THE NEXUS BETWEEN INTELLECTUAL CAPITAL AND VALUE OF THE FIRMS: A STUDY ON BSE S&P IT FIRMS IN INDIA

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ABSTRACT

Purpose: This paper examines the nexus between Intellectual Capital and Value of Information Technology Firms in the Indian Information Technology Industry. Forty-five companies, listed on BSE S&P IT Sector, were taken as a sample, for the purpose of this study.

Methodology: Value Added Intellectual Co-efficient (VAIC) method, as developed by Pulic (1998) and Granger Causality, was used for the evaluation of intellectual capital and its relationship with the value of sample companies.

Findings: The result of the study supports the hypothesis that the value of firms could be explained by the intellectual capital. It is found that there was significant association between intellectual capital and the value of sample firms.

Practical Implication: The corporate are to be suggested to concentrate more on human capital efficiency. Besides, the Government officials, policy makers and other stake holders are advised to urge the corporate disclosure practices

Keywords: Intellectual Capital, IT Sector, Value of Firms, Value Added Intellectual Co- Efficient (VAIC)JEL Classification Code: 034, E24, J24, G32

INTRODUCTION

The growing gap between the book value and the market value of firms, calls for more research to retrieve the holistic assessment of the intangible values, ignored in the annual financial statement of firms (Ming-Chin Chen et al, 2005). It is to be noted that calculating a value of a company is a complex task. Different companies examined their values, differently. Besides, company does have several values, depending on the methods used (Lazzolino and Laise, 2012). Traditional valuation methods, used by corporates in developing countries like India, include discounted cash flow valuation, liquidation and accounting valuation, relative valuation and contingent claim valuation. The measurement techniques recommended have burgeoned over the decades (Jurckzak, 2008). Traditional corporate valuation methods are based on balance sheet, income statement or cash flow statement but the intellectual capital, which is also an important asset is totally ignored (Gan et al., 2008). In fact, the intellectual capital of a firm is valued as zero on the balance sheet, under the traditional method. As a result, large differences do exist between market and book value of a company and a part of this gap can be explained by the presence of intellectual capital. This fact has been observed well in firms, which are knowledge based and technology intensive industries, particularly information technology, pharmaceutical industry and financial sectors (Maji and Goswami, 2015).

Intellectual Capital and its Measurement

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, et al. 2011).

Nexus of IT Industry with Intellectual capital

The information technology (IT) sector is one of the knowledge-based industries across the Globe. In India, IT industry is also a fast growing sector by making its presence felt all over the world. It is interesting to note that the IT industry has been a major contributor to the growth of Indian economy in terms of foreign exchange services and providing employment opportunities (Singh and Narwal, 2015). Indian IT companies are expanding their business, at the global level, by various mergers and acquisitions undertaken by these companies (Bharathi, 2010). This sector is also providing good employment to a large part of the Indian population (Pal and Soriya, 2011). India's IT industry has been increasingly focusing on digital opportunities as digital is poised to be a major segment in the next few years. It is also currently the fastest growing segment, growing over 30 per cent annually. According to the annual report, published by the Ministry of Human Resource Development, Government of India (2016), companies must meet the emerging challenges of a dynamic knowledge society, with a main focus on requisite skill development, for improving intellectual outputs and creation of intellectual assets in a company.

LITERATURE REVIEW

An attempt has been made, to review the earlier studies undertaken, in the area of intellectual capital and the value of firm. A quantitative analysis, by Firer and S. Mitchell William (2003) tested the association between the efficiency of added and traditional dimension of corporate performance and they found strong association between the efficiency of VA and components of a firm. Riahi –Belkaoui (2003) selected Forbes magazine's 100 American manufacturing and service firms, in 1991, to examine the relationship between ROA and specific

intangible asset of intellectual capital, which was a sustainable source for superior wealth creation. Firer and Stainbank (2003) found that intellectual capital influenced the organizational performance. Singh and Mitchell (2007) revealed a positive association between extent of intellectual capital information and degree of under price.

