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An Empirical Investigation of the Relationship between Drivers of Value Creation and Financial Performance of Technology driven firms

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Abstract

The purpose of this paper is to analyze the relationship between the tangible and intangible drivers of value creation and the measures of traditional financial performance in technology driven pharmaceutical industry. The study attempts to modify the classic Value Added Intellectual Coefficient Model (VAIC^{TM}) developed by Ante Pulic in 1993 (Pulic, 2004) by introducing three new components of Intellectual Capital i.e. Innovation Capital, Relational Capital and Social Capital to assess value creation efficiency of 190 BSE and NSE listed technology driven Pharmaceutical firms in India. Return on Assets (Profitability), Asset Turnover (Productivity) and Market to Book Value Ratio (Market valuation) are used as dependent variables.The results indicate positive and significant relationships between the drivers of value creation and firm profitability, productivity and market valuation. Human Capital and Innovation Capital emerge as the most significant drivers of value creation. The Modified VAIC^{TM} Model (MVAIC) was found to be a better predictor of value creation for the sample firms, as compared to the VAIC^{TM} Model.

The introduction of Innovation Capital, Relational Capital and Social Capital as new components of Intellectual capital provides valuable insights about the concept of value creation in technology driven firms.

Keywords : Intellectual Capital, Value Creation Efficiency, Pharmaceutical, Innovation Capital, Human Capital

I. Introduction

In present times, the developing Indian economy is at the threshold of implementing several major scientific reforms and technological transformations, which once executed, may change the way India is perceived across the globe. The last few decades of the twentieth century have witnessed ripples of change in the way that business is being conducted in the nation's corporate sector. Not only India, an unseen revolution seems to have taken place, which has changed the mission and vision of all companies operating on an international platform as well.

Gone are the days when 'industrial capitalism' and 'dependence on tangible assets such as land, capital, plant and machinery' was the focus of all research. With increasing dependence on factors such as innovation, technology and intellectual capital, the advent of the 'knowledge-based economy' has changed the way managers strive to measure firm performance, profitability and productivity. Research has proved that 'intangibles or intangible assets', with the knowledge worker at the helm of affairs, have now started contributing immensely in the creation of meaningful value for all stakeholders of an enterprise. In germane literature, terms such as intellectual capital, intangible assets and invisible resources have been used synonymously by scholars (Vishnu, 2015; Mondal & Ghosh, 2012). These assets are now competing with tangible assets as predictors of firm performance. In 1962, Brookings Research Institute, a USA based consultancy firm, discovered that 62% of a company's value was represented by physical capital (as cited in Mondal, 2014). However, given the increase in 'R&D Investments, brand development and training', Low (2000) points out that 'the percentage of company's value that is unaccounted for by tangible assets has skyrocketed anywhere from 50% to as much as 90% of its value' (p.253). In such a scenario, studying the contribution of intangibles in value creation, will not only help managers in getting a complete view of their firms, but also assist them in devising strategies to improve their future performance.

Another proposition of traditional financial management – that value may be created only for the shareholders of a company – has been rejected by modern day economists. Value Creation, per se, is now a vast area of immense opportunities, which when given the right inputs, may reap benefits for all the stakeholders of a firm. Thus, value may be created (or destroyed) at all levels of a firm, and this creation (or destruction) of value may have a multi-dimensional impact on the employees, brand image, goodwill or any other aspect of business, for that matter.

However, despite being an oft-discussed and evolving area of study, not much has been done so far to understand the concepts of value creation and its drivers. There is little or no consensus on the definitions and typology of value creation, let alone, the drivers that impact it. It is a widely accepted fact that 'value' is a relative term and 'value creation' has multiple dimensions in which it may be interpreted. Thus, the first motivation to perform this study was to define the concept of value creation, to discuss the variables that affect it and to break new ground in the area of measurement of

intangibles as drivers of value creation in knowledge based companies of India with special focus of the Pharmaceutical sector.

Secondly, limited research has been done (in the Indian context) to discuss value creation efficiency of firms and even in that, there is an observed discrepancy about how the drivers of value creation impact firm productivity, profitability and market valuation. The study attempts to put forth conclusions that may answer these questions.

Thirdly, the study identifies Intellectual Capital (IC) as the primary driver or source of value creation in knowledge based firms of India, more so in the Pharmaceutical sector of the country – which is considered to be 'an innovative and research-oriented industry' laying 'due emphasis on quality of Human Capital, R&D activities, product and process innovation and intellectual proprietorship' (Vishnu & Gupta, 2014)

In order to measure, the impact of IC on value creation efficiency of firms, the study uses a modified version of the Value Added Intellectual Capital (VAIC^{TM}) Model, postulated by Ante Pulic in 1993 (Pulic, 2004). The impact of MVAIC is then studied on the firm productivity, profitability and market valuation, to assess whether or not the components create value in knowledge based companies of India.

