Impact of Intellectual Capital on the Value of the Indian Firms

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ABSTRACT: *This paper examines the nexus between Intellectual Capital and Value of Firms in the Indian Information Technology Industry. Forty five companies, listed on BSE, were taken as a sample, for a period of 2006 to 2016, for the purpose of this study. Value Added Intellectual Co-efficient (VAIC) method as developed by* ***Pulic (1998)*** *and Granger Causality were used for the evaluation of intellectual capital and their relationship with value of the firms of the sample companies. The result of the study supports the hypothesis that the value of firms could be explained by the intellectual capital. Hence there was significant association between intellectual capital and the value of firms in India.*

Keywords: Intellectual Capital, IT Sector, Value of Firms, Value Added Intellectual Co- Efficient (VAIC)

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1. Introduction

The growing hiatus between the firm's book value of firms and their market compelled more research to retrieve the holistic assessment of the intangible values, omitted in the annual financial statement of firms **(Ming-Chin Chen et al, 2005).** The main objectives of a manager of company, among others, are to maximize the value of firms. It is to be noted that calculating a value of a company is a complex task. Different companies valued their values, differently. However, the value of company value depends on the aim of the valuation as a company can have several values, depending on the methods used **(Lazzolino & Laise, 2012).** The past two decades have seen a stream of innovation in financial markets, but the valuation methods have not been changed significantly, to fairly value the firm by covering all assets, including intangible assets. Traditional valuation methods, used by corporates include discounted cash flow valuation, liquidation and accounting valuation, relative valuation and contingent claim valuation. The measurement techniques recommended have burgeoned over decades **(Jurckzak, 2008).**

These methods clearly reflect historical performance while it is also necessary to take into consideration the value which is off-balance sheet and important for the possible growth of firms. Traditional corporate valuation methods are based on balance sheet, income statement or cash flow statement but, the intellectual capital is also an important asset **(Gan & Saleh, 2008).** Yet intellectual capital of firm is valued, at zero, on the balance sheet, under the traditional method. The rigorous construct measurement is difficult for the enhancement of science and Technology, especially, while the variables of interest are complex or not taken into consideration **(Murugesan Selvam et. al, 2016).** As a result, large differences do exist between market and book value of company and a part of this can be explained by intellectual capital. Even though there is no universal definition for intellectual capital, its information provides an indication about the future growth potential of a company. This fact has been observed well in firms of knowledge based and technology intensive industries, particularly information technology, pharmaceutical industry and financial sectors **(Maji, S. G., & Goswami, M. 2015).**

1.1. Intellectual capital

As stated earlier, the intellectual capital and knowledge assets are difficult to discern and quantify. Their results will nonetheless be reflected in the company's greater productivity, efficiency, and overall profitability **(Irina Berzkalne & Elvira Zelgalve, (2013).** The limitations of financial statements, in explaining company value, by covering intangible assets, underline the fact that the source of economic value is no longer the production of material goods but the creation of intellectual capital **(Chen, Cheng & Yuchang, 2005).** The universal truth is that intellectual capital is intangible and cannot be accurately measured. Hence the intellectual is defined capital as all non-financial assets of a company that are not reflected in the balance sheet (**Frykman & Tolleryd, 2010)**. The cause and effect relationships between the intellectual capital and value creation are, at best, only indirect and hence there is no universal definition (**Tawy & Tollington, 2012)**. It is emphasized that the intellectual capital is the "intangible safety - cushion", which can be used only by companies, which have created it over the years (**Bayburina & Golovko, 2009**). Therefore, it is necessary, on the part of firms, to focus on its sustainable development. The panel data analysis, used in earlier studies, clearly revealed the fact that the human capital could be considered as the key factor for the long-term growth of BRIC companies. It is also emphasized that the intellectual capital, ascertainable in monetary value, provides a company with a competitive edge and the intellectual capital enables the firms to differentiate itself from its competitors (**Brown et al, 2005)**. Value Added Intellectual Coefficient (VAIC) is a method, developed by **Pulic (2000),** which monitors and measures the value creation efficiency of the company, according to accounting based figures. The VAIC Model is intended to measure, the extent to which a company produces added value, based on the intellectual (capital) efficiency or intellectual resources **(Stahle, Stahle & Aho, 2011).**

1.2. A Sketch of Indian IT Industry

The IT industry sector is one of the knowledge based industries across the Globe. The growth of the IT industry highly depends on the presence of intellectual capital in it. It is interesting to note that IT industry has been a major contributor to the growth of Indian economy in terms of foreign exchange ser-vices and employment opportunities **(Raman Deep & Karam Pal Narwal, 2015).** In India, information technology industry is also a fast growing sector by making its presence felt all over the world. Indian IT companies are expanding their business, at the global level, by various mergers and acquisitions undertaken by these companies **(Bharathi kamath, 2010).** According to NASSCOM report, IT sector has in-creased its share from 1.2% in FY98 to 7.7% in FY2016, in terms of Gross Domestic Product (GDP). It is to be noted that export earning was also approxi-mately at USD 108 billion in the year, FY2016. This sector is also providing effectively good employment to a large part of the Indian population **(Karam Pal & Sushila Soriya, 2011).** IT industry also became the larg-est employer in private sector, having a growth Compound Annual Growth Rate (CAGR) of 12.84% in US Billion in 2016. The IT Companies are now investing a lot of funds in R&D and training the employees to create an efficient workforce and enhancing productivity. The quality R&D in IT industry forms a significant portion of companies' expenses, which is critical when there are under pressure, to promote innovations in the changing landscape. The contribution of the IT sector to India's GDP stood at 7.7 per cent in 2016. Indian software product industry is expected to reach the mark of US$ 100 billion by 2025 **(NASSCOM, DIPP, Aranca Research, 2016).**

Indian Accounting Standard (AS) 26 clearly specifies stringent criteria, needed to be fulfilled by an intangible asset, to be reported as intangible assets of a company in its report. To be reported under this standard, the assets must fulfil the required conditions. Many research studies were conducted to check the inter relationship between components of intellectual capital i.e. human, structural and relationship capital **(Karam Pal & Sushila Soriya, 2011)**. According to the annual report, the **Ministry of Human Resource Development, Government of India (2016),** for enabling the creation of world class quality and diverse human resource in intellectual property rights in India, companies must meet the emerging challenges of a dynamic knowledge society, with a main focus on requisite skill development, for improving intellectual output and creation of Intellectual assets in a company.

