowledge that can be converted into value
Bontis (1999)	IC “is quite simple the collection of intangible resources and their flows”, an intangible resource is “any factor that contributes to the value generating processes of the company”

Author	Definition
Petty, Guthrie (2000)	IC “as the economic value of two categories of the intangible assets of a company”, organizational capital and human capital
Rastogi (2003)	IC may be properly viewed as the holistic or meta-level capabilities of an enterprise to coordinate, orchestrate, and deploy its knowledge resources towards creating value in pursuit of its future vision”

In the last two decades, both academic research and managerial practices have shown a growing interest in the field of intellectual capital. The intellectual capital of any company is basically comprised of three main components: human capital, organizational / structural capital and relational capital [Bontis, 1999; Edvinsson, Malone, 1997; Edvinsson, Sullivan, 1996; Roos et al., 1998].

Human capital is defined as the combination of knowledge, skills, experience, and the individual capabilities of a firm’s employees [Edvinsson, Malone, 1997; Roos et al., 2001]. Many authors also said that the value of human capital is derived from an employee’s competence, attitude and intellectual agility that encompass the ability to innovate and change practices, that reflects on problems and reaches innovative solutions.

Organizational Capital or Structural Capital deals with the structure and information systems that can lead to business intellect. Structural capital is comprised of all types of “knowledge deposits”, such as organizational routines, strategies, process handbooks, and databases [Boisot, 2002; Edvinsson, Sullivan, 1996; Ordóñez de Pablos, 2004; Walsh, Ungson, 1991].

The basic distinction between human capital and structural capital is that human capital is the capital that the human resource takes along with them, while structural capital is that which remains in the company when employees go home for the night [Bontis, 2001; Bontis et al., 2000; Curado, 2008; Roos et al., 1998; Stewart, 1997]. Although it is influenced by human capital, structural capital exists objectively and independently from human capital [Chen et al., 2004]. For example, patents are creat-

ed by human capital, but after their creation, they belong to the company.

Some authors further divided organizational/structural capital into process capital and innovation capital [Wang, Chang, 2005]. Process capital includes the activities and processes of the firms and the roles and responsibilities of the employees, whereas innovation capital encompasses the set of technologies and methods that the firm owns [Agostini, Nosella, 2017; Canibano et al., 2000].

Relational Capital captures the value of relationships with those stakeholders who are external to the organization, such as the knowledge of market channels, customers, suppliers and regulatory agencies [Maditinos et al., 2009]. Relational capital includes not only the set of external relationships established by the firm, but also other dimensions such as branding and reputation [Bontis, 1999; Lowendahl, 2005; Sveiby, 1997; Urde, 1999; Wong, Merrilles, 2008]. It is comprised of the knowledge embedded in all the relationships an organization develops, whether with customers, competitors, suppliers, trade associations or governmental bodies [Bontis, 1999].

The measurement of intellectual capital is a difficult task and the main problems associated with it are: (i) the components of IC are qualitative in nature and based on judgments, (ii) the required information is not available to outsiders and (iii) the conversion of qualitative information into quantitative term is very difficult [Clarke et al., 2011]. At the initial stage, only theoretical and qualitative models were available [Ståhle et al., 2011], while later, some empirical models had been developed by different authors with some of them as follows:

Authors	Models
Pulic (2000, 2004)	Value Added Intellectual Coefficient (VAIC™)
Stewart (1997)	Calculated Intangible Value (CIV)
Gu, Lev (2001)	Intangible-Driven Earnings (IDE)
Corrado et al. (2004)	Corrado–Hulten–Sichel (CHS)

From all these models, Ante Pulic's VAIC™ model is extensively used in research studies because it only uses audited quantitative information, which is publicly available [Chan, 2009b] and that overcomes the basic problems associated with the measurement of IC [Clarke et al., 2011]. Pulic (2004) criticized other IC measurement models because they lack comparability and scope.