The USP of the study lies in the fact that the modified VAIC^{TM} model not only measures theRelational Capital (as measured by expenditures on advertising, selling and marketing) and social capital or CSR expenditures (which are not captured by the classic VAIC^{TM} model) created by firms but also uses new proxy variables to measure value creation efficiency of each sub component. Thus, the objective is to analyze which component of the MVAIC is a better predictor of the value creation efficiency in firms.

The second part of the paper provides a brief literature review of the relationship between value creation efficiency and the drivers of value creation. The third part deals with the methodology followed to modify the classic VAIC^{TM} Model and the final part provides the analysis, discussion and conclusions that may be drawn from the present study.

II. Literature Review

1. Value Creation – Definition & Typology

In their book "Cracking the Value Code", Richard E.S. Boulton, Barry D. Likert, and Steve M. Samek have defined value creation as the "*future value captured in the form of increased market capitalization*". According to them, "*companies in today's superheated economies are in a race to discover the underlying code for value creation*". Such companies are trying to discover the optimum combination of both tangible and intangible assets that would help to create maximum economic value for their business. Frioui (2006) suggests that the concept of value creation has inherent linkages with performance measurement of firms. If any company wants to sustain its competitive advantage, it must create long-lasting and continuous value.

'Value' in an organization may be divided into three essential components (Ayed, 2007)- Tangible value – This is measured or composed of the economic value or material wealth created by firms; Institutional value – These values are intangible in nature. They 'consolidate and develop the pride of belonging to the viable and liveable entity; Social value – These values are also intangible in nature and constitute the partnership that a firm shares with the society or environment in which it operates.

Low (2000), along with his team, also concluded that value creation in knowledge intensive firms may be tangible or financial in nature and intangible or non-financial in nature. Several other studies (Low,2000; Lev, 2001; Wendee, 2011) conducted in the early 2000s, concluded that traditional accounting measures capture only a part of the value created by the firms. A major part of the value created by firms is attributable to the intangible drivers of success. As such, for all purposes of this study, the definition of value creation as provided by a report on "The concept of "value creation" in Integrated Reporting" by Ernst & Young (2013), has been adopted. Value creation has, thus, been defined as follows -*"Value is created through an organization's business model, which takes inputs from the capitals and transforms them through business activities and interactions to produce outputs and outcomes that, over the short, medium and long term, create or destroy value for the organization, its stakeholders, society and the environment".*

2. Drivers of Value Creation

In scientific literature, value drivers may be defined as those variables which influence the value of an enterprise (Kazlauskiene & Christauskas, 2008). Drivers of value may be *positive or negative* (Damodaran,2002; Maas & Graaf, 2008; Kazlauskiene & Christauskas, 2008 as cited in Wendee, 2011;) or they may be classified as *external or internal* depending upon the aspect of business that they might affect (Woodcock, 1992).

Cheremnich (2000) came up with an extensive classification of value drivers which divided them into internal (related to a particular firm) and external (related to the external environment of the firm); quantitative (those that can be measured in figures) or qualitative (those which cannot be measured in figures); financial (which can be expressed monetarily) or non-financial (which do not have any financial expression.) Recognizing the fact that intangible investment is increasingly being views as the most important category of investment, Wyatt (2008) came up with six categories of intangibles that 'relate to the firms' core value drivers'. These six drivers were kept under three broad categories – I. Technology resources - R&D expenditures & related IP; II. Human Resources – (as measured by Human Capital) ; and III. Production resources –- which include advertising, brands, customer loyalty, competitive advantage and goodwill. Drawing inferences from the works of Grjaznovoj & Fedotovoj (1998), Cheremnich (2000), Ripol-Saragosi (2001) and Gross (2006), Tiwari & Kumar (2015) came up with a classification of value drivers across two dimensions. The first dimension is based on internal (related to the inherent performance of a firm) and external (related to the macro-

economic environment) aspects. The second dimension deals with the qualitative and quantitative drivers of value creation. Tiwari & Kumar (2015) points out that, while quantitative value drivers are concerned with the collection and analysis of data in numeric form, qualitative drivers simply describe some special quality or characteristic of a firm (p.6) The latter are difficult to measure and the analysis of their impact on value is quite ambiguous. An analysis of literature reveals that even though value creation and its drivers have received a lot of attention by academicians and practitioners alike, yet no consensus has been reached as far as the classification of value drivers is concerned. As such, for all purposes of the present study, value drivers have been classified into two major categories following Cheremnich (2000), Kazlauskiene & Christauskas (2008) i.e. Tangible/Financial Drivers of Value Creation – which include all the aspects that maybe related to the Capital employed by a firm be it in the form of financial or physical capital & Intangible/Non-Financial Drivers of Value Creation – which include all those aspects which are intangible in nature such as intellectual capital, human capital, structural capital, innovation capital, social capital and relational capital.