A factual research done by Shu-Lien Chang (2007) dealt with a broad, analytical perspective for adding two fundamental subcomponents (R&D expenditures and intellectual property). An empirical research paper, by Kate Walsh, et al (2008), studied the influence of Intellectual Capital on the performance of firms in customer service, using different strategic (e.g., low-cost leader, differentiation). Dimitrios Maditinos, et al (2011) selected 96 Greek companies, listed in Athens stock exchange to analyze the impact of intellectual capital on firms' market value and financial performance. Martin Clark, et al (2011) examined the effect of intellectual capital on the firm performance and proved the direct relationship between VAIC and CEE that had more than HCE. Firms created more values through human capital as found by Chokri Zehri, et al (2012) analyzed the development and investment banks in Turkey, in terms of Intellectual Capital Performance, by using VAIC. The study concluded that investment banks in Turkey started to gather strength.

In another study, Mondal and Ghosh (2012) checked the relationship between IC and financial performance. The study revealed that there was relationship between the performance of banks' IC and financial performance. Joshi, et al (2013) also proved that the value creation capability was highly influenced by the human capital. An empirical investigation, by Komnenic and Pokrajcic (2012), clearly indicated that HC was positively associated with all three corporate performance measures. Taghizadeh Khanqah, et al (2012) connoted that there was a statistically significant relationship between structure capital efficiency and financial performance (ROE and ROA). Celenza and Rossi (2014) proved that Value Added Intellectual Coefficient was the reflection of the variation of Market Value. Kamath (2015) investigated the impact of IC on the financial performance and market valuation of firms in India. The analysis revealed that IC significantly influenced profitability, productivity and market value. A study undertaken by Bhatia (2015), examined the impact of intellectual capital on the firms. It was found that intellectual capital was the positive predictor of profitability. Maji, and Goswami (2015) compared the relative importance of intellectual capital on corporate performance in India. The study discovered that there was statistically significant relationship between HCE and financial performance. The present study proposes to analyze the nexus between intellectual capital performance and value of IT firms in India.

STATEMENT OF THE PROBLEM
Indian companies gained sustainable competitive advantage and enhanced its performance through the use of intangible assets or intellectual assets. In other words, the intellectual capital is one of the main assets of a company as 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. The valuation method of IC should be attached to the strategy and goals of the company. However, it is difficult to measure the same since it is intangible and non-physical in nature. In the knowledge economy, the Indian companies are still adhering to the traditional accounting system, namely, financial statements of the companies, prepared by following traditional accounting models that cover only physical and financial assets of the organizations. In short, traditional accounting system ignores intangible assets of a company. 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 undertake the study of this nature. This gap may be largely explained by the absence of intangible assets in the financial statements (Lev, 2001). At present, the concept of Brain Drain is taken into consideration by the IT industries, to retain the experienced staff, which possesses 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 IT firms in India. Different methods, used for valuing the intellectual capital, have different advantages, in different situations. In a knowledge-based economy, one must take into consideration not only the traditional ways to measure the value of the firms, but also the value of intellectual capital, as well by using latest methods. Only few studies investigated the link between IC and firm performance in India (Vishnu and Kumar Gupta, 2014). Hence an attempt has been made in this study, to examine the relationship between intellectual capital and value of IT firms in India. The study of this nature would be useful for analyzing the impact of intellectual capital on the creation of firms' value and findings of this study may be useful to knowledge based firms for taking appropriate measures and to promote IC in a firm. The main objective of this study is to examine the nexus between intellectual capital and the value of sample companies in India. 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 sample firms during the study period.
NH 2: There is no causal relationship between intellectual capital performance and value of firms during the study period.

METHODS
Sample Selection
The aim of this paper is to investigate the impact of intellectual capital on the value of sample firms. IT firms are knowledge based firms, which contribute much to the economic growth of India. Hence, it was proposed to cover all the 49 IT firms, listed in BSE S&P, as on 31st, December, 2016, but the required data were not available for all the firms. After discarding four firms due to non-availability of data on the selected variables, the final selection of sample comprises was restricted to only 45 IT companies in India.

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 also collected from reputed Websites, Published Research Reports and Journals.

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

Tools used
The present study analyzed the impact of intellectual capital on the value of IT firms in India, by using the following tools. Variables and Empirical models

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

Independent Variables
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. VAIC™ took into the account the whole company as a dynamic system. Accordingly,

VAIC = ICE + CEE
ICE = HCE + SCE
Where,
ICE =Intellectual Capital Efficiency   CEE = Capital Employed Efficiency
HCE = Human Capital Efficiency   SCE = Structural Capital Efficiency

Value Added (VA)

According to Irina Berzkalne and 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).

