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A Study on Effectiveness of Investment in Intellectual Capital of Indian Knowledge Companies

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Abstract

Intellectual capital (IC) is non-monetary assets or resources without physical substances which are underlying factors of a firm's value creation process. Knowledge based companies mainly depend upon these type of assets for their value creation and competitive advantage. The present study makes an attempt to examine efficiency and effectiveness of investment in intellectual capital of 100 Indian knowledge companies during the period 2002 to 2011. In other words, this study examines the efficiency of intellectual capital management with regard to target level of Indian knowledge companies.

For the purpose of the study, 100 Indian knowledge-intensive companies comprising 32 software companies, 32 pharmaceuticals companies, and 36 banking and finance companies are selected on the basis of highest market capitalisation. For measuring the efficiency of intellectual capital Pulic's VAICTM (value added intellectual coefficient) is applied. This study examines, by applying partial adjustment (PAM) model, how fast the sample companies are improving the respective level of intellectual capital efficiency with respect to a target efficiency level.

The study results also indicate that the speed of achieving that target level of efficiency of sample companies is moderate. From the beta values of regression results it is also observed that IT companies are more efficient in intellectual capital management with regard to target level as compared to banks and pharmaceutical companies.

This is the first study in the IC literature that applies partial adjustment model to examine the speed of achieving target efficiency level by an individual knowledge company. However, this study confined to knowledge companies only.

Keywords: Intellectual Capital, Knowledge Company, VAICTM, Partial Adjustment Model

Introduction

Intellectual capital (IC) is non-monetary assets or resources without physical substance e.g., innovation, knowledge, research and development, employee training or customer satisfaction, which are underlying factors of a firm's value creation process (MERITUM, 2002; Lev & Zambon, 2003). The importance of IC resources in firm's value creation process has continuously increased due to the change from manufacturing-based economies to knowledge-based economies (Barth & Clinch, 1998; Kallapur & Kwan, 2004). Today, in the knowledge driven - economy IC is a key issue in strengthening a firm's competitive position and in achieving its objectives (Guthrie & Petty, 2000).

Another opinion is that the growth of knowledge economy has increased the importance of intellectual capital (Cabrita & Vaz, 2006) whereas traditional performance methods only consider attributes of physical and financial capital and lacking intellectual capital (Kujansivu, 2005). Research of different countries actively engaged in finding out methods for measuring intellectual capital. The main motivation comes from the failure of the traditional

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performance measures to include the IC contributions which directly or indirectly affect the business performance. This has resulted in the development of various methods for measuring IC contribution. However, most of the methods are non-financial and non-comparable among companies in the industry. There are few non-financial measures (namely, calculated intangible value, value added intellectual coefficient (VAIC)) that produce IC value or efficiency which provides concrete basis for comparing the IC performance of different companies.

In the present study attempt has taken to measure the intellectual capital efficiency of 100 knowledge based companies and to examine the effectiveness of investment in intellectual capital of the above sample companies.

Current study is divided into following subsections. Second section provides an overview of VAIC framework. Third section discusses the advantages of VAIC framework and fourth section presents some results of empirical studies by applying VAIC framework. In fifth section the effectiveness of intellectual capital management in achieving the target efficiency level is examined. Lastly, sixth section concludes the study.

Measurement of Intellectual Capital Efficiency

Till date there is no unique, well-defined and widely accepted intellectual capital measurement model. Sveiby (2010) finds 42 different measurement models available in the literature. He classifies these models into four approaches, these are as follows;

- Market capitalisation approach,
- Direct intellectual capital measurement approach,
- Return on assets approach, and
- Scorecard approach.

Under market capitalisation approach the value of intellectual capital is determined by subtracting book value of assets from market value of the company. However, several problems associated with this approach like market value of a company varies from day to day and subject to the speculative bubbles of the stock market. Under second approach, IC values are determined by indentifying individual components of intellectual capital and assigning monetary value to them. This measurement approach suffers from subjectivity (Chan, 2009a) in indentifying intellectual components since there is no well accepted definition of intellectual capital and it varies from firm to firm. ROA approach calculates IC as the capitalisation of excess earnings of a firm over and above the industry average earnings. If a newly established knowledge firm fails to earn over and above industry above earnings then it may not be true that the firm has no intellectual capital. Methods under scorecard approach are popularly used to report intangible assets in management accounting. According to Chan (2009a) Scorecards are used to generate indicators and indices, and may not require the assignment of a financial value to the IC components.