It is noteworthy that as the present study aims to capture the contribution of value drivers in the performance of pharmaceutical firms of India, greater stress has been laid on measuring the contribution of 'intangible knowledge assets' that play a major role in value creation in such firms.

3. The Value Added Intellectual Coefficient (VAIC^{TM}) Model

A number of tools, models and indices have been adopted over a period of time to measure value creation in knowledge based firms. The determinants of value creation in a business enterprise are so varied and great in number that it would very difficult to collate and classify them in quantifiable terms. However, in 1998, Ante Pulic proposed the Value Added Intellectual Coefficient Model (VAIC^{TM}) as a means to measure the value creation efficiency of a firm. According to him, the Intellectual Capital of a firm is the biggest contributor in the value created or value added by it. Thus, if it would somehow be possible to quantify the intellectual capital component of a firm, the resulting coefficients would actually be the amount of value the firm may have created over a certain period of time.

The key proposition of the VAIC^{TM} Model is the fact that, in the knowledge economy, employees "the prime carriers of knowledge" should be treated as an investment rather than a cost. Pulic (2004) explains this further by saying that just as the investments in plants, machineries and equipments were considered to be the base of value creation in the industrial era, employees and their intellectual capital is the major source of value creation in firms in today's knowledge-intensive era. He proposed that employees should, therefore, be given a 'new status' of being assets to firms rather than being liabilities.

In keeping with this view, Pulic (2004) states that value added (VA) or created by a firm during a given period of time is the net of all the incomes received by the company and the costs borne by it in the same time duration. In other words,

VA = OUT- IN

Where, output (OUT) represents the overall income, generated by all the products and services sold on the market and inputs (IN) contain all the expenditures. As already stated, labour expenses were not considered as a part of the costs because of their 'active role in the value creating process'. Thus, value added by the firm (VA) basically expresses the 'new created wealth of a company during a given time period'. According to Pulic (2004), VA is an 'objective indicator of business success' and shows the 'ability of a company to create value' (pp. 64). Therefore, it should include all the investments of a company in salaries of employees, interests on financial assets, dividends, taxes to the government and other future investments.

As such, value added maybe calculated from the company accounts, as follows -

VA = OP + EC + D + A

OP = Operating Profits; EC = Employee Costs; D= Depreciation; A= Amortization

Value Creation efficiency is measured by classifying Intellectual capital into its two major sub-components viz. a viz. Human Capital and Structural Capital of a firm. The intellectual capital efficiency of a firm is a summation of its human capital efficiency and structural capital efficiency. It is obvious that both HCE & SCE should rise as the Intellectual Capital efficiency (ICE) rises. Mathematically,

ICE = HCE+SCE

Where, HCE or Human Capital Efficiency Coefficient = VA/HC ; VA= Value Added; HC= Human Capital or total wages and salaries paid by the company.

SC= Structural Capital, calculated as follows-

SC= VA-HC.

Where, VA= Value Added; HC = Human Capital

Structural Capital is not an independent indicator rather it is dependent upon the value added by a firm and the amount it invests in the salaries & wages of employees. The greater the amount invested in human capital, the lesser would be the structural capital.

Thus,

SCE or Structural Capital Efficiency Coefficient = SC/VA

Where, VA= Value Added

SC = Structural Capital or VA-HC

In addition to the above mentioned components, it is also worth mentioning that intellectual capital does not create value independently. Therefore, in order to capture the value creation efficiency of all the resources in their entirety, it is also important to take into account the physical and financial capital of a firm. To do this, the capital employed by the firm or the book value of the net assets of a company should be taken into cognizance.

Thus, CEE or Capital Employed Efficiency Coefficient = VA/CE

Where, VA= Value Added

CE= Capital Employed or book value of net assets of a company

Thus, Value Added Intellectual Coefficient ($VAIC^{TM}$) is the sum total of the Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE) & Capital Employed Efficiency (CEE) of a firm.

In other words,

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

4. The $VAIC^{TM}$ Model, Financial Performance and Pharmaceutical sector

A number of studies, conducted in the past decade, have shown inherent linkages between the concepts of intellectual capital efficiency, value creation capabilities and financial performance of firms. The pharmaceutical sector, which is considered amenable for such research studies owing to its 'knowledge-intensive characteristics', has also been used amply to understand the dynamics of intellectual capital in the technology-driven, knowledge based economy (Vishnu & Gupta, 2013).

Chen *et al.* (2010) conducted a study on the U.S. Healthcare industry and established positive and significant relationship between IC efficiency and performance of firms. Similarly, Sharabati *et al.* (2010) concluded that 'effective management of IC' leads to positive management and better performance in Jordanian pharmaceutical firms. Mehralian *et al.* (2012) studied the pharmaceutical sector of Iran to understand the relationship between IC and the traditional measures of performance of the firm. The results indicated that the IC performance of a company can explain its profitability but not its productivity or market valuation. Rahman & Ahmad (2012) considered the banking, textiles and pharmaceuticals sector of Bangladesh and found inconclusive linkages between IC and financial performance of firms.