2. Review of Literature

An attempt has been made, to review the earlier studies undertaken, in the area of impact of intellectual capital and the value of firm. **Table 1.** presents the review of existing studies.

Author(s) and Year	Sample Size	Period	Objectives	Tools Used	Variables		Findings
					Dependent	Independent	
Bharathi Kamath.G (2015)	30 firms of different sectors	2008-2012	To investigate the impact of IC on the financial performance and market valuation of firms in India	Descriptive Statistics, correlation analysis, regression	MB, ROA, GS, ATO, MCAP	HCE, SCE, CEE	IC significantly influenced profitability, productivity and market value
Aparna Bhatia, Kushpoo Aggarwal (2015)	51 software companies listed in BSE	2001-2011	To study the impact of intellectual capital on firm performance	Regression model	ROA, RONW	VAIC(ICE, HCE, CE)	Intellectual capital was the positive predictor of profitability
Santi gopal, maji and Mitra goswami (2015)	100 listed firms 44 from engineering sector and 56 from steel sector	1999-2012	To compare the relative importance of intellectual capital on corporate performance in India.	Correlation matrix analysis, fixed effect regression model and quantitative regression	ROA, ROE, growth in revenue MB ratio	ICE, HCE, SCE, CEE	Intellectual capital and physical capital efficiency were positively and significantly associated with firm performance
Irina Berzkalne, Elvira Zelgalve, (2014).	64 Batlic listed Companies.	2005-2011	To analyze the linear relationship between the VAIC and company value	Correlation Analysis	Tobins'Q	HCE, SCE, CEE and VAIC	There was relationship between those variables.
Sriranga vishnu and vijay kumar gupta (2014)	22 large pharmaceu-tical firm	2005-2011	To study relationship between IC and performance of the firms in India	Regression analysis	ROS, ROA	HCE, SCE, RCE, CEE	There was positive relationship between IC and performance variables
Domenico Celenza and Fabrizio Ross (2014)	23 Italian listed companies	2003-2008	To investigate the relationship between corporate performance and VAIC	Correlation, descriptive statistics, regression	ROE, ROI, ROS	VAIC	Value Added Intellectual Coefficient was the reflection of the variation of Market Value
Chokri zehri, asma	25 Listed Companies	2009-2011	To analyze the relationship	Descriptive statistics and	ROA, ROS, MB	VAHU, STVA,	Firms created more efficient

abdelbaki, najla bowabde-llah (2012)	in Tunisia		between IC and business performance.	regression		VACA, TAI, END	added value through human capital
Amirtava mondal, santanu kumar ghosh(2012)	27 nationalized banks 23 scheduled commercial banks and 15 foreign bank	1999-2008	To check the relationship between IC and financial performance	Regression	ROA, ROE, ATO	HCE, SCE, CEE	There was relationship between the performance of bank's IC and financial performance
Mahesh joshi, daryll cahill and jasvinda sindu, manic hansal(2012)	40 financial sector companies listed in ASX	2006-2008	To examine IC performance of Australian financial sector	Descriptive statistics and multiple regression	ROA	VAIC	Value creation capability was highly influenced by HC
Biserka komnenic, dragana pokrajcic (2012)	37 MNC companies in Serbia	2006-2008	To study the impact of intellectual capital on organizational performance business.	Descriptive statistics and regression model	HCE SCE	ROA, ROE, ATO	HC was positively associated with all three corporate performance measures
Dimitrios maditinos, dimitrios chat zoudes, charalampos tsairidis, georgirs the riou (2011)	96 greek companies listed in Athens stock exchange	200-2008	To analyze the impact of intellectual capital on firm's market value and financial performance	Descriptive statistics, correlation, regression	VACA, VAHU, STVA, VAIC	Market to-book value ratio, financial perfor-mance, growth revenue	Statistically significant relationship between HCE and financial performance was found.
Martin Clark Dyna seng and Rosalind H.Whiting (2011)	1676 Australian listed Companies	2004-2008	To examine the effect of intellectual capital on firm performance of those companies	Descriptive statistics, correlation analysis, multiple regression	ROA, ROE, RG, Emplo-yee product-ivity	HCE, SCE, CEE	Direct relationship between VAIC and CEE had more than HCE
J.L.W.mitchell van der zahn, inderpal sing and Joshua Heniro (2007)	291 SGX listed companies	1997-2003	To test the association between the extent of intellectual capital disclo-sure in the growth of unseasonal IPO	Descriptive statistIcs, correlation, OLS regression	Abnor mal-return of stock	Disclosure index	Positive asso-ciation between extent of Intellectual capital inform-ation and degree of under price was found.