The above four approaches do not include the popular method developed by Pulic (2000) known as value added intellectual capital coefficient (VAIC). K.H. Chan (2009a) suggested that VAIC may be viewed as fifth IC measurement approach. The main logic behind selecting it as a separate approach is that VAIC shows the value creation efficiency of company's intellectual ability by considering the all types (intellectual and physical) of resources. VAIC has widely been used in numerous empirical researches conducted worldwide. Relatively simple and quantitative approach that usage accounting information and producing efficiency indicators which are comparable among companies within the industry makes the approach popular. The procedure for calculating VAIC starts from determining the company's ability to create value added (VA). VA is the difference between sales (OUT) and inputs (IN) and can be represented in the following equations;

$$VA = OUT - IN$$

where output (OUT) represents the sales revenue that the company earned by selling all the products and services in the market in a particular time period. Inputs (IN), on the other hand, comprise all the expenses incurred in earning the above revenue except employee costs. In developing this model Pulic considered that in the knowledge economy the employee costs are not input costs rather those are investment by the company. Value added can also be calculated from the companies audited financial accounts, as follows;

$$VA = I + DP + D + T + M + R + W$$

where,

I = Interest expenses, DP= Depreciation, D= Dividends, T = Taxes Paid, Minority shareholders' interest, R= Retained earnings, W = Wages and Salaries.

VAIC™ is the sum of two indicators. These are: (i) Capital Employed Efficiency (CEE) – the indicator of VA efficiency of capital employed; and (ii) Intellectual Capital Efficiency (ICE) – the indicator of VA efficiency of company's Intellectual Capital base. Intellectual Capital Efficiency, on the other hand, is composed of (a) Human Capital Efficiency (HCE) – the indicator of VA efficiency of human capital; and (b) Structural Capital Efficiency (SCE) – the indicator of VA efficiency of structural capital.

These efficiency indicators are calculated as follows:

The relation between VA and HC (human capital) is termed as 'human capital coefficient' which shows how much VA is created by a rupee spent on employees. It actually indicates the ability of employees (HC) to create value in a company. Consistent with the views of other leading IC researchers (for example, Edvinsson, 1997; Sveiby, 2001, 2007), Pulic (1998) argues total salary and wage costs are an indicator of a firm's human capital (HC). HCE, therefore, is calculated as the ratio of total VA divided by the total salary and wages spent by the firm on it employees. Following equation shows this relationship algebraically:

HCE = VA/HC

where:

HCE = human capital efficiency coefficient;

VA = Value added and

HC = total salary and wages cost.

The second relation is 'structural capital coefficient' which indicates the contribution of structural capital in the value creation process. In Pulic's model structural capital is calculated by differentiating HC from VA. The higher the contribution of HC in the value creation, the lesser will be the structural capital (SC). Being an inverse relationship between HC and SC, the structural capital efficiency indicator is calculated as follows

SCE = SC / VA

where

SCE = structural capital efficiency coefficient;

SC = Structural capital; and

VA = Value Added.

SCE indicates the amount of SC needed to generate a rupee of VA and shows how successful in value creation process.

Since intellectual capital cannot generate value per se, physical and tangible capital must be combined with intellectual resources to create value. The third coefficient of VAIC model indicates the VA by one unit of physical capital, which is calculated as follows

CEE = VA/CE

where

CEE = capital employed efficiency coefficient; VA = Value added; and

CE = book value of the net assets.

Advantages of VAIC™

Recently, VAIC ™ method has gained popularity among the researchers to measure intellectual ability of companies. K.H. Chan (2009) supports the adoption of this technique as an effective method of measuring intellectual capital efficiency because. VAIC™ has a number of advantages listed by many researchers (Schneider, 1999; Goh, 2005; Tseng & Goo, 2005; Chan, 2009) which are summarised as below:

- It produces quantifiable, objective and quantitative measurements without requirement of any subjective grading and awarding of scores or scales.
- It generates indicators that are relevant, useful and informative to all stakeholders.
- It uses financially oriented measures therefore, calculated indicators, relations or ratios computed may be used for comparison along with traditional financial indicators commonly found in business.
- It uses very simple and straight forward procedures in the computation of the indexes and coefficients.
- It makes use of public or published financial data therefore, minimizes the question of reliability of IC efficiency.
- It can be employed to any size organisation ranging from small to large.