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

Components of IC

The IC includes mainly three components i.e. Capital Employed (CE), Human Capital (HC) and Structural Capital (SC) and they are 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. 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

DISCUSSION

A) Testing the Average Values for Sample Variables for S&P BSE IT Firms using Descriptive Statistics

Table-1 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 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 negative average values for two variables, namely, Human Capital Efficiency (-13.999) and Value Added Intellectual Coefficient (-1.63698), in respect of sample firms. But in the year 2012, an independent variable, namely, structural capital efficiency recorded the least average negative value of -0.38197. It is interesting to note that the average value of Tobin's Q, for sample IT 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 four sample variables, namely, Tobin's Q, CEE, HCE, and VAIC respectively. In the case of SCE, a high average value of 1.021349 was recorded in 2009. In short, the analysis clearly indicated that the average value of sample IT firms declined from 6.865632 to 2.176845, with fluctuations due to the influence 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 had made high investment in the human capital, which benefitted the firms in the long run. It is inferred that intellectual capital with more values was associated with an increased value of the sample firm during the study period.

B) Linear Relationship between Intellectual Capital Performance and Value of Sample Firms using Correlation Analysis from 2006 to 2016

The results of the correlation analysis, reflecting linear relationship between the intellectual capital performance and value of firms, during 2006, 2006-2016 and 2016 are shown in Table-2. The analysis of Pearson Correlation from 01-01-2006 to 31-12-2016 brings out the fact that there was positive correlation (0.999) between Value Added Intellectual Coefficient and Capital Employed Efficiency. For all the other variables considered for this study, there was no significant relationship (i.e. no positive correlation) in 2006. It is clearly revealed that a set of variables (namely, Tobin's Q - Human Capital Efficiency) reported negative value (-0.148) in 2006. 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) in 2006. 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 sample Firms" partially is rejected.

From 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 a variable set, namely, Tobin's Q - CEE while the coefficient value was calculated at 99 percent significant level, for three sets of variables, namely, Tobin's Q – VAIC, for VAIC – CEE and VAIC – HCE. It is interesting to note that VAIC – CEE earned a significant value of 0.973, at 99 percent of significant level in 2016. But the four sample variables (except SCE – CEE), recorded significant values of correlation at 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 in 2016. Hence the Null Hypothesis, "There is no linear relationship between Intellectual Capital performance and Value of sample Firms", is partially rejected. The results of Pearson correlation matrix, for the sample variables, during the period from 1st January, 2006 to 31st December 2016, as given in Table-2 reveals that there was 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 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 sample firms", is partially rejected. To sum up the results of correlation analysis, it could be noted for different sample years 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. But mixed results were

obtained from the analysis of the years - 2006 and 2016. In 2006, the value for CEE, obtained with VAIC, was significant, which was the lowest value of the firm. However, different results from correlation analysis, were puzzling and therefore, further analysis was made, by using Granger Causality.

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

Table -3 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 because the F-Statistics values were at 0.012 (for Tobin's Q - CEE), 0.16737 (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) in 2006. It is clear from the Table that no sample variable was found significant and did have causal relationship among themselves during 2006 in respect of sample firms. Hence the null hypothesis - "There is no causal relationship between intellectual capital performance and value of sample firms", is fully accepted.

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 recorded insignificant relationship with CEE, with the value of 0.2129 in 2016. 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, with negative values of 0.4894 and 0.5113 respectively. Tobin's Q – SCE earned a positive value of 0.0208, which showed causal relationship in 2016. But VAIC –Tobin's Q recorded unidirectional relationship, with the value of 0.0366 in 2016. Hence the null hypothesis "There is no causal relationship between intellectual capital performance and value of firms", is partially accepted. According to the results of causal relationship between performance of the intellectual capital and value of sample firms during the study period from 1st January, 2006 to 31st, December, 2016 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 results of Granger Causality Test in 2006, that no set of variable experienced relationship with each other. Therefore, all the variables during entire study period from 2006 to 2016, witnessed significant unidirectional relationship in respect of sample firms.