Ming-Chin Chen, Shu-Ju Cheng, Yuhcarg Hwang (2005)	4,254 Observed Companies	1992-2002	To test the relationship between IC and Firm Performance	Descriptive statistics, Correlation Regression	M/B, ROE, ROA, ATO, GR	VACA, VAHU, STVA	The firms have positive impact on the market value cum financial performance
Steven Firer, S.Mitchell William (2003)	75 Publicly traded companies in south Africa	2001-2003	To test the association between the efficiency of added and traditional dimension of corporate performance	Descriptive statistics, Correlation linear multiple regression	ROA, ATO, MB	VAIC	Strong association between the efficiency of VA by components of a firm was found.
Ahmed Riahi –Belkaoui (2003)	Forbes magazine's 100 American manufacturing and service firms in 1991	1992-1996	To examine the relationship between ROA specific intangible asset of intellectual capital	Descriptive statistics regression	Value added, total asset	Compo-nent of Intellec-tual capital	Intellectual capital was sustainable sources of superior wealth creation
S. Firer, L. Stainbank (2003)	65 South African listed companies	2001-2003	To investigate whether intellectual capital could influence the organizational performance or not	Descriptive statistics, linear multiple regression	Risk (debt equity ratio) ROA, ATO, MB	VAIC, PC, OS	There was positive relationship between the core explanatory variable and company's profitability

Table1. Summary of Notable Studies relating to Intellectual Capital and Value of the Firm

3. Research Gap

The necessity of intellectual capital differs from firm to firm, depending on the nature of firms and industry. The human capital efficiency is more important in service sector, especially in Information Technology Sector, than in other sector, all over the world. From the existing literature, it could be traced that the research on intellectual capital has not been much developed in India. Being an emerging country, with a huge young population, India has a large potential of human capital efficiency and structural capital efficiency, along with the capital employed efficiency. In the Indian context, only very limited number of research studies has been conducted, to measure the performance of intellectual capital, especially financial reporting of intellectual capital on the firm's profitability and productivity sectors **(Karam Pal & Sushila Soriya, 2011).** This stud proposes to analyze the nexus between intellectual capital performance and value of firms in India.

4. Statement of the Problem

Researchers found that Indian companies gain sustainable competitive advantage and enhance performance, through the use of intangible assets/ intellectual assets. Intellectual capital is one of the main assets of a company because it promotes competitive advantages which form the basis of value creation **(Edvinsson and Malone, 1997; Bontis, 2001).** To create value for an organization, an intellectual capital of a firm need to be identified, measured and valued and it should be attached to the strategy and goals of the company. However, it is difficult to measure since it is intangible and non-physical in nature. Besides,

it should be measured on a periodical basis. In the knowledge economy, the companies are still following the traditional accounting system, namely, financial statements of the companies, prepared by following traditional accounting model that covers most of the physical and financial assets of the organizations but traditional accounting system ignore intangible assets. As a result, there has been growing gap between the market value and book value of the companies and such gap has motivated the researchers to examine the reasons behind it. This gap may be largely explained by the absence of intangible assets at the financial statements **(Lev, 2001).** At present, the concept of Brain Drain is taken into consideration by the IT industries, to retain the astute staff who possess heavy intellectual power in their field, for maximizing their corporate value. Against this background, the present study was undertaken, to study the nexus between intellectual capital performance and value of the firms, in India.

5. Need for the Study

Different methods, used for valuing, the intellectual capital, have different advantages, in different situations. Traditional valuation methods pay more attention to either historical figures or inexact forecasting for subsequent periods. In a knowledge-based economy, one must take into consideration not only the traditional ways to measure the value of the firms, but it is necessary to recognize intellectual capital as well. Only few Indian studies investigated the link between IC and firm performance in India **(Vishnu, S., & Kumar Gupta, V. 2014).** Hence an attempt has been made in this study, to examine the relationship between intellectual capital and company value of firms in India. The study of this nature would be helpful for analyzing the impact of intellectual capital on the creation of Company value **(Ahmed Musa Khan& Mohd. Anas Raushan, 2012).**

6. Objectives of the Study

The main objective of this study is to examine the impact of intellectual capital on the value of sample companies in India.

7. Research Questions

This study was carried out by posing the following the questions.

Q1) How do the Indian knowledge companies, particularly Information Technology Sector, create its value from its intellectual capital?

Q2) How is the sample companies' intellectual capital managed effectively, in the matter of achieving target efficiency level i.e. financial performance or value?

8. Hypotheses of the Study

Based on the objective of the study, the following null hypotheses were developed and tested in this study.

NH 1: There is no linear relationship between intellectual capital performance and value of firms during the study period.

NH 2: There is no causal relationship between intellectual capital performance and value of firms during the study period.

9. Methodology of the Study

9.1. Sample Selection

The aim of this paper is to investigate the impact of intellectual capital on the value of sample BSE S&P IT sector firms. It was proposed to cover all the 49 firms listed in S&P, but the required data were not available for all the firms. After discarding four firms due to unavailability of data on the selected variables, the final selection of sample comprises was restricted to only 45 companies in India.

9.2. Sources and Collection of Data

The required data, for this study, were collected from the audited and published annual reports of sample companies, as available at Prowess Database, maintained by the Center for Monitoring Indian Economy. The other required data were collected from reputed Websites, Published Research Reports and Journals.

9.3. Study Period
The present study covered a period of eleven years, from 01.01.2006 to 31.12.2016.

9.4. Tools to be used
The present study analyzed the impact of intellectual capital on the value of firms in India, by using the following tools.