Many studies have been conducted to define and measure intellectual capital but it is difficult to measure it successfully in monetary terms. Some of the researchers have applied the VAIC™ model in order to identify the link between intellectual capital and financial performance of the companies, but the results were not similar in all the studies. Firer and Mitchell Williams (2003) had conducted a study on 75 South African, publicly listed firms and found that human capital efficiency had a negative impact on profitability, productivity, and market valuation but structural capital efficiency had a positive impact on profitability while physical capital had connected positively with market valuation. Shiu (2006) conducted a study in Taiwan and also found similar results where human capital had a negative impact on productivity and market valuation. Chan (2009) had also conducted a study on the Hong Kong Stock Exchange and found that human capital had a negative relationship with productivity, profitability and market valuation, while physical capital had a significant relationship with all these factors. Bollen, Vergauwen and Schnieders (2012) said that all the components of intellectual capital had an indirect relationship with financial performance measures.

On the other hand, Maditinos et al. (2011) had conducted a study on the Athens Stock Exchange and found that human capital efficiency was positively associated with profitability. Ting & Lean (2009) concluded that human capital efficiency and physical capital efficiency both had a positive significant relationship with profitability. Zeghal & Maaloul (2010) carried out a study on 300 firms in the UK and found that only physical capital efficiency had a significant influence on the financial and stock market performance of the firms. Chen et al. (2005) in Taiwan found that human capital efficiency and physical capital efficiency had a significant impact on profitability, productivity, market valuation, and growth, whereas structural capital efficiency had significant impact only on profitability and market valuation. Mavridis (2004) found that human capital efficiency was more important for the performance of banks in Japan when compared to physical capital efficiency. Appuhami (2007) did not find any significant relationship between HCE and capital gains made by investors, although the relationship was a positive one.

Overall, studies using VAIC™ have given a mixture of results across different countries, industries, and years. For example, where as Chen et al. (2005) concluded that IC is a driver of both firm value and financial performance, Shiu (2006) found only weak relationships between VAIC™ and performance. In addition, Firer and Mitchell

Williams (2003) and Chan (2009) concluded that firms and investors place greater importance on physical capital over IC, but Appuhami (2007) concluded that in the Thai financial sector, IC is more important. This varying evidence does not lead to an appealing conclusion regarding the relationship between IC and firm performance.

Objectives of the Study

The objective of the study was drawn from previous studies in the Indian context [Bharathi Kamath, 2008; Mondal, Ghosh, 2012; Pal, Soriya, 2012]. A review of those studies revealed that due to different industrial and geographical settings, the results varied considerably. This led to the validation of the impact of IC on the financial performance of IT companies. The following objectives were framed:

- To measure the impact of intellectual capital on financial performance.
- To check which components of intellectual capital have significant impact or insignificant impact on financial performance?
- To find out the most significant component of intellectual capital in terms of financial performance.

Methodology

Development of Hypothesis

The present study empirically explored this issue by analyzing the impact of the intellectual capital (IC) measure through VAIC™ on commonly used measures of a company's financial performance, namely, ATO, ROE, ROA & MB, which represent productivity, profitability, and market valuation, respectively.

In this study, the author predicted a positive relationship between financial performance as measured by ATO, ROA, ROE & MB and the components of IC performance in the Indian IT sector.

The aggregate measure, based on the components of VAIC™, represents the total measure of IC. In the following hypotheses, the association of this aggregate measure, along with three components of VAIC™ for each financial indicator, had examined. The three components of VAIC™ reflect the classification of IC into physical, human and structural capital. On the basis of the reviewed literature, we formulated four major hypotheses, which were broken up further into twelve sub-hypotheses.

H1. The VAIC™ is positively associated with productivity as measured by ATO.

H1a. The CEE is positively associated with productivity as measured by ATO.

H1b. The HCE is positively associated with productivity as measured by ATO.

H1c. The SCE is positively associated with productivity as measured by ATO.

H2. The VAICTM is positively associated with profitability as measured by ROA.

H2a. The CEE is positively associated with profitability as measured by ROA.