- It enhances the utility of traditional financial statements by incorporating measures of IC performance.
- The results are easily understood by those who have very basic understanding of accounting information.
- The commonly accepted definition of IC makes this method as the most appropriate method to measure IC performance of any organisation.

Application of VAIC™ Model

Several attempts have been taken by various authors to measure intellectual capital efficiency of business organisations and its impact on business performance are also examined. Most of them have applied Pulic's VAIC framework to measure the value creation efficiency of corporate intellectual capital and assess the linkage between intellectual capital and financial performance of companies. However, in few cases VAIC framework have also been used to examine the nexus between intellectual capital efficiency and IC disclosure and stock level of companies.

The VAIC framework is invented and applied by Pulic (2000) in Europe to examine the relation between market value added (MVA) and intellectual capital efficiency of 30 'FTSE-250' companies. He again used the model to benchmark banks operating in Croatian region (Pulic, 2002). In a similar study Bornemann (1999) examined the Croation national economy by analyzing 400 companies through VAIC. In a separate study Williams (2001) applied VAIC model to investigate intellectual capital efficiency and IC disclosure practices of 30UK companies.

In South Africa, Firer and Stainbank (2003), Firer and Williams (2003) use VAIC model to examine the association between intellectual capital efficiency and corporate financial performance of South African public companies.

Above mentioned studies are widely followed and referenced in subsequent studies by numerous authors of different countries. In India Kamath (2007, 2008), Ghosh and Mondal (2009), Pal and Soriya (2012) apply VAIC model to measure the intellectual capital efficiency of Indian companies. In Australia Clarke, Seng and Whiting (2010), Joshi, Cahill and Sidhu (2010) analysed the intellectual capital efficiency of Australian Companies by following VAIC rules. Ting and Lean (2009), Maheran and Muhammad (2009) of Malaysia used VAIC framework to examine the relationship between intellectual capital performance and financial performance of Malaysian financial institutions. In Taiwan several studies are conducted to examine the relationship between intellectual capital efficiency and business performance. Researchers like Shiu (2006), Chen, Cheng and Hwang (2005) measure the intellectual capital efficiency by following VAIC model. Tan, Plowman and Hancock (2007) of Singapore and Chan (2009) of Hong Kong also applied the said model in their studies to measure the value creation efficiency of sample companies. In Russia the model VAIC is used by Molodchik and Bykova (2011) to measure the organisational value creation efficiency of 401 Russian organisations.

Table 1 shows results of some empirical studies, where VAIC model is followed.

Table 1: Empirical Studies Where VAIC Model is Followed

Authors and year	*Country and Period*	*Research Proposition*	*Dependent Variables*	*Significant Relationships*
Firer and Williams (2003)	South Africa 2001	The study investigates whether the performance of a company's intellectual capital can explain organisational performance	ROA = Net Income less preference dividends / BV Total Assets; ATO = Total Revenue / BV Total Assets; M–B Ratio = Market Capitalisation / BV Net Assets;	VAIC only positive with ROA and negative with ATO and M/B Ratio
Firer and Williams (2003)	South Africa 2001	Investigates the association between efficiency of value added of the major components of a firm's resources and three traditional dimensions of corporate performance (ROA, ATO, M/B ratio)	ROA = Net Income less preference dividends / BV Total Assets; ATO = Total Revenue / BV Total Assets; M–B Ratio = Market Capitalisation / BV Net Assets;	HCE negative with ATO, MB SCE positive with ROA CEE positive with MB