10. Variables and Empirical Models

i) Dependent Variables
Tobins'Q was used as the measure of value of firms.

ii) Independent Variables
a) Value Added (VA)
According to **Irina Berzkalne, Elvira Zelgalve, (2014),** VAIC could be used as proxy of intellectual capital, which influences the firm performance. The VA was used to compute the components of Value Added Intellectual Coefficient (VAIC).

$$\textit{Value Added}\ (VA) = DP + W + I + D + T + R$$

Where,
DP = Depreciation Expenses
W = Salaries of Employees;
I = Interest Expenses;
T = Tax '
R = Changes in Retained Earnings

The Capital Employed (**CE**), Human Capital (**HC**) and Structural Capital (**SC**) is calculated as below.

b) CE = Total Assets-Intangible Assets

c) HC = Compensation to Employees

d) SC = Value Added-Human Capital

Capital Employed is an alternative indication of tangible resources. He Human Capital is an indirect measure of intangible resources.

e) Capital Employed Efficiency (VACA) = VA is divided by Capital Employed

f) Human Capital Efficiency (VAHU) = VA is divided by Human Capital

g) Structural Capital Efficiency (STVA) =Structural Capital is divided by VA

Value added intellectual coefficient is widely utilized, in the assessment of intellectual capital **(Fourati & Aers, 2013; Joshi, Cahill Sidhu, & Kansal, 2013).**

i) Value Added Intellectual Coefficient (VAIC) Model
Pulic (1998) developed the method of Value Added Intellectual Coefficient (VAIC™) and **Manfred Boremann (1999)** improved the model further. **Pulic's** Methodology concentrates on value-adding, value-adders, and value-adding procedures. VAIC™ took into the account the whole company as a dynamic system. Accordingly,

$$VAIC = ICE + CEE$$

$$ICE = HCE + SCE$$

ii) Relationship between Intellectual Capital Performance and Firm Value

As stated earlier, the main objective of the study was to analyze the relationship between intellectual capital and the value of firms and to study their impact, during the post global crisis period. For the purpose of this study, analyzes were divided as follows:

10.1 Testing the Average values for Sample Variables for S&P BSE IT Firms using Descriptive Statistics

10.2 Linear Relationship between Intellectual Capital performance and Value of Firms using Correlation Analysis

• Linear Relationship between Intellectual Capital Performance and Value of Sample Firms using Correlation Analysis in 2006

• Linear Relationship between Intellectual Capital performance and Value of Sample Firms using Correlation Analysis in 2016, and

• Linear Relationship between Intellectual Capital performance and Value of Sample Firms using Correlation Analysis from 2006 to 2016

10.3 Causal Relationship between Intellectual Capital performance and Value of Sample Firms using Granger Causality.

• Causal Relationship between Intellectual Capital performance and Value of Sample Firms using Granger Causality Analysis in 2006

• Causal Relationship between Intellectual Capital performance and Value of Sample Firms using Granger Causality in 2016, and

• Causal Relationship between Intellectual Capital performance and Value of Sample Firms using Granger Causality Analysis in 2006 to 2016

10.1.1 Testing the Average Value for Sample Variables of S&P BSE IT Firms using Descriptive Statistics

Variables	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
I. Value of the Firm											
Tobin's Q	6.865632	4.195246	1.010199	1.844207	1.952396	1.112832	1.368142	1.572923	2.141462	2.382495	2.176845
II. Intellectual Capital											
Capital Employed Efficiency (CEE)	83.40646	22.08189	23.25831	9.656907	8.670299	10.98434	17.48672	31.77191	40.45611	28.63033	29.2726
Human Capital Efficiency (HCE)	-7.971466	-8.62221	9.23555	-8.86004	-11.8565	-13.5055	-11.7411	-13.0455	-13.7017	-13.999	-12.5661
Structural Capital Efficiency (SCE)	0.858337	0.668981	0.96839	1.021349	0.688802	0.884201	-0.38197	0.853494	0.665364	0.698628	0.727701
Value Added Intellectual Co-Efficient (VAIC)	76.293	14.12867	14.99115	1.818219	-2.49737	-1.63698	5.363641	19.57995	27.41982	15.32993	17.43416

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 2. Testing the Average Value of sample variables of S&P BSE Informational Technology Indexed Firms during the study period from 1st January 2006 to 31st December 2016

Table 2 shows the average values, for sample variables of S&P BSE (IT) firms and intellectual capital, during the period from 1st January 2006 to 31st December 2016. The sample variables included one dependent variable, namely, Tobin's Q for the value of firms and four independent variables, namely, (Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Capital Employed Efficiency (CEE) and Value Added Intellectual Coefficient (VAIC), for measuring the performance of intellectual capital. The Table clearly reveals the fact that the year 2008 recorded the least average value of 1.01199, in respect of Tobin's Q, the year 2010 received the least average value of 8.670299 for Capital Employed Efficiency, the year 2011 registered the negative average values for two variables, namely, Human Capital Efficiency (-13.999) and Value Added Intellectual Coefficient (-1.63698), during the study period. But in the year 2012, an independent variable, namely, structural capital efficiency received the least average negative value of -0.38197. It is interesting to note that the average value of Tobin's Q, for sample firms, in all the years of study, exceeded the value of one and the highest average value (6.865632) was recorded in 2006. It is significant to note from the analysis that out of 10 years of study period, the year 2006 witnessed high average values of 6.865632, 83.40646, -7.971466, and 76.293 for all sample variables, namely, (Tobin's Q, CEE, HCE, and VAIC (except SCE), respectively. In the case of SCE, a high average value of 1.021349 was recorded in 2009. In total, the analysis clearly indicated that the average value of sample firms declined from 6.865632 to 2.176845, with fluctuations due to the impact of sample variables of intellectual capital. Besides, the value of firm (Tobin's Q) varied (increased or decreased), in tune with changes in the values of variables of intellectual capital, during the study period.

The value of 76.29333 was recorded for Value Added Intellectual Capital Coefficient (VAIC) in 2006. In other words, the sample firms would have made high investment in the human capital, which would benefit the firms, in the long run. It indicated that a higher level of intellectual capital could be associated with an increased value of the sample firm, during the study period.