H2b. The HCE is positively associated with profitability as measured by ROA.

H2c. The SCE is positively associated with profitability as measured by ROA.

H3. The VAICTM is positively associated with profitability as measured by ROE.

H3a. The CEE is positively associated with profitability as measured by ROE.

H3b. The HCE is positively associated with profitability as measured by ROE.

H3c. The SCE is positively associated with profitability as measured by ROE.

H4. The VAICTM is positively associated with market valuation as measured by MB.

H4a. The CEE is positively associated with market valuation as measured by MB.

H4b. The HCE is positively associated with market valuation as measured by MB.

H4c. The SCE is positively associated with market valuation as measured by MB.

Sample and Regression Models

The sample was drawn from the IT sector for which the sectoral index of BSE, namely BSE IT, had been selected. In all 51 companies of the Information Technology (IT) sector, data from the financial years ranging from 2006 to 2016 had been taken. The data used in this study had been extracted from the CMIE's Prowess.

Model 1 to Model 8 examines the relationship between ATO, ROA, ROE & MB and the components of VAICTM. In order to examine the impact of productivity on profitability and market valuation, ATO (measure of productivity) was also used as a control variable in all the models, except those in which ATO itself acts as a dependent variable. These models are illustrated in the following regression equations:

Model	Regression Equations
1	$ATO = \alpha + \beta_1 VAICTM^{TM} + \beta_2 PC + \beta_3 \log \text{total assets} + \mu$
2	$ATO = \alpha + \beta_1 CEE + \beta_2 HCE + \beta_3 SCE + \beta_4 PC + \beta_5 \log \text{total assets} + \mu$
3	$ROA = \alpha + \beta_1 VAICTM^{TM} + \beta_2 ATO + \beta_3 PC + \beta_4 \log \text{total assets} + \mu$
4	$ROA = \alpha + \beta_1 CEE + \beta_2 HCE + \beta_3 SCE + \beta_4 ATO + \beta_5 PC + \beta_6 \log \text{total assets} + \mu$
5	$ROE = \alpha + \beta_1 VAICTM^{TM} + \beta_2 ATO + \beta_3 PC + \beta_4 \log \text{total assets} + \mu$
6	$ROE = \alpha + \beta_1 CEE + \beta_2 HCE + \beta_3 SCE + \beta_4 ATO + \beta_5 PC + \beta_6 \log \text{total assets} + \mu$
7	$MB = \alpha + \beta_1 VAICTM^{TM} + \beta_2 ATO + \beta_3 PC + \beta_4 \log \text{total assets} + \mu$
8	$MB = \alpha + \beta_1 CEE + \beta_2 HCE + \beta_3 SCE + \beta_4 ATO + \beta_5 PC + \beta_6 \log \text{total assets} + \mu$

Definitions of Variables

Measure of dependent variables: Financial performance indicators are considered as the best indicators to reflect the fulfillment of a business entity's economic goals. Many researchers have used different financial indicators in their studies with some as follows:

Authors	Variables
Firer, Mitchell Williams (2003)	ROA, ATO, MB
Gan, Saleh (2008)	ROA, ATO, MB
Ghosh, Mondal (2009)	ROA, ATO, MB
Mehralian et al. (2012)	ROA, ATO, MB
Chen et al. (2005)	ROE, ROA, GR, EP
Chu et al. (2011)	ATO, ROA, ROE, MB

In order to conduct the study, the four dependent variables of ATO, ROA, ROE and MB were used as a proxy measure designed to capture the respective properties of profitability, productivity, and market valuation.

Asset Turnover Ratio (ATO): this is used to measure the productivity of banks, which is computed by dividing the income of banks by the total funds employed.

Return on Assets (ROA): gives an idea as to how efficient management is at using its assets to generate earnings.

Return on Equity (ROE): measured as the ratio between the net incomes (minus preference dividends) divided by the book value of the total equity, it shows the earnings available to the equity shareholders and is generally considered an important financial indicator for investors.