In congruence to the mixed or inconclusive results obtained across the world, the Indian pharmaceutical sector too yields no definite answer to the research questions at hand.A study conducted by Pal & Soriya (2012) calculated the $VAIC^{TM}$coefficients and attempted to draw comparisons of the IC performance of pharmaceutical and textile sector of India so as to investigate the relationship between IC efficiency, financial performance and market valuation as measured by ROA, ATO, MB, Debt-Equity Ratio and sales. The study revealed a positive relationship between IC and profitability of a firm. However, no significant links were obtained between IC, productivity and market valuation. On similar lines, Vishnu & Gupta (2014) collected data for 22 large pharmaceutical firms of India. Return on assets and return on sales were taken as performance variables. IC and its components – human capital, structural capital and relational capital (RC), were the predictor variables. Results showed instances of positive relationship between IC and performance variables.

On the other hand, Purohit & Tandon (2015) used a sample of 10 (BSE 100) IT and Pharmaceuticals companies of India and concluded that the relationship between different components of value added

by a firm and the three indicators of financial performance i.e. profitability (RoA), productivity (ATO) and market valuation (Market to Book Value) is limited and the results fail to support most of the proposed hypotheses.

III. Research Gaps and Hypotheses

1. Research Gaps

Review of germane literature on drivers of value creation reveals several research lacunae that may be filled with further analysis. Firstly,research studies conducted in the past have revealed mixed results regarding the relationship of the drivers of value creation of firms and traditional measures of financial performance, while some have found a positive relationship between the two (Clarke et al.,2011; Gan & Saleh, 2008), still others provide negative or weak relationships (Firer & Williams, 2003; Zeghal & Maaloul,2010). Not only on an international level, studies conducted in the Indian corporate sector on VAIC^{TM} and value creation, provide inconclusive evidences of relationship between dependent and independent variables. A review of literature also revealed that although VAIC^{TM} is an ideal tool to capture value creation efficiency of knowledge based firms yet, no study conducted in India has so far used the tool to identify the drivers of value creation in these firms. The novelty of the present study is thus, the fact that it will be one of the pioneer researches conducted in this area. Secondly, although VAIC^{TM} (in its original form) has been accepted as an efficient, holistic and complete measure for value creation, yet the increased attention on the role of intangibles such as corporate social responsibility and relational capital in superior firm performance warrants the need for a modified VAIC^{TM} (MVAIC). Only a few studies of this kind have been conducted in the Indian context (Mondal,2016; Vishnu, 2015; Vishnu &Gupta, 2014)

2. The Proposed Model – Modified Value Added Intellectual Coefficient or MVAIC

The research gaps identified through an analysis of existent literature point towards the need of an extended or modified VAIC^{TM} Model (henceforth referred to as MVAIC) to capture the essence of value creation in knowledge based firms in India. Thus, the present study incorporates two more variables along with the original variables of VAIC^{TM} to measure the intellectual capital efficiency of firms. Primarily, the variables - Social Capital & Relational Capital have been added in the MVAIC. Another modification is done in the calculation of Structural Capital (which incorporates the R&D expenditures incurred by the firm to account for value created through innovation). Structural Capital, has therefore been renamed to 'Innovation Capital" in MVAIC.

A. Calculation of Modified Value Added (MoVA) following Kasarova *et al* (2010)-

MoVA = EBITDA + MHC

Where, EBITDA = Earnings before Interest Tax Depreciation & Amortization;

MHC = Modified Human Capital (inclusive of Directors Remuneration)

B. Calculation of Modified Human Capital Efficiency Value Addition (HCEVA)- The calculation of Human Capital Efficiency in MVAIC is done on more or less similar lines as the

original VAIC^{TM} model. As such, it includes all the expenses that an organization incurs on compensation given to employees, salaries, wages, bonus, ex gratia provident fund & gratuities paid and staff welfare & training expenses as Human Capital. In the modified measurement of HC (MHC), Director's Remuneration has also been added to the employee costs as it is believed that the top level management of the firms plays a crucial role in deciding how it creates value (Vishnu, 2015).

HCEVA = MHC/MoVA

MHC= Modified Human Capital i.e. Employee Costs + Director's Remuneration

C. **Calculation of Modified Capital Employed Efficiency Value Addition (CEEVA)-** Keeping Pulic's classic VAIC^{TM} model in view, the proposed CEEVA indicator is selected as a proxy to represent Physical & Financial capital of a firm. As such, Capital employed includes the book value of net assets of a firm.

CEEVA = CE/MoVA

CE = Capital Employed

D. **Calculation of Innovation Capital Efficiency Value Addition (ICEVA) (or Structural Capital Efficiency) -** ICE or Innovation Capital Efficiency is obtained by summing the Research & Development (R&D) expenses of a firm (Jhunjhunwala, 2009; Liebowitz & Suen, 2000; Vishnu & Gupta, 2014; Vishnu, 2015). This is done to accommodate organizational processes and innovation-related activities of a firm. According to Wyatt (2008), R& D Expenditures give rise to product and process innovations which ensures sustainable earning streams in future as well as value creation.