10.2.1 Linear Relationship between Intellectual Capital and Value of Sample Firms using Correlation Analysis in 2006

The results of the correlation analysis, reflecting linear relationship between the intellectual capital performance and value of firms, during the study period, from 1st January to 31st December 2006, are shown in **Table 3**. It is to be noted that 45 observations were used for the purpose of this study. The analysis of Pearson Correlation, as revealed by Table-3, brings out the fact that there was positive correlation (0.999) between Value Added Intellectual Coefficient and Capital Employed Efficiency, in

Variables	**TOBIN'S Q**	**Capital Employed Efficiency (CEE)**	**Human Capital Efficiency (HCE)**	**Structural Capital Efficiency (SCE)**	**Value Added Intellectual Co-Efficient (VAIC)**
I. Value of the Firm TOBIN'S Q	1	0.037	-0.148	0.021	0.029
II. Intellectual Capital Capital Employed Efficiency (CEE)	0.037	1	0.089	-0.046	0.999**
Human Capital Efficiency (HCE)	-0.148	0.089	1	-0.114	0.141
Structural Capital Efficiency (SCE)	0.021	-0.046	-0.114	1	-0.050
Value Added Intellectual Co-Efficient (VAIC)	0.029	0.999**	0.141	-0.050	1
Number of Observations	45	45	45	45	45
**. Significant at the 0.01 level (2-tailed).					
Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7					

Table 3. Results of Linear Relationship between Intellectual Capital Performance and Value of Sample Firms using Correlation Analysis during the Study Period from 1st January to 31st December 2006

2006. For all the other variables considered for this study, there was no significant relationship (i.e. no positive correlation) during the study period. The analysis of the Table reveals that a set of variables (namely, Tobin's Q - Human Capital Efficiency) reported negative value (-0.148), during the study period. Similarly, there was negative relationship between three variable sets (Structural Capital Efficiency-Capital Employed Efficiency with the value of -0.046; Structural Capital Efficiency-Human Capital Efficiency with the value of -0.114, and Structural Capital Efficiency-Value Added Intellectual Coefficient with the value of -0.050), during the study period. The overall analysis of Pearson Correlation indicated that there was no linear relationship, for three sets of variables, namely, Tobin's Q - CEE, Tobin's Q – HCE and Tobin's Q – SCE, except one set (CEE – VAIC). Hence the Null Hypothesis- **"There is no linear relationship between Intellectual Capital performance and Value of Firms"** partially is rejected.

10.2.2 Linear Relationship between Intellectual Capital and Value of Sample Firms using Correlation Analysis in 2016

Variables	**TOBIN'S Q**	**Capital Employed Efficiency (CEE)**	**Human Capital Efficiency (HCE)**	**Structural Capital Efficiency (SCE)**	**Value Added Intellectual Co-Efficient (VAIC)**
I. Value of the Firm TOBIN'S Q	1	0.360*	0.016	0.101	0.347*
II. Intellectual Capital Capital Employed Efficiency (CEE)	0.360*	1	0.091	-0.016	0.973**
Human Capital Efficiency (HCE)	0.016	0.091	1	-0.091	0.320*
Structural Capital Efficiency (SCE)	0.101	-0.016	-0.091	1	-0.031
Value Added Intellectual Co-Efficient (VAIC)	0.347*	0.973**	0.320**	-0.031	1
Number of Observations	45	45	45	45	45
*. Significant at the 0.05 level (2-tailed).					
**. Significant at the 0.01 level (2-tailed).					

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 4. Results of Linear Relationship between Intellectual Capital and Value of Sample Firms using Correlation Analysis during the Study Period from 1st January to 31st December 2016

Table 4 depicts the results of linear relationship, between intellectual capital performance and value of sample firms, in 2016 (from 1-1-2016 to 31-12-2016). It is clear that the value of coefficient was calculated, at 95 percent confident level, for Tobin's Q - CEE while the coefficient value was calculated, at 99 percent significant level, for Tobin's Q – VAIC, for VAIC – CEE and VAIC – HCE. It is to be noted that Tobin's Q was a dependent variable for the value of firm while CEE, HCE, SCE, and VAIC were independent variables related to the performance of the intellectual capital. It is interesting to note that VAIC – CEE earned a significant value of 0.973, at 99 percent of significant level, during the study period. But the other four sample variables (except SCE – CEE), earned significant values of correlation (0.347 for Tobin's Q-VAIC, 0.360 for Tobin's Q – CEE, 0.320 for HCE – VAIC, and 0.973 for CEE – VAIC), in respect of sample firms. The overall analysis of the Table clearly shows that independent variables, namely, CEE and VAIC recorded relationship with dependent variable of Tobin's Q. But there was no relationship between HCE – Tobin's Q and SCE – Tobin's Q, during the study period. Hence the Null Hypothesis- **"There is no linear relationship between Intellectual Capital performance and Value of Firms"** is partially rejected.

10.2.3 Linear Relationship between Intellectual Capital performance and value of Sample Firms using Correlation Analysis from 2006 to 2016

Variables	TOBIN'S Q	Capital Employed Efficiency (CEE)	Human Capital Efficiency (HCE)	Structural Capital Efficiency (SCE)	Value Added Intellectual Co-Efficient (VAIC)
I. Value of the Firm TOBIN'S Q	1	0.111*	-0.065	-0.007	0.097*
II. Intellectual Capital Capital Employed Efficiency (CEE)	0.111*	1	0.088*	-0.004	0.986**
Human Capital Efficiency (HCE)	-0.065	0.088*	1	-0.040	0.251**
Structural Capital Efficiency (SCE)	-0.007	-0.004	-0.040	1	0.003
Value Added Intellectual Co-Efficient (VAIC)	0.097*	0.986**	0.0251**	0.003	1
Number of Observations	495	495	495	495	495
*. Significant at the 0.05 level (2-tailed).					
**. Significant at the 0.01 level (2-tailed).					