Market to Book Ratio (MB): ratio of the total market capitalization (share price times number of outstanding common shares) to the book value of net assets.

Measure of independent variables: The VAICTM Pulic (2000) is an analytical procedure designed to enable management, shareholders and other relevant stakeholders to effectively monitor and evaluate the efficiency of the VA by using a firm's total resources and each major resource component. Actually, VAICTM is a composite sum of three separate indicators:

Capital Employed Efficiency (CEE) – indicates how much new value has been created by one invested unit of capital employed.

Human Capital Efficiency (HCE) – shows how much value added has been created by one money unit invested in the employees.

Structural Capital Efficiency (SCE) – indicates the share of SC in the created value.

The following equation formalizes the relationship algebraically:

$$CEE + HCE + SCE = VAIC^{TM}$$

The total value added is the difference between the output and input in the organization.

$$VA = W + I + T + NI$$

Where,

W = Wages and Salaries.

I = Interest expenses.

T = Taxes paid.

NI = Profit after tax.

CEE = VA/CE.

VA = Value added.

CE = Capital employed.

HCE = VA/HC.

VA = Value added.

HC = Human capital.

$$SCE = SC/VA.$$

VA = Value added.

SC = Structural capital = VA – HC.

Measure of control variables:

Physical capacity (PC): measures the physical intensity of the companies i.e. how many fixed assets there are in proportion to the total assets. It is calculated as:

$$PC = \text{Fixed assets} / \text{Total assets}.$$

Natural log (Total Assets): is employed as the proxy for the size of the firm:

$$\text{Total Assets} = \text{Log (Total Assets)} = \text{Firm size}.$$

Methodology

The analysis was carried out by a panel data regression that had been conducted by using Stata 13.0. The estimators are BLUE and all the assumptions of CLRM were fulfilled. The full results can be provided on request.

Data Analysis

Descriptive Statistics

Table I presents the mean and standard deviation of the dependent variables, independent variables and control factors of the IT sector for the whole study period of 2006–2016. The results show that the ATO had an average of 91% with an SD of 400%, whereas the ROA had an average of only 10% with the SD at 21%. The ROE had an average of 11% with an SD of 123%. The CEE and SCE both had averages of 62% and 41% with an SD of 61% and 91% respectively. In the case of the minimum and maximum values, some variables such as VAICTM, ATO, MB, HCE and PC showed a remarkable variation. Only the ROA showed some consistency while the rest of the variables were otherwise inconsistent.

Table I. Descriptive statistics for selected variables from the IT sector

Variable	Obs	Mean	Std. Dev	Min	Max
ATO	561	.9192448	4.099524	-26.28223	92.95547
ROA	561	.1048047	.2140106	-3.516358	1.284027
ROE	561	.1175492	1.234371	-27.77705	4.254427
MB	561	3.255526	9.532208	-118	56.57
CEE	561	.6210386	.6128962	-5.215329	3.119576
HCE	561	1.529035	6.271753	-113.9556	28.0516
SCE	561	.4151664	.9105643	-9.965094	13.64391
VAIC TM	561	2.56524	6.417243	-112.9729	29.72279
PC	561	.9316743	18.19509	-.0379837	431.1125
LTA	561	8.706287	1.869	.4700036	13.57093

Table II. Spearman Correlations – independent and dependent variables of the IT sector

	CEE	HCE	SCE	VAIC TM	ATO	ROA	ROE	MB	PC	LTA
CEE	1.0000									
HCE	0.1217	1.0000								
SCE	-0.0736	-0.0186	1.0000							
VAIC TM	0.2040	0.9863	0.1167	1.0000						
ATO	-0.3290	-0.0022	-0.0746	-0.0442	1.0000					
ROA	0.3356	0.2273	0.0080	0.2553	0.0999	1.0000				
ROE	0.1489	0.0886	-0.0371	0.0955	0.0384	0.2211	1.0000			
MB	0.0571	-0.0707	0.1015	-0.0493	-0.0081	0.0534	0.0161	1.0000		
PC	-0.4026	-0.0071	-0.0697	-0.0552	0.9496	-0.1505	0.0032	-0.0102	1.0000	
Lta	0.1179	0.1396	0.0643	0.1568	-0.1497	0.2057	0.0023	0.1039	-0.1873	1.0000

Correlation analysis

To find out the intensity of the relationship among all the variables of the IT sector, the correlation coefficient was estimated along with its significance and this is depicted in Table II.