ICEVA = (MoVA-MHC)/ MoVA

MHC= Modified Human Capital

E. **Calculation of Relational Capital Efficiency Value Addition (RCEVA)-** The calculation of Relational Capital Efficiency is done by taking the value of relational capital into consideration. Relational Capital is defined as 'the ability of an organization to interact positively with business community members to motivate the potential for wealth creation by enhancing human and structural capital (Vishnu, 2015).Previous literature revealed that Advertising, Marketing, Selling & Distribution expenses were the main indicators of relational capital.

RCEVA = RCE/ MoVA

RCE = Relational Capital Efficiency i.e. Marketing, Selling & Advertising Expenses

F. **Calculation of Social Capital Efficiency Value Addition (SCEVA)-** The social capital efficiency of a firm is measured through the expenditures that an organization incurs on fulfilling its Corporate Social Responsibility or CSR. For years now, the Indian corporate sector has been focusing on developing a clean, socially acceptable image in the eyes of its stakeholders. 'Social capital' is the term that has been given to the driver that measures value creation through a company's CSR expenditure.

SCEVA = CSR Expenditures/MoVA

G. Calculation of Modified Value Added Intellectual Capital (MVAIC) – Similar to the classic VAIC™ Model, the MVAIC is obtained by summing up all the individual components of Intellectual Capital Efficiency.

MVAIC = HCEVA+ CEEVA+ ICEVA+ RCEVA+ SCEVA

Where HCEVA - Human Capital Efficiency Value Addition; CEEVA -Capital Employed Efficiency Value Addition; ICEVA- Innovation Capital Efficiency Value Addition; RCEVA- Relational Capital Efficiency Value Addition; SCEVA - Social Capital Efficiency Value Addition.

3. Research Hypotheses

In order to address the above research gaps and in the light of the extended model that has been proposed in the earlier section, the following set of hypotheses has been proposed.

H1: Companies with greater Modified Value Added Intellectual Coefficient (MVAIC) tend to create more value, in terms of firm's profitability (Higher RoA)

H1a: Companies with greater HCEVA tend to have higher ROA, ceteris paribus.

H1b: Companies with greater RCEVA tend to have higher ROA, ceteris paribus.

H1c: Companies with greater SCEVA tend to have higher ROA, ceteris paribus.

H1d: Companies with greater CEEVA tend to have higher ROA, ceteris paribus.

H1e: Companies with greater ICEVA tend to have higher ROA, ceteris paribus.

H2: Companies with greater Modified Value Added Intellectual Coefficient (MVAIC) tend to create more value, in terms of firm's productivity (Higher ATO)

H2a: Companies with greater HCEVA tend to have higher ATO, ceteris paribus.

H2b: Companies with greater RCEVA tend to have higher ATO, ceteris paribus.

H2c: Companies with greater SCEVA tend to have higher ATO, ceteris paribus.

H2d: Companies with greater CEEVA tend to have higher ATO, ceteris paribus.

H2e: Companies with greater ICEVA tend to have higher ATO, ceteris paribus.

H3: Companies with greater Modified Value Added Intellectual Coefficient (MVAIC) tend to create more value, in terms of firm's market value (Higher MB)

H3a: Companies with greater HCEVA tend to have higher MB, ceteris paribus.

H3b: Companies with greater RCEVA tend to have higher MB, ceteris paribus.

H3c: Companies with greater SCEVA tend to have higher MB, ceteris paribus.

H3d: Companies with greater CEEVA tend to have higher MB, ceteris paribus.

H3e: Companies with greater ICEVA tend to have higher MB, ceteris paribus.

H4 : In comparison to the Classic VAIC™ Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India.

H4a: In comparison to the VAIC^{TM} Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India, in terms of firm's profitability (Higher ROA).

H4b: In comparison to the VAIC^{TM} Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India, in terms of firm's productivity (Higher ATO).

H4c: In comparison to the VAIC^{TM} Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India, in terms of firm's market value (Higher MB).

4.Data Source

For empirical investigation of the proposed hypotheses, 190 firms of Pharmaceutical Sector of India were taken into consideration. The data used in this empirical study has been collected from the published annual reports of the companies which is available on Centre for Monitoring Indian Economy (CMIE) ProwessIQ Database. The companies have been shortlisted on the basis of the market capitalization, for the year 2016, and are listed on either the Bombay Stock Exchange (BSE) or National Stock Exchange (NSE). Companies with negative data values or missing values have been excluded from the sample. The present study covers a span of ten years i.e. 2007- 2016. Simple linear regression has been used to test the hypothesis.

5. Description of Variables

A. Dependent Variables

1. **Return on Assets (ROA) –** also known as Return on Total assets, is the ratio of operating income or net income to the average total assets.