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 5. Results of Linear Relationship between Intellectual Capital Performance and Value of Sample Firms using Correlation Analysis during the Study Period from 1st January, 2006 to 31st December 2016

The results of Pearson correlation matrix, for the sample variables, in relation to the performance of intellectual capital and the value of sample firms, during the study period from 1st January, 2006 to 31st December 2016, are given in **Table 5**. As noted earlier, four variables, namely, CEE, HCE, SCE and VAIC, were considered as independent variables, for analyzing intellectual capital performance while one variable, namely, Tobin's Q was used as dependent variable (as proxy variable for measuring the value of sample firms). It is understood that there was a positive relationship between Tobin's Q – CEE, with the value of 0.111, at 95 percent significant level and Tobin's Q – VAIC, with the value of 0.097, at 95 percent significant level. But other two sets of variables (namely, Tobin's Q – HCE and Tobin's Q – HCE) reported negative relationship, with the correlation values of -0.065 and -0.007 respectively, during the study period. Hence the Null Hypothesis- **"There is no linear relationship between Intellectual capital performance and value of firms",** is partially rejected.

To sum up, from the correlation analysis for different sample years, it could be noted that there was significant and positive relationship between Tobin's Q and VAIC. In addition, there was significant correlation between Tobin's Q and capital employed efficiency (CEE) in 2016. Mixed results were obtained, from the results of the years 2006 and 2016. In 2006, the CEE, obtained with VAIC, was significant, which might have led to the lowest value of the firm (Tobin's Q ratio) and VAIC™. However, different results, in connection with correlation analysis, were puzzling and therefore, further analysis was made, by using Granger Causality in the following pages.

10.3.1 Causal Relationship between Intellectual Capital Performance and Value of Sample Firms using Granger Causality Analysis in 2006

Table 6 shows the results of causal relationship, between the performance of intellectual capital and value of firms, during the study period, from first January to 31st December, 2006. It is to be noted that all the sample variables, selected for the study, recorded inverse bi-directional relationship with each other, as per the F-Statistics values of 0.012 (for Tobin's Q -CEE), 0.16737

Null Hypothesis:	Obs	F-Statistic	Prob.	Result of Hypotheses
TOBIN'S Q does not Granger Cause Capital Employed Efficiency	43	0.012	0.9881	Accepted
Capital Employed Efficiency does not Granger Cause TOBIN'S Q	43	0.16737	0.8465	Accepted
TOBIN'S Q does not Granger Cause Human Capital Efficiency	43	2.49752	0.0957	Accepted
Human Capital Efficiency does not Granger Cause TOBIN'S Q	43	1.70381	0.1956	Accepted
TOBIN'S Q does not Granger Cause Structural Capital Efficiency	43	0.12095	0.8864	Accepted
Structural Capital Efficiency does not Granger Cause TOBIN_S_Q	43	0.14176	0.8683	Accepted
TOBIN'S Q does not Granger Cause Value Added Intellectual Coefficient	43	0.03381	0.9668	Accepted
Value Added Intellectual Coefficient does not Granger Cause TOBIN'S Q	43	0.16637	0.8473	Accepted

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 6. Results of Causal Relationship between Intellectual Capital and Value of Sample Firms using Granger Causality Analysis during the Study Period from 1st January to 31st December, 2006

(for CEE- Tobin's Q), 2.49752 (for Tobin's Q -HCE), 1.70381 (for HCE-Tobin's Q), 0.12095 (for Tobin's Q -SCE), 0.14176 (for SCE-Tobin's Q), 0.03381 (for Tobin's Q -VAIC) and 0.16637 (for VAIC- Tobin's Q), during the study period. It is clear from the Table that no sample variable found significant and causal relationship among themselves, during the study period, in respect of sample firms. Hence the null hypothesis **- "There is no causal relationship between intellectual capital performance and value of firms",** is fully accepted.

10.3.2 Causal Relationship between Intellectual Capital Performance and Value of Sample Firm using Granger Causality Analysis in 2016

The results of causal relationship, between the performance of intellectual capital and value of firms, during the study period, from first January to 31st December, 2016, are given in **Table 7**. The analysis of relationship between CEE – Tobin's Q reveals that there was unidirectional relationship, that is, CEE recorded positive and significant relationship with Tobin's Q, with the value of 0.0535 while Tobin's Q did have insignificant relationship with CEE, with the value of 0.2129, during the study period. Similarly, the analysis of causal relationship between Tobin's Q with HCE clearly indicated that there was bidirectional inverse relationship i.e., Tobin's Q – HCE and HCE – Tobin's Q, earned negative values of 0.4894 and 0.5113 respectively. Tobin's Q – SCE earned a positive value of 0.0208, which showed causal relationship. But VAIC –Tobin's Q recorded unidirectional relationship, with the value of 0.0366, during the study period. Hence the null hypothesis - **"There is no causal relationship between intellectual capital performance and value of firms",** is partially accepted.