In Table II the capital employed efficiency shows a positive correlation with profitability and market to book value while it is negatively correlated with productivity. Human capital efficiency and structural capital efficiency are also negatively correlated with productivity, whereas HCE is negatively correlated and SCE is positively correlated with the market to book ratio.

Multiple Regression Results

Table 1. Regression Results for ATO – VAICTM

	IT			
Variable	C	VAIC TM	PC	LTA
Coefficient	.166523	.002633	.215207	.062651
Std Error	.263855	.008558	.003034	.029870
t-Statistics	0.63	0.31	70.91	2.10
Probability	0.528	0.758	0.000**	0.036*

Notes: (i) Adjusted R² = 0.9020.

(ii) *Significant at $\alpha = 0.95$.

(iii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 2. Regression Results for ROA – VAICTM

	IT			
Variable	C	VAIC TM	PC	LTA
Coefficient	-.062567	.007530	-.001294	.017144
Std Error	.041743	.001354	.000480	.004725
t-Statistics	-1.50	5.56	-2.70	3.63
Probability	0.134	0.000**	0.007*	0.000**

Notes: (i) Adjusted R² = 0.1002.

(ii) *Significant at $\alpha = 0.95$.

(iii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 3. Regression Results for ROE – VAICTM

	IT			
Variable	C	VAIC TM	PC	LTA
Coefficient	.13704	.018803	.000431	-.007825
Std Error	.253311	.008216	.002913	.028676
t-Statistics	0.54	2.29	0.15	-0.27
Probability	0.589	0.022*	0.882	0.785

Notes: (i) Adjusted R² = .

(ii) *Significant at $\alpha = 0.95$.

(iii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 4. Regression Results for MB – VAICTM

IT				
Variable	C	VAICTM	PC	LTA
Coefficient	-1.636278	-.099530	.004092	.590758
Std Error	1.950299	.0632617	.022432	.220786
t-Statistics	-0.84	-1.57	0.18	2.68
Probability	0.402	0.116	0.855	0.008*

Notes: (i) Adjusted $R^2 = 0.0099$.

(ii) *Significant at $\alpha = 0.95$.

(iii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 5. Regression Results for ATO – CEE, HCE, SCE

IT						
Variables	C	CEE	HCE	SCE	PC	LTA
Coefficient	-.060560	.419733	-.004475	-.016072	.220739	.060530
Std Error	.265911	.096636	.008668	.059259	.003267	.029442
t-Statistics	-0.23	4.34	-0.52	-0.27	67.55	2.06
Probability	0.820	0.000**	0.606	0.786	0.000**	0.040*
Adj. R^2	0.9050					
F-statistics	1067.77					

Notes: (i) *Significant at $\alpha = 0.95$.

(ii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 6. Regression Results for ROA – CEE, HCE, SCE

IT						
Variables	C	CEE	HCE	SCE	PC	LTA
Coefficient	-.115972	.104575	.005837	.005604	6.840507	.016606
Std Error	.041226	.014982	.001343	.009187	.000506	.004564
t-Statistics	-2.81	6.98	4.34	0.61	0.00	3.64
Probability	0.005	0.000**	0.000**	0.542	0.999	0.000**
Adj. R^2	0.1619					
F-statistics	22.64					

Notes: (i) *Significant at $\alpha = 0.95$.