   In other words, **ROA = Net Income/ Average Total Assets**

   This ratio has been used as a proxy to measure firm's profitability, because it helps in analyzing how efficiently a firm can leverage its assets to produce overall profits during a given period of time.

2. **Asset Turnover (ATO) –** The ratio of total sales to total assets (Peterson & Fabrozi, 1999) is termed as asset turnover ratio. It is used to indicate a firm's productivity and also, its ability to generate sales from its assets.

   In other words, ATO maybe calculated as follows -

   ATO= Net Sales/Average Total Assets

   ATO is used as a proxy indicator of a firm's productivity.

3. **Market to Book Value (MB) –** This indicator is used to assess the market value of firms and its relationship with the book value. This ratio is especially used as an indicator of intellectual capital efficiency of a firm as it highlights the use of

intangibles in value creation in knowledge-based companies. As such, Market to Book Value (MB) ratio may be calculated as follows–

MB = Market Value/Book Value

Where,Market Value = Price per share * Total no. of shares outstanding

Book Value = Equity which is a portion of company's balance sheet

= Book value of common stocks.

B. Independent Variables –

1. HCEVA - Human Capital Efficiency Value Addition;
2. CEEVA -Capital Employed Efficiency Value Addition;
3. ICEVA- Innovation Capital Efficiency Value Addition;
4. RCEVA- Relational Capital Efficiency Value Addition;
5. SCEVA - Social Capital Efficiency Value Addition;
6. MVAIC – Modified Value Added Intellectual Coefficient.

6. Operationalization of Variables –

Multiple regression equations shall be applied for testing the hypotheses framed to study the value creation efficiency of pharmaceutical firms of India.

Dependent Variable (ROA, ATO, MB) = a_1 + b_1 (MVAIC) + b_2 (HCEVA) + b_3 (SCEVA) +b_4 (CEEVA) + b_5 (ICEVA) + b_6 (RCEVA)+ e_1

Where, ROA=Return on Assets, ATO = Asset Turnover Ratio, MB = Market to Book Value), MVAIC= Modified Value Added Intellectual Coefficient, HCEVA= Human capital efficiency Value Addition, SCEVA = Structural Capital Efficiency Value Addition, CEEVA = Capital Employed Efficiency Value Addition, RCEVA= Relational Capital Efficiency Value Addition, ICEVA = Innovation Capital Efficiency Value Addition, a1 = Constant term, b1, b2, b3 ,b4 ,b5 ,b6 = Coefficient of respective variables, e1= error term

IV. Results

Table I, II, III and IV present the results obtained for the regression models corresponding to the research hypothesis developed in the study. Table I presents the findings of the regression model which studied the impact of the drivers of value creation on firm profitability. The proxy measure chosen for firm profitability was Return on Assets.

The first set of hypotheses i.e. H1 (H1a, H1b, H1c, H1d and H1e) have been depicted in Table -I. The findings indicate a positive relationship between Intellectual Capital Efficiency along with its sub-components and profitability performance of the Pharmaceutical Sector firms in India.

As per Table I, the driver - HCEVA has the highest R square value i.e. 12 per cent (0.119) closely followed by ICEVA which has an R square value of 10 per cent (0.101). This indicates that taken together, human capital and innovation capital of Pharmaceutical firms, explain almost 22 per cent of the value created in these firms. Overall, MVAIC is positively and significantly related to the pharmaceutical firm's profitability, as measured by ROA. The newly introduced variables i.e.variables i.e. RCEVA and SCEVA show negative and insignificant relationships with firm profitability.

Table II presents the results of the second set of hypothesis i.e. H2 (H2a, H2b, H2c, H2d and H2e) which analyze the relationship between MVAIC and firm productivity, as measured by Asset Turnover Ratio (ATO). In this regard too, HCEVA emerged as a top driver of value creation, explaining about 13 per cent (0.129) of the variance in ATO. CEEVA emerged as the major driver of value creation in this model, by predicting approximately 9 per cent (R-Square – 0.089) of the variance in ATO, which is highly significant as indicated by the F value of 26.412. Overall, MVAIC is found to be positively and significantly associated with ATO.