103.3 Results of Causal Relationship between Intellectual Capital Performance and Value of Sample Firms using Granger Causality Analysis from 2006 to 2016

Table 8 reveals the results of causal relationship, between performance of the intellectual capital and value of sample firms, during the study period, from first January, 2006 to 31st, December, 2016. According to the results of the Table, it is clear that there was unidirectional relationship between CEE to Tobin's Q and Tobin's Q to CEE, with values of 0.0202 and 0.0200 respectively. Besides, VAIC – Tobin's Q recorded unidirectional relationship, with a value of 0.0182. The pair of Tobin's Q to SCE and SCE to Tobin's Q found inverse bidirectional relationship, with values of 0.9965 and 0.9173 respectively. Hence the null hypothesis - **"There is no causal relationship between intellectual capital performance and value of firms",** is partially rejected. It could be noted from the above discussion, regarding Granger Causality Test in 2006, that no variable experienced relationship with each

Null Hypothesis:	Obs	F-Statistic	Prob.	Result of Hypotheses
TOBIN'S Q does not Granger Cause Capital Employed Efficiency	43	1.61182	0.2129	Accepted
Capital Employed Efficiency does not Granger Cause TOBIN'S Q	43	3.16545	0.0535	Rejected
TOBIN'S Q does not Granger Cause Human Capital Efficiency	43	0.7282	0.4894	Accepted
Human Capital Efficiency does not Granger Cause TOBIN'S Q	43	0.68285	0.5113	Accepted
TOBIN'S Q does not Granger Cause Structural Capital Efficiency	43	4.29623	0.0208	Rejected
Structural Capital Efficiency does not Granger Cause TOBIN'S Q	43	0.13698	0.8724	Accepted
TOBIN'S Q does not Granger Cause Value Added Intellectual Coefficient	43	1.7801	0.1824	Accepted
Value Added Intellectual Coefficient does not Granger Cause TOBIN'S Q	43	3.61267	0.0366	Rejected

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 7. Results of Causal Relationship between Intellectual Capital and Value of Sample Firms using Granger Causality Analysis during the Study Period from 1st January to 31st December, 2016

Null Hypothesis:	Obs	F-Statistic	Prob.	Result of Hypotheses
TOBIN'S Q does not Granger Cause Capital Employed Efficiency	493	0.26068	0.7706	Accepted
Capital Employed Efficiency does not Granger Cause TOBIN'S Q	493	3.9326	0.0202	Rejected
TOBIN'S Q does not Granger Cause Human Capital Efficiency	493	3.94558	0.0200	Rejected
Human Capital Efficiency does not Granger Cause TOBIN'S Q	493	1.15122	0.3171	Accepted
TOBIN'S Q does not Granger Cause Structural Capital Efficiency	493	0.00347	0.9965	Accepted
Structural Capital Efficiency does not Granger Cause TOBIN'S Q	493	0.08629	0.9173	Accepted
TOBIN'S Q does not Granger Cause Value Added Intellectual Coefficient	493	0.63334	0.5312	Accepted
Value Added Intellectual Coefficient does not Granger Cause TOBIN'S Q	493	4.03743	0.0182	Rejected

Source: Collected from https://prowessiq.cmie.com and computed using E-Views 7

Table 8. Results of Causal Relationship between Intellectual Capital and Value of Sample Firms using Granger Causality Analysis during the Study Period from 1st January, 2006 to 31st, December, 2016

other. Therefore, the entire study period i.e. from 2006 to 2016, witnessed significant unidirectional relationship, between Tobin's Q and some independent variables.

11. Conclusion and Recommendation

It is important that the components of intellectual capital are to be adequately integrated and they have to be reflected, without fail, in the financial statements of the firms. It is also necessary to reach a consensus on what constitutes the best method for managing and reporting the firm's intangible value drivers such as intellectual capital components. It is expected that an increase in the value of intellectual capital of firm is expected to enhance the value of firms. This paper examined the impact of intellectual capital on the value of the firms. The descriptive statistics, Pearson correlation analysis and granger causality test were used, to test the impact of intellectual capital on the value of firms. This study covered 45 S&P BSE IT companies, over the period from 2006 to 2016. As a proxy variable for the value of firms, Tobin's Q was employed while VAIC and its components namely, HCE, SCE and CEE were used for measuring intellectual capital performance. It is to be noted that there were statistically significant values for VAIC – CEE rather than for all other variables in 2006. But in 2016, there was significant relationship between Tobin's Q and VAIC but VAIC had significant relationship with its components, namely, CEE and HCE, except SCE. According to the correlation analysis, there was also significant relationship between Tobin's Q and VAIC, for listed firms in India. Granger Causality Test clearly revealed that no pair had achieved positive bidirectional relationship, with each other, in 2006. In contrast to 2006, there was unidirectional relationship between VAIC – Tobin's Q in 2016. Likewise, Tobin's Q reported unidirectional relationship with SCE and CEE in 2016. The Granger Causality Test indicated that all independent variables, except Tobin's Q – SCE, maintained unidirectional causal relationship with Tobin' Q. The results of this study clearly confirmed the fact that the intellectual capital could have influenced the value of sample firms significantly during the study period. It was also confirmed from the results of this study that the employees' skill and their efficiency played a vital role in cutting down the cost of production in all sectors, particularly in the technology sector **(Raman Deep and Karam Pal Narwal, 2015)**. The development of intellectual capital property was a cardinal factor in the emerging market, for creating the value of firms and helping to achieve competitive advantage **(Yalama 2013).**

The earlier studies, carried out by **Fairer and Williams, 2003; Chan, 2009 and; Kamath, 2008,** found that intellectual capital had no significant impact on the value of the firms. But this study clearly found that there was definite impact of intellectual capital on the value of firms, during the study period. According to **Ballon et al. (2005),** the companies must provide steady and continuous training to employees, for bringing out their efficiency, for better performance and for promoting the value of firms in the long run. It is true that the human capital would transcend the efficiency of physical and structural capital.

The results of this study have clearly provided important information for the corporate executives, government officials and other policy makers. The study on relationship between the sample variables may be extended to other service sectors, to evaluate the efficiency of human capital in order to invest in human capital. The corporates especially IT sectors are to be advised to put more concentration on human capital efficiency. Besides, the Government officials, policy makers and other stake holders are advised to improve the corporate disclosure practices, in an appropriate manner, so that the annual report of companies instantly reflects all available information, about the intellectual capital, in supporting the value of firms.