CONCLUSIONS AND RECOMMENDATIONS

It is important that the components of intellectual capital are to be adequately integrated in such a way to get their due place 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 in the financial statement of firms. It is expected that an increase in the value of intellectual capital of firm is expected to enhance the value of firms. This study examined the impact of intellectual capital on the value of the firms. 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 recorded

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. The results of this study confirmed the findings that employees' skill and their efficiency played a vital role in cutting down the cost of production in all sectors, particularly in the technology sector (Singh and Narwal, 2015). Besides, the earlier studies, carried out by Fairer and Williams, 2003; Hang 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 an 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. The results of this study have clearly provided important information for the corporate executives, government officials and other policy makers. Hence 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 corporate, especially IT sectors, are to be advised to concentrate more on human capital efficiency. Besides, the Government officials, policy makers and other stake holders are to be advised to improve the corporate disclosure practices, in an appropriate manner, so that the annual report of Indian companies instantly reflects all available information, about the intellectual capital, in supporting the value of firms.

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Table-1: The results of Average Value of sample variables of S&P BSE IT Firms during the study period from 1st January 2006 to 31st December 2016

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: Results of Linear Relationship between Intellectual Capital Performance and Value of Sample Firms using Correlation Analysis during the study period of 2006, 2006-2016 and 2016.

Variables	TOBIN'S Q			Capital Employed Efficiency (CEE)			Human Capital Efficiency (HCE)			Structural Capital Efficiency (SCE)			Value Added Intellectual Co-Efficient (VAIC)		
	2006	2006-2016	2016	2006	2006-2016	2016	2006	2006-2016	2016	2006	2006-2016	2016	2006	2006-2016	2016
I. Value of the Firm TOBIN'S Q	1	1	1	0.037	0.111*	0.360*	-0.148	0.111*	0.016	0.021	-0.007	0.101	0.029	0.097*	0.347*
II. Intellectual Capital Capital Employed Efficiency (CEE)	0.037	0.111*	0.360*	1	1	1	0.089	1	0.091	-0.046	-0.004	-0.016	0.999**	0.986**	0.973**
Human Capital Efficiency (HCE)	-0.148	-0.065	0.016	0.089	0.088*	0.091	1	0.088*	1	-0.114	-0.040	-0.091	0.141	0.251**	0.320*
Structural Capital Efficiency (SCE)	0.021	-0.007	0.101	-0.046	-0.004	-0.016	-0.114	-0.004	-0.091	1	1	1	-0.050	0.003	-0.031
Value Added Intellectual Co-Efficient (VAIC)	0.029	0.097*	0.347*	0.999**	0.0986**	0.973**	0.141	0.0986**	0.320*	-0.050	0.003	-0.031	1	1	1
Number of Observations	45	495	45	45	495	45	45	495	45	45	495	45	45	495	45
*. Significant at the 0.05 level (2-tailed).															
**. Significant at the 0.01 level (2-tailed).															

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

Table-3: Results of Causal Relationship between Intellectual Capital and Value of Sample Firms using Granger Causality during the study period of 2006, 2006-2016 and 2016

Null Hypothesis: (2006)		2006			2006-2016			2016		
	Obs	F-Statistic	Prob.	Result of Hypotheses	F-Statistic	Prob.	Result of Hypothesis	F-Statistic	Prob.	Result of Hypotheses
TOBIN'S Q does not Granger Cause Capital Employed Efficiency	43	0.012	0.9881	Accepted	0.26068	0.7706	Accepted	1.61182	0.2129	Accepted
Capital Employed Efficiency does not Granger Cause TOBIN'S Q	43	0.16737	0.8465	Accepted	3.9326	0.0202	Rejected	3.16545	0.0535	Rejected
TOBIN'S Q does not Granger Cause Human Capital Efficiency	43	2.49752	0.0957	Accepted	3.94558	0.0200	Rejected	0.7282	0.4894	Accepted
Human Capital Efficiency does not Granger Cause TOBIN'S Q	43	1.70381	0.1956	Accepted	1.15122	0.3171	Accepted	0.68285	0.5113	Accepted
TOBIN'S Q does not Granger Cause Structural Capital Efficiency	43	0.12095	0.8864	Accepted	0.00347	0.9965	Accepted	4.29623	0.0208	Rejected
Structural Capital Efficiency does not Granger Cause TOBIN_S_Q	43	0.14176	0.8683	Accepted	0.08629	0.9173	Accepted	0.13698	0.8724	Accepted
TOBIN'S Q does not Granger Cause Value Added Intellectual Coefficient	43	0.03381	0.9668	Accepted	0.63334	0.5312	Accepted	1.7801	0.1824	Accepted
Value Added Intellectual Coefficient does not Granger Cause TOBIN'S Q	43	0.16637	0.8473	Accepted	4.03743	0.0182	Rejected	3.61267	0.0366	Rejected

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