Table II: Regression results on Overall Value Creation Efficiency of MVAIC and Its sub-components with Asset Turnover (ATO) of Pharmaceutical Sector in India

Table I: Regression results on Value Creation Efficiency of MVAIC and its sub-components with Return on Assets (ROA) of Pharmaceutical Sector in India

Independent Variable	R^2	F-Value	p-value	Coefficients	t-value	Significance
HCEVA	0.119	25.346	0.000*	Constant	14.052	0.000
				HCEVA	5.034	0.000*
RCEVA	0.016	3.023	0.084	Constant	13.220	0.000
				RCEVA	-1.739	0.084
SCEVA	0.057	1.469	0.141	Constant	14.511	0.000
				SCEVA	-3.387	0.141
CEEVA	0.080	11.211	0.027*	Constant	14.231	0.000
				CEEVA	3.100	0.027*
ICEVA	0.101	26.412	0.005*	Constant	19.254	0.000
				ICEVA	5.426	0.005*
MVAIC	0.063	12.600	0.000*	Constant	14.474	0.000
				MVAIC	3.550	0.000*

Note : Here *p<.05; n=190

Independent Variable	R^2	F-Value	p-value	Coefficients	t-value	Significance
HCEVA	0.129	6.424	0.012*	Constant	19.903	0.000
				HCEVA	2.535	0.012*
RCEVA	0.061	5.712	0.040*	Constant	22.762	0.000
				RCEVA	5.844	0.040*
SCEVA	0.089	18.429	0.080	Constant	25.953	0.000
				SCEVA	-4.293	0.080
CEEVA	0.089	26.412	0.000*	Constant	25.953	0.000
				CEEVA	4.293	0.000*
ICEVA	0.037	0.255	0.014*	Constant	25.571	0.000
				ICEVA	5.505	0.014*
MVAIC	0.087	17.935	0.000*	Constant	25.544	0.000
				MVAIC	4.235	0.000*
Note : Here *p<.05; n=190						

Table III depicts the result of the third set of hypothesis i.e. H3 (H3a, H3b, H3c, H3d and H3e) which analyze the relationship between MVAIC and Market Valuation of a firm, as measured by its Market to Book Value Ratio (MB). Among all the three performance indicators, MVAIC is found to have the strongest explanatory power (R-Square = 15 per cent) for the MB ratio of the sample companies. It may be inferred that investors in the pharmaceutical sector of India give preference to how much a

Table III: Regression results on Value Creation Efficiency of MVAIC and Its sub-components with Market to Book Value of Pharmaceutical Sector in India

Independent Variable	R^2	F-Value	p-value	Coefficients	t-value	Significance
HCEVA	0.157	10.254	0.000*	Constant	7.705	0.000
				HCEVA	3.788	0.000*
RCEVA	0.045	1.386	0.053	Constant	9.264	0.000
				RCEVA	-2.621	0.053
SCEVA	0.010	15.000	0.007*	Constant	7.415	0.000
				SCEVA	0.016	0.007*
CEEVA	0.050	4.337	0.119	Constant	10.246	0.000
				CEEVA	2.083	0.119
ICEVA	0.105	2.002	0.096	Constant	10.196	0.000
				ICEVA	1.048	0.096
MVAIC	0.146	14.090	0.045*	Constant	10.087	0.000
				MVAIC	2.022	0.045*
Note : Here *p<.05; n=190						

company is investing in developing its Intellectual Capital base. As in the case of profitability and productivity, HCEVA has emerged as the most significant driver of value creation, as far as market

performance of a firm is concerned. Further, ICEVA, RCEVA and CEEVA show insignificant interaction with MB.

General trends of low R square values have been observed in all the above regression models. Rahman & Ahmed (2012) claim that such an occurrence may be attributed to a variety of factors. Primarily, the traditional performance indicators taken in the study can be influenced by a number of factors such as –'*expectations about future revenue generation or profit growth, the prospect of paying dividends, the present financial situation of a company in terms of liquidity, solvency, profitability or efficiency of a company or simply speculation about the company or its ability to achieve sustainability*' (Rahman & Ahmed,2012; pp. 133)

In the present study, only five independent variables were taken to analyze the value creation efficiency of firms and to assess their explanatory power on firm profitability, productivity and market valuation, for the chosen regression model. Considering the large number of other independent factors that could influence ROA, ATO and MB of a firm, the Adjusted R square values obtained in the present study, are quite satisfactory.

Table IV contains the results of Hypothesis 4 which stated that 'in comparison to the Classic VAIC^{TM} Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India'. By observing the Adjusted R-Square values of both the models in terms of firm profitability, productivity and market valuation, it may be concluded that all the three hypotheses (H4a, H4b and H4c) have found support in the present study. The predictability of MVAIC model is much better as compared to the VAIC^{TM} Model. The MVAIC Model explains 43.9 per cent (0.439) of the variance of ROA, as compared to VAIC^{TM} Model which has an adjusted R-square value of 42.3 per cent (0.423). This means that Hypothesis H4a is supported and accepted for the Indian Pharmaceutical sector. Adjusted R Square of the MVAIC Model is 0.273 for ATO, which indicates that the model is able to explain 27.3 per cent of the variance in this dependent variable. This value is higher as compared to the Adjusted R square value of the VAIC^{TM} Model, which is 0.200 (20 per cent). This data reinforces the finding that the proposed MVAIC Model is a better predictor of value creation in pharmaceutical sector, in terms of firm productivity. Hence, Hypothesis H4b is supported.