Authors and year	*Country and Period*	*Research Proposition*	*Dependent Variables*	*Significant Relationships*
Chen et al., (2005)	Taiwan Stock Exchange 1992 – 2002	Examines the relationship between value creation efficiency of IC and firm's market valuation and financial performance	MB ratio = MV Common Stock / BV Common Stock; ROE = Pre–tax Income / Average Stockholders' Equity; ROA = Pre–tax Income / Average Total Assets; Revenue Growth = ((Current Revenue / Prior Years Revenue) – 1) X 100%; Productivity = Pre–tax income / Number of Employees.	VAIC positive with ROA, ROE, MB, GR, EP; HCE positive with ROA, ROE,MB, GR, EP; SCE positive with ROA, MB CEE positive with ROA, ROE,MB, GR, EP;
Shui (2006)	Taiwanese Listed Companies 2003 Also tests 1 year lag		ROA = Net Income / BV of Total Assets ATO = Total Revenue / BV of Total Assets M–B Ratio = Market Capitalisation / BV of Net Assets	VAIC positive with ROA, MB; HCE negative with ATO, MB CEE positive with ROA, ROE,MB, GR, EP;
Appuhami (2007)	Thailand 2005	Investigates the impact of the value creation efficiency IC on investors' capital gain on shares	Capital Gain on Shares =((Market Price per Share (PPS) – Prior Year's Market PPS) / Prior Year's Market PPS) X 100)	VAIC positive with MR; CEE negative with MR;
Chan (2009b)	Hong Kong Stock Exchange 2001 – 2005	Whether intellectual capital (IC) has an impact on the financial aspects of organisational performance	M–B Ratio = Market Capitalisation / BV Common Stock; ROA = Operating Income / BV Total Assets; ATO = Total Revenue / BV Total Assets; ROE = Net Income / Total Shareholders Equity;	VAIC positive with ROA, ROE; HCE negative with ATO, MB SCE positive with ROA, ROE; CEE positive with ROA, ATO, MB, ROE;
Ting and Lean (2009)	Malaysia 1999-2007 (9 years)	Examines the intellectual capital performance and its relationship with financial performance	ROA = Profit after Tax / Total Assets;	VAIC positive with ROA; HCE positive with ROA; CEE positive with ROA;
P. Kujansivu and A. Lonnqvist (2007)	20000 Finnish companies, for the period 2001-2003	Examines the relationship between the value of IC and efficiency of IC	CIV = calculated intangible value	Weak relationship between CIV and VAIC
Dimitrios Maditinos, et al. (2011)	96 Greek companies, for the period 2006 to 2008	Examines the impact of IC on firms' market value and financial performance.	M–B Ratio = Market Capitalisation / BV Common Stock; ROA = Operating Income / BV Total Assets ROE = Net Income / Shareholder's Equity GR = (Current year's revenue – Last year's revenue) -1 *100	VAIC has no relationship with M/B, ROA, ROE, GR; HCE positive with M/B, ROA, ROE, GR;

Authors and year	Country and Period	Research Proposition	Dependent Variables	Significant Relationships
Gholamhossein Mehralian et al. (2012)	Listed Iranian pharmaceutical companies (2004-2009)	Examines the relationship between intellectual capital (IC) components (human, structural, and physical capitals) with the traditional measures of financial performance	M–B Ratio = Market Capitalisation / BV Common Stock; ROA = Operating Income / BV Total Assets; ATO = Total Revenue / BV Total Assets	CEE positive with ROA;
Fethi Calisir Et al. (2010)	Listed information technology company of Istambul stock exchange (2005-2007)	Examines VAIC and its components' impact on company performance	M–B Ratio = Market Capitalisation / BV Common Stock; ROA = Operating Income / BV Total Assets; ROE = Net Income / Shareholder's Equity ATO = Total Revenue / BV Total Assets	HCE positive with ROA CEE positive with ROE, ATO
Jose María Díez et al. (2010)	Spanish firms with a staff of 25 employees or more	Explores the possible relation between indicators of human and structural capital and the economic-financial results.	SALES GROWTH (SG) = (current year's sales- Last year's sales)/ Last year's sales	HCE positive with SG SCE positive with SG
Tan et al. (2007)	150 publicly lised companies of Singapore exchange	Investigates the association between the intellectual capital (IC) of firms and their financial performance.	ROE = profit to shareholders / shareholders fund EPS = profit to shareholders / number of shares; ASR = difference between current and last year's share price +dividend / current year's share price	VAIC positive with ROE, EPS, ASR
Stevo Pucar (2012)	134 firms in Bosnia and Herzegovina (B&H)	Analyses the impact of intellectual capital (IC) on export performance	Exports per worker = Total exports /Number of employees Growth of exports per worker = difference between current and last year's export / current tears export	VAIC is positive with growth of exports to some of sample companies
Zeghal and Maaloul (2010)	300 UK companies comprising high-tech, service and traditional sectors	Analyses the role of value added (VA) as an indicator of intellectual capital (IC), and its impact on the firm's economic, financial and stock market performance	Operating income/sales (OI/S) = operating income / total sales M–B Ratio = Market Capitalisation / BV Common Stock; ROA = Operating Income / BV Total Assets;	ICE positive with OI/S and ROA; ICE positive with M/B only to high-tech companies
Mondal and Ghosh (2012)	65 Indian banks for the period 1999 to 2008	Investigates empirically the relationship between intellectual capital and financial performance	ROA = Net Income less preference dividends / BV Total Assets; ROE = Net Income / Shareholder's Equity ATO = Total Revenue / BV Total Assets	VAIC positive with ROA, ROE,ATO; HCE positive with ROA, ROE,ATO
G.B. Kamath (2008)	25 Indian pharmaceutical companies (1996-2006)	Examines the relationship between intellectual capital components and traditional measures of financial performance	ROA = Net Income less preference dividends / BV Total Assets; ATO = Total Revenue / BV Total Assets; M–B Ratio = Market Capitalisation / BV Net Assets;	No significant relationship found by the author