(ii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 7. Regression Results for ROE – CEE, HCE, SCE

IT						
Variables	C	CEE	HCE	SCE	PC	LTA
Coefficient	-.030009	.337991	.013816	-.024186	.004575	-.008924
Std Error	.256700	.093289	.008368	.057206	.003154	.028422
t-Statistics	-0.12	3.62	1.65	-0.42	1.45	-0.31
Probability	0.907	0.000**	0.099	0.672	0.147	0.754
Adj. R ²						
F-statistics						

Notes: (i) *Significant at $\alpha = 0.95$.

(ii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Table 8. Regression Results for MB – CEE, HCE, SCE

IT						
Variables	C	CEE	HCE	SCE	PC	LTA
Coefficient	-2.686508	1.297723	-.142856	1.071703	.026447	.561083
Std Error	1.981643	.720162	.064598	.441615	.024351	.219415
t-Statistics	-1.36	1.80	-2.21	2.43	1.09	2.56
Probability	0.176	0.072	0.027*	0.016*	0.278	0.011*
Adj. R ²	0.0240					
F-statistics	0.0024					

Notes: (i) *Significant at $\alpha = 0.95$.

(ii) **Significant at $\alpha = 0.99$.

Source: Computed by the authors.

Results & Discussion

The present study measured the intellectual capital performance of the IT sector in India. VAICTM was applied to a sample of 51 companies from the BSE IT index for a period of 11 years from 2006–2016. The findings suggest that VAICTM has an insignificant impact on the productivity of the IT sector as reported by Ghosh & Mondal (2009), Kamath (2008) and Pal & Soriya (2012). Intellectual capital had a positive significant impact on the profitability of the IT sector, which is similar to some previous studies [Chu et al., 2011; Pal, Soriya, 2012]. Intellectual capital also had an insignificant impact on market valuation. Many previous studies also failed to establish any significance between intellectual capital and market value [Gan, Saleh, 2008; Maria Morariu, 2014]. Intellectual capital is the main cause for the difference between the mar-

ket value and book value of the company. Thus, overall, VAICTM was found to have a significant positive influence on profitability only, but not on productivity and market valuation.

In order to understand the relationship of the individual components of VAICTM with the financial performance of the IT sector, the model was further analyzed and the findings suggested that CEE had a significant positive relationship with the productivity and profitability of the IT sector [Gan, Saleh, 2008; Chu et al., 2011] but in the case of market valuation, it had an insignificant association.

The HCE had a significant positive association with the ROA, but not with ROE [Gan, Saleh, 2008]. In the case of productivity, it had an insignificant impact; while in the case of market valuation, the HCE had a significant negative impact on the IT sector. This indicates that IT

companies prefer to employ more physical and financial assets, rather than human assets. While in the case of the IT sector, the negative significance of HCE with MB shows that investors perceived expenses spent on employees as a cost rather than as an investment. Chu et al. (2011) also had similar results.

The statistical association between SCE and MB was positively significant [Chu et al., 2011], while it had an insignificant impact on the productivity of the IT sector [Gan, Saleh, 2008; Maria Morariu, 2014]. The SCE had an insignificant impact on the profitability of the IT sector [Gan, Saleh, 2008; Mondal, Ghosh, 2012]. This had been expected, as the SCE had an inverse relationship with HCE [Pulic, 2000]. Some of the previous studies had failed to establish the significance of SCE on financial performance [Firer, Mitchell Williams, 2003]. The present study gave quite significant results for SCE as a moderate predictor as a measure of the financial conditions of a business. This is completely against the concept regarding the inappropriateness of VAICTM methodology for computation of SCE, which is considered as one of the major limitations of VAICTM technique [Stähle et al., 2011].

In the case of the control variables, PC showed an insignificant impact in most of the models, while the LTA was significant in almost all the models. All the regression results were based on Pooled OLS regression except the impact of VAICTM on ROE (Table 3 and 7) in the IT sector, which used the Random – effects GLS regression. All the methods of regression were based upon the results of Hausman Test and Breusch– Pagan Lagrangian multiplier test. Spearman's correlation (Table II) clearly shows that there was a problem of multicollinearity between the two control variables ATO and PC in the IT sector. The Breusch-Pagan test had been used to check the homoscedasticity of the data and as in most cases, the data was found to be heteroscedastic, but the problem was resolved with the help of the Robust standard error. The Wooldridge test for autocorrelation showed that the problem of autocorrelation was also present in a few cases, which had been resolved by the help of the Prais-Winsten test. All the estimators were BLUE and fulfilled all the assumptions of CLRM.