On similar lines, the value of adjusted R square for the MVAIC Model, in terms of MB, was capable to explain about 26 per cent (0.260) of the variance in the market valuation of firms. This is only slightly higher than the explanatory power of the VAIC^{TM} Model i.e. 25.9 per cent (0.259). Thus, the hypothesis H4c, which stated that 'in comparison to the VAIC^{TM} Model, the proposed MVAIC model is a better predictor of value creation efficiency of knowledge based firms in India, in terms of firm's market value (Higher MB)' has been supported in the present study. The findings have been corroborated by the study of Vishnu (2015) on the Indian Pharmaceutical firms where a modified version of VAIC^{TM} was proposed and on the basis of the adjusted R square values, it emerged as a better predictor of value creation in firms, as compared to the classic VAIC^{TM} Model developed by

Pulic (1998). On the other hand, Nyugen (2016) found no statistically significant difference between his modified version of VAIC^{TM} (inclusive of R & D expenditures and Marketing Expenditures) and

Table IV: Comparative Analysis of proposed model (M-VAIC) and VAIC^{TM} with reference to performance of Pharmaceutical Sector firms in India

Dependent Variable	Model	Adj. R^2	F-Value	P-Value	Coefficients	t-value	Significance
ROA	**M-VAIC**	**0.439**	36.582	0.000*	**Constant**	10.960	0.000
					HCEVA	4.007	0.000*
					CEEVA	5.230	0.000*
					RCEVA	-1.307	0.122
					ICEVA	6.520	0.014*
					SCEVA	1.056	0.403
	VAIC^{TM}	**0.423**	47.172	0.000*	**Constant**	-2.405	0.017
					HCE	5.252	0.000*
					SCE	2.281	0.024*
					CEE	7.233	0.000*
ATO	**M-VAIC**	**0.273**	18.884	0.000*	**Constant**	14.497	0.000
					HCEVA	-.449	0.654
					CEEVA	5.321	0.000*
					RCEVA	4.137	0.000*
					ICEVA	.266	0.791
					SCEVA	2.770	0.006*
	VAIC^{TM}	**0.200**	16.796	0.000*	**Constant**	10.449	0.000*
					HCE	3.520	0.005*
					SCE	-3.539	0.001*
					CEE	6.366	0.000*
MB	**M-VAIC**	**0.260**	5.426	0.000*	**Constant**	5.236	0.000
					HCEVA	4.563	0.001*
					CEEVA	-2.545	0.156
					RCEVA	2.356	0.252
					ICEVA	-0.256	0.781
					SCEVA	2.364	0.005*
	VAIC^{TM}	**0.259**	4.446	0.005*	**Constant**	2.254	0.000
					HCE	3.443	0.001*
					SCE	0.707	0.481

	CEE	-.332	0.740

Note : Here *p<.05; n=190

the classic VAIC^{TM} and thus concluded that the original model developed by Pulic (1998) is sufficient to understand the value creation efficiency of firms.

VI. Conclusion

In the developing knowledge based economy of India, progress is taking place at such a rapid pace that would be very difficult to grasp and explore the emerging opportunities in the corporate world, without developing a proper insight into what creates value in such enterprises. A number of research studies, discussions forums, workshops and conferences are been organized, therefore, to analyze the drivers of competitive advantage and value creation in knowledge based companies –the future of Indian corporate sector. The need of the hour, consequently, is to examine and report the drivers of value creation in knowledge based companies and this is the main objective of the present study. Intellectual capital, along with its sub-components, emerged as the top driver of value creation through an extensive literature review.

Overall, the hypotheses constructed to link MVAIC, in totality, with ROA, ATO and MB, (H1, H2 & H3) found complete and undisputed support from all the three measures of financial performance chosen for the present study. This, in fact, is the true success of this study. The fact that a newly developed measure of value creation efficiency found support and positive association with the three traditional measures of financial performance of firms i.e. ROA, ATO and MB, is indeed quite heartening. The findings of the present study are found to be in total support of germane literature which recognises the importance of Intellectual capital as the 'fourth factor of production in addition to land, labor and financial capital' (Mondal, 2014; pp.159). Further, Human Capital, Capital Employed and Innovation Capital have emerged as the top three drivers of value creation, depending upon their positive and significant links with all the three measures of financial performance, across all the four sectors chosen for the study. These findings open up multiple dimensions and implications for future research.

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List of Abbrevaitaions

VAIC™	Value Added Intellectual Coefficient
HCE	Human Capital Efficiency
SCE	Structural Capital Efficiency
CEE	Capital Employed Efficiency
MVAIC	Modified Value Added Intellectual Coefficient
HCEVA	Human Capital Efficiency Value Addition
ICEVA	Innovation Capital Efficiency Value Addition
RCEVA	Relational Capital Efficiency Value Addition
SCEVA	Social Capital Efficiency Value Addition
CEEVA	Capital Employed Efficiency Value Addition
ROA	Return on Assets
ATO	Asset Turnover Ratio
MB	Market to Book Value
IT	Information Technology