Authors and year	Country and Period	Research Proposition	Dependent Variables	Significant Relationships
Makki and Lodhi (2009)	Seven year data set (2001-2007) in Lahore Stock Exchange Index companies (LSE-25)	Examines the relationship between intellectual capital and return on investment (ROI)	ROI = Net income / Total assets	HCE positive with ROI; CEE positive with ROI
Syed Najibullah (2005)	22 banks in Bangaladesh (2005)	Investigates empirically the relation between the value creation efficiency and firms' market valuation and financial performance of 22 Bangladeshi banks	ROE = pre - tax income ÷ average stockholders' equity ROA = pre - tax income ÷ average total assets GR = (current year's revenues ÷ last year's revenues) - 1) × 100%. Employee productivity (EP) = pre - tax income ÷ number of employees	VAIC only positive on GR; CEE has positive impact on ROE and ROA

From Table 1, it is clear that VAIC is very popular among researchers across several countries to measure value creation efficiency of a company's intellectual capital. It very simple and straight forward procedures in the computation of the necessary indexes and coefficients, which may be simple to understand, especially for management and business people who are accustomed to traditional accounting information.

Effectiveness of Intellectual Capital Management

The management of intellectual capital done by the Indian knowledge companies in order to achieve target efficiency is examined in this section. In other words, we examine the speed of achieving target efficiency level by an individual knowledge company using partial adjustment model. It may be mentioned here that the speed of achieving the targeted IC efficiency is viewed as the degree of efficiency of the management of an enterprise in managing its intellectual capital. Thus higher the observed speed, greater the efficiency of the IC management by the firm and vice-versa. The following sections describe about the data source, methodology and results.

Data Source

The present study is conducted on 100 Indian knowledge companies comprising three sectors, namely, information technology sector (32), pharmaceutical sector (32), and banking sector (36). The data used in this empirical study are collected from published annual reports of respective company and from Capitaline Database. Online database of Reserve Bank of India is also accessed to collect bank data. The companies selected in this study are leader in their respective businesses in terms of market capitalisation as on 15th August 2012 and are listed in the Indian stock markets (BSE and/or NSE). However, banks are selected on the basis of availability of 10 years data. Companies with missing data and negative data are not included in this data. In this study 10 years data from the year 2002 to 2011 are used.

Research Methodology

In order to measure the firm's intellectual capital management efficiency in achieving the target level efficiency during study period following OLS model, i.e., partial adjustment model, has been used.

$$y_t - y_{t-1} = \alpha + \beta (Z^* - y_{t-1}) + e$$

where

$y_t - y_{t-1}$ = actual change = Y,

$Z^* - y_{t-1}$ = desired change = X,

Z^* = target efficiency level,

β = coefficient of adjustment/ speed of efficiency, $0 \leq \beta \leq 1$,

Therefore, our OLS equation is as follows:

$$Y = \alpha + \beta X + e,$$

The estimated beta (β) value represents the speed of the individual firm in achieving the target efficiency level. Here, β =1 for a firm indicates the degree of firm's efficiency in the matter of managing intellectual capital is equal to the target level. Similarly, $\beta \leq 1$ speaks for the need for further improvements by the respective firm.