Conclusion

The present study contributes to the literature in the following ways. Firstly, it employed updated data from 2016, which had not been used so far. Secondly, the study was conducted on an IT sector that is considered among the most promising sectors in terms of growth, contribution to GDP, employment and providing primary services. Thirdly, the sample selection was based on the index of BSE, which had not been studied earlier. Finally, this study rejected the arguments of many authors regarding the calculation of HC and SC in VAICTM that causes multicollinearity between HCE and SCE, and the insignificant impact of SCE on financial performance [Nazari, Herremans, 2007; Stähle et al., 2011].

The results of this study show that the concept of intellectual capital or value creation by using knowledge is not being valued or given importance by the knowledge driven industries in India. In order to conduct the study, the BSE IT index was taken as a sample from 2006 to 2016. CEE was found to be the best predictor among all the components of VAICTM, except for market valuation, which had a significant positive relationship with all other measures of financial performance. This indicates that the performance of a firm is still being perceived in terms of tangible assets, even in the case of knowledge based industries. This idea is absolutely opposite the argument of many scholars that intellectual capital is more important for knowledge driven enterprises because it helps them in acquiring a competitive advantage [Marr, Chatzkel, 2004]. According to the traditional view of productivity, as the number of employees is increasing with the other factors remaining the same, the marginal output starts diminishing. In contrast, from the value creation perspective, human capital may be looked upon as a depository of knowledge. The pool of knowledge contained in humans becomes IC for value creation, contributing to the enhancement of a company's overall productivity [Pulic, 2000]. The insignificance of HCE with productivity may be because traditional accounting practices do not give due consideration to measuring the value created by human capital. The insignificant relation of HCE with financial performance measures may be because of the inability of the companies to extract the full potential of their employees, as it seems that human resources are devoid of proper training, development and management. It has been expected and proved by many previous studies that human capital efficiency should be higher than physical and structural capital efficiency [Goh, 2005].

The insignificant impact of SCE on the productivity and profitability of IT is similar to many earlier studies [Ghosh, Maji, 2015]. It also indicates that managers must be responsible for the optimum utilization of the structural resources in order to achieve the desired profitability and productivity, especially in the case of IT industries. The insignificant impact of VAICTM on MB shows that an average Indian investor does not consider intellectual capital while making decisions regarding investments. One of the major reasons behind this tendency might be the non-disclosure of intellectual capital on the financial statements of companies.

The VAICTM model has been criticized regarding the calculation of HC and SC in this model. HC and SC are very much similar to each other and this leads to the problem of multicollinearity between HCE and SCE [Stähle et al., 2011]. The correlation coefficients between HCE and SCE in Table II are very low and there is no multicollinearity between them. The general perception regarding the insignificant impact of SCE on measures of financial performance [Nazari, Herremans, 2007] is also not applicable because SCE has a significant impact on the market valuation of the IT sector.

Limitations and Future Research

The main limitation of this study was that the time period of a decade was very long during which time the structure of the companies generally kept changing, which affects the analysis of the companies. The use of MB as the market valuation also fell under a grey area because investors might not always consider financial statements before investing; in fact, major decisions have been made under the influence of news and information. Structural capital should also be clearly defined as to whether it would be technology or plans and procedures that can achieve profitability. Another problem was with data since some companies had to be dropped due to the unavailability of the data.

Therefore, future studies could be conducted with a different IC measurement model for a shorter duration of time or the results of VAIC™ could be compared with other IC efficiency measures. Human capital could be calculated with data generated from some other means rather than by extracting it from financial statements.

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