References

[1] Berzkalne, I., Zelgalve. E. (2014). Intellectual capital and company value. *Procedia-Social and Behavioral Sciences*, 110, 887-896.

[2] Bharathi, K. G. (2010). The Intellectual Capital Performance of Banking Sector in Pakistan. *Pakistan Journal of Commerce & Social Sciences*, 4 (1).

[3] Bhatia, Aparna. (2015). Intellectual Capital and Financial Performance of Indian Software Industry: A Panel Data Analysis. *Pacific Business Review International* Volume 7 (8) 33-43.

[4] Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital. *International Journal of Management Reviews*, 3(1) 41-60.

[5] Brown Jr, A., Osborn, T., Chan, J. M., Jaganathan, V. (2005). Managing Intellectual Capital. *Research Technology Management*, 48, 34–41.

[6] Celenza, D., Rossi, F. (2014). Intellectual capital and performance of listed companies: empirical evidence from Italy. *Measuring Business Excellence*, 18 (1) 22-35.

[7] Chen, M. C., Cheng, S. J., Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of intellectual capital*, 6 (2) 159-176.

[8] Clarke, M., Seng, D., Whiting, R. H. (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12 (4) 505-530.

[9] Edvinsson, L., Malone, M. S. (1997). Intellectual capital: realizing your company\'s true value by finding its hidden brainpower.

[10] Firer, S., Mitchell Williams, S. (2003). Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital*, 4 (3) 348-360.

[11] Firer, S., Stainbank, L. (2003). Testing the relationship between intellectual capital and a company's performance: evidence from South Africa. *Meditari Accountancy Research*, 11 (1) 25-44.

[12] Frykman, D., Tolleryd, J. (2010). Corporate Valuation (2nd ed.). London: Prentice Hall.

[13] Gan, K., Saleh, Z., Abessi, M. (2008). Corporate Governance, Ownership Structures and Intellectual Capital Disclosures: Malaysian Evidence. *In*: Paper presentado al 16th Conference on the Theories and Practices of Securities and Finance Markets. Department of Finance, National Sun Yat-Sen University (p. 5-6).

[14] Iazzolino, G., Laise, D. (2013). Value added intellectual coefficient (VAIC) A methodological and critical review. *Journal of Intellectual Capital*, 14 (4) 547-563.

[15] Joshi, M., Cahill, D., Sidhu, J., Kansal, M. (2013). Intellectual capital and financial performance: an evaluation of the Australian financial sector. *Journal of Intellectual Capital*, 14 (2) 264-285.

[16] Jurckzak, (2008), Intellectual Capital Measurement Methods*, Economics and Organization of Enterprise* , 1 (1) 37 – 45.

[17] Kamath, Bharathi, G. (2015): Impact of intellectual capital on financial performance and market valuation of firms in India. *International Letters of Social and Humanistic Sciences* 48. 107-122.

[18] Komnenic, B., Pokrajèiæ, D. (2012). Intellectual capital and corporate performance of MNCs in Serbia. *Journal of Intellectual Capital*, 13 (1) 106-119.

[19] 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*, 12 (1) 132-151.

[20] Maji, S. G., Goswami, M. (2015). The journey of IC research: Reflections from the past two decades. *Asian Journal of Research in Banking and Finance*, 5 (6) 85-102.

[21] Mondal, A., Ghosh, S. K. (2012). Intellectual capital and financial performance of Indian banks. *Journal of Intellectual Capital*, 13 (4) 515-530.

[22] Pal, K., Soriya, S. (2011). Financial Reporting of Intellectual Capital and Company's Performance in Indian Information Technology Industry.

[23] Pulic, A. (1998). Measuring the performance of intellectual potential in knowledge economy. *In:* 2nd McMaster Word Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential.

[24] Pulic, A. (2000). VAIC – An Accounting Tool for IC Management. *International Journal of Technology Management,* 20, 702–714. http://dx.doi.org/10.1504/IJTM.2000.002891

[25] 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*, 4 (2) 215-226.

[26] Selvam, M., Gayathri, J., Vasanth, V., Lingaraja, K., Marxiaoli, S. (2016). Determinants of Firm Performance: A Subjective Model. *International Journal of Social Science Studies*, 4 (7) 90-100.

[27] Singh, I., Mitchell Van der Zahn, J. L. (2007). Does intellectual capital disclosure reduce an IPO's cost of capital? The case of underpricing. *Journal of Intellectual Capital,* 8 (3) 494-516.

[28] Singh, R. D., Narwal, K. P. (2015). Intellectual capital and its consequences on company performance: a study of Indian sectors. *International Journal of Learning and Intellectual Capital*, 12 (3) 300-322.

[29] Stahle, P., Stahle, S., Aho, S. (2011). Value Added Intellectual Coefficient (VAIC): A Critical Analysis. *Journal of Intellectual Capital*, 12, 531–551. http://dx.doi.org/10.1108/14691931111181715

[30] Tawy, N., Tollington, T. (2012). Intellectual Capital: Literature Review. *International Journal of Learning and Intellectual Capita*l, 9, 241– 259. http://dx.doi.org/10.1504/IJLIC.2012.047286

[31] Vishnu, S., Kumar Gupta, V. (2014). Intellectual capital and performance of pharmaceutical firms in India. *Journal of Intellectual Capital*, 15 (1) 83-99.

[32] Zehri, C., Abdelbaki, A., Bouabdellah, N. (2012). How intellectual capital affects a firm's performance?. *Australian Journal of Business and Management Research*, 2 (8) 24.