In this study industry intellectual capital efficiency rate (i.e., industry average) is taken as the target efficiency level. In calculating the industry intellectual capital efficiency rate i.e., the target efficiency level, we use 'equal-weighted mean'. However, we excluded firms those have abnormally high or negative intellectual capital efficiency in calculating equal-weighted mean. Median value can also be used in place of equal- weighted mean. In a situation, where individual firm's efficiency level is high above the industry average level, then industry average do not represents the target level to that firm and another target level is selected for those firms. A firm with consistent intellectual capital efficiency throughout the study period is selected among the firms having higher intellectual capital efficiency than industry average. The selected firm's intellectual capital efficiency is considered as the target efficiency level for those firms having higher efficiency level than industry average.

Empirical Results

In this section empirical results are presented. On the basis of observed beta values companies are classified into top performer beta value is above 0.80, good performers have beta score between 0.50 to 0.80, and common performers where beta score below 0.50.

Information Technology sector

Table 2 presents the regression results of 32 information technology (IT) companies. Among the selected companies, two companies namely, TCS and Rolta India Limited have higher intellectual capital efficiency than industry average and Rolta India Limited has consistent intellectual capital efficiency over the study period. Out of the 32 sample IT companies, Geodesic and ICSA are excluded in the study because of abnormally high intellectual capital efficiency and 3i InfoTech also remains outside this study because of decreasing intellectual capital efficiency.

Table 2: Regression Results of Information Technology Companies

Software Companies	*α*	*β*	R^2	*t-value*
TCS	-0.968	0.782	0.612	3.313*
INFOSYS	0.003	0.733	0.538	2.853*
WIPRO	0.138	0.650	0.422	2.262*
HCL INFO	0.280	0.468	0.219	1.402
ORACLE	0.361	0.788	0.621	3.387*
MAHINDRA SATYAM	-0.520	0.832	0.692	3.968*
TECH MAHINDRA	0.775	0.832	0.693	3.974*
MPHASIS	0.245	0.804	0.647	3.580*
HEXAWARE	-0.702	0.992	0.984	20.529*
FINANCIAL TECH	0.638	0.751	0.564	3.009*
CMC	-0.183	0.648	0.420	2.521*
INFOTECH	-0.556	0.867	0.751	4.597*
NIIT	0.035	0.514	0.264	1.340
POLARIS	0.181	0.560	0.314	1.788*
ZENSAR	-0.556	0.935	0.874	6.969*
ROLTA				
HINDUJA VENTURE	-0.491	0.521	0.272	1.617*
HCL INFOSYSTEM	-0.127	0.592	0.769	3.187*
TATA ELAXI	0.133	0.639	0.408	2.195*
GEOMETRIC	-1.029	0.867	0.751	4.599*
RICOH	-1.118	0.963	0.927	9.410*
MASTEK	0.193	0.393	0.155	1.132
SASKEN	-0.276	0.665	0.442	2.356*
SAKSOFT	-0.140	0.717	0.514	2.302*
BLUE STAR	-0.288	0.580	0.337	1.884*
DATAMATICRS	-0.366	0.584	0.341	1.905*
KALE CONSULTANTS	0.069	0.766	0.587	3.153*
SUBEX AZURE	0.302	0.388	0.151	1.115
SONATA SOFTWARE	-0.450	0.792	0.628	3.434*

Here * represents significance level at 1% level.

From the regression results in Table 2 it is revealed that beta values are not significant in 3 companies out of 28 companies and beta values of these three companies do not exceed 0.50. However, eight companies have beta values more than 0.80 ($0.80 \leq \beta = 1.00$) and these beta values are significant at 1% significance level. The beta

values of 17 companies, which are significant at 1% significance level, lie between 0.50 and 0.80 ($0.50 \leq \beta \leq 0.80$) and three companies have values less than 0.50. From the beta values it is also appeared that Hexaware technologies is the most successful company among the 32 sample IT companies with regard to achieving target intellectual capital efficiency level and followed by Ricoh India Ltd., Zensar Technologies Ltd. and so on.

Pharmaceutical Sector

Table 3: Regression Results of Pharmaceutical Companies

Name of Company	*α*	*β*	R^2	*t-value*
Sun Pharma	-0.270	0.596	0.355	1.965*
Cipla	-0.584	0.621	0.386	2.904*
Dr. Reddy	0.132	0.800	0.640	3.526*
Lupin	-0.014	0.708	0.502	2.656*
Ranbaxy	-0.415	0.591	0.349	1.937*
Cadila Health	-0.990	0.528	0.379	1.646*
Glaxo	2.427	0.654	0.434	2.346*
Divis Lab				
Glenmark	0.120	0.622	0.386	2.100*
Phiramal Healthcare	-0.750	0.773	0.597	3.223*
Torrent Pharma	-0.124	0.789	0.623	3.400*
Ipca Labs	-0.238	0.397	0.157	1.143
Sanofi India	0.076	0.626	0.392	2.124*
Biocon	2.000	0.464	0.216	1.387
Strides Acrolab	-0.113	0.637	0.406	2.189*
Astrazencea	0.041	0.886	0.784	5.045*
Pfizer	-0.367	0.769	0.592	3.186*
Aurobindo Pharma	-1.298	0.660	0.436	2.327*
Jubilant Life	0.322	0.531	0.382	1.659*
Novertis India	-0.297	0.897	0.805	5.307*
Wyeth	0.495	0.323	0.105	0.902
FDC limited	0.114	0.631	0.398	2.150*
Unichem	0.027	0.465	0.216	1.389*
Fresuniues Kabi	-0.377	0.44	0.193	1.094
Alembic	-0.601	0.770	0.593	3.196*
Plethico Pharma	1.193	0.433	0.188	1.272
Natco Pharma	-0.268	0.80	0.631	3.461*
Merck Limited	0.041	0.354	0.125	1.001
Ajanta Pharma	-0.343	0.808	0.654	3.634*
Orchid Chemicals	-0.566	0.865	0.749	4.571*
Dishman Pharma	-1.000	0.801	0.636	3.496*

Here, * denotes 1% significance level

Table 3 shows the regression results of 31 pharmaceutical companies. One company (Abbott India Ltd.) is excluded from the study having decreasing intellectual capital efficiency level over the period. Out of 31 sample companies, eight companies i.e. Cipla, Glaxo, Divi's Laboratory, Biocon, Aurobindo Pharma, Wyeth, Plethico Pharma, and Dishman Pharma have higher intellectual capital efficiency than the industry average level. Among the eight pharmaceutical companies 'Dishman pharma' has consistent intellectual capital performance over the 10 years study period and selected as target level to those eight outperforming companies. However, the beta values of seven companies are above 0.80 ($0.80 \leq \beta = 1.00$) out of 30 sample firms. Sixteen companies have beta values between 0.50 and 0.80 ($0.50 \leq \beta \leq 0.80$) and seven companies have beta values less than 0.50 ($0 \leq \beta \leq 0.50$). From the empirical results it is seen than Novertis India ($\beta = 0.897$) is the most successful company with regard to achieving target efficiency level and followed by Astrazencea ($\beta = 0.886$), Orchid Chemicals ($\beta = 0.865$).

Banking Sector

The regression results of 36 banks are presented in Table 4. Here it is seen that Corporation Bank, Oriental Bank of Commerce, Andhra Bank, HDFC Bank, IDBI Bank, ICICI Bank, Karur Vysya Bank, and Axis Bank have higher intellectual capital efficiency than the industry average and among them Axis Bank is selected as leader because of having consistent intellectual efficiency than others throughout the study period. From the table it is seen that beta values of seven banks are above 0.80 ($0.80 \leq \beta = 1.00$). However, beta values of 22 banks fall between 0.50 to 0.80 ($0.50 \leq \beta \leq 0.80$) and six banks have beta values less than 0.50 ($0 \leq \beta \leq 0.50$). From the sample of 36 sample banks it is seen that Kotak Mahindra Bank ($\beta = 0.907$) is the most successful bank in achieving the target intellectual efficiency level.

Table 4: Regression Results of Banks

Bank Name	*A*	*β*	R^2	*t-value*
Allahabad Bank	-0.099	0.628	0.3950	2.136*
Bank of Baroda	0.05	0.299	0.1390	1.536
Bank of India	-0.478	0.787	0.6190	3.375*
Canara Bank	-0.082	0.61	0.3720	1.722**
Central Bank of India	-0.702	0.603	0.3640	2.002**
Corporation Bank	-0.504	0.433	0.1880	1.271

Bank Name	A	β	R^2	t-value
Dena Bank	-1.481	0.867	0.7510	4.601*
Indian Bank	0.05	0.589	0.3470	1.927**
Indian Overseas Bank	-0.535	0.754	0.5680	3.033*
O B of Commerce	-1.196	0.818	0.6700	3.769*
Punjab National Bank	-0.064	0.516	0.2600	1.594**
Syndicate Bank	-0.688	0.629	0.3960	2.141**
UCO Bank	-0.58	0.66	0.4360	2.325**
Union bank of India	0.169	0.633	0.4000	2.161**
Vijaya Bank	-0.27	0.558	0.3110	1.778
State Bank of B & J	-0.399	0.837	0.7000	4.045*
State Bank of India	-0.279	0.535	0.2870	1.677**
State Bank of Mysore	-0.187	0.564	0.3180	1.808**
S B Of Travancore	-0.088	0.732	0.5360	2.483*
Andhara Bank	-0.036	0.277	0.0770	0.768
Bank of Maharastra	-0.476	0.78	0.6080	3.297*
ING Vysya Bank	-0.898	0.744	0.5530	2.945*
Kotak Mahindra Bank	-0.354	0.907	0.8220	5.687*
INDUSLAND BANK	-0.658	0.891	0.7930	5.185*
City Union Bank	-0.334	0.535	0.2860	1.674**
Dhanalakshmi Bank	-1.444	0.831	0.6910	3.955*
Federal Bank	0.131	0.632	0.3990	2.156**
HDFC Bank	-0.236	0.487	0.2370	1.474
ICICI Bank	-0.11	0.531	0.2820	1.658**
IDBI Bank	-0.184	0.667	0.4450	2.370*
Karnataka Bank	-0.068	0.254	0.0440	0.694
Karur Vysya Bank	-0.083	0.253	0.0640	0.639
South Indian Bank	-0.284	0.648	0.4200	2.250*
Axis Bank				
YES Bank	0.651	0.801	0.6320	2.261*
Lakshmi Vilas Bank	-0.531	0.657	0.4320	2.307*

Here, * denotes 1% significance level and ** denotes 5% significance level.

Discussion of Results

This paper makes an attempt to examine the efficiency of intellectual capital management with regard to target level of Indian knowledge companies during the period 2002 to 2011. For measuring the value creation efficiency of intellectual capital Pulic's (2000) VAIC (value added intellectual capital) model has been used in this study. Partial adjustment model is used in the study in order to measure speed of achieving target level by an individual company during the study period. In evaluating the individual firm's efficiency with regard to the speed of achieving target level of efficiency, industry norm is selected as target efficiency level. From the empirical results it is seen that out of the 100 sample companies, 22 companies are top performers since, beta values are more than 0.80 and beta values of 55 companies fall 0.50 to 0.80. However, 14 companies out of the above 55 companies have beta values nearer to 0.80. All over 13 among hundred sample companies have beta values less than 0.50 and categorised as common performers. From the beta values of regression results it is also observed that IT companies are more efficient in intellectual capital management with regard to target level as compared to banks and pharmaceutical companies.

Conclusions

In the present chapter attempt is made to examine the intellectual capital performance of 100 knowledge companies. The value creation efficiency of intellectual capital is measured through Pulic's VAIC method. From the average VAIC scores it is revealed that value creation efficiency of pharmaceutical companies comes first and followed by software companies and banks. The average IC efficiency score is four whereas the score is three in case of software companies and banks. In this chapter an attempt is also made to examine the intellectual capital management of sample companies in order to achieve the target efficiency level. Here, industry average IC efficiency is considered as target efficiency level for all companies and companies whose efficiency level are above industry average, industry leader's efficiency is selected as target level. Empirical results show that companies which have better intellectual capital efficiency are able to manage their intellectual capital efficiently to achieve the target efficiency level.

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