The Impact of Intellectual Capital Efficiency on Financial Performance in the Indian Auto - Component Industry

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Abstract

Purpose : The purpose of this paper was to study and discover the financial health of a company by measuring the relationship between the intellectual capital (IC) components with the traditional measures of organizational performance - financial, economic, and stock market.

Design/Methodology/Approach : Using data from a sample of 42 listed companies from the Indian auto-component industry for the period from 2008 - 2013, this study applied the most attractive IC measurement model known for its practical and empirical validity (Zeghal & Maaloul, 2010). This measurement methodology is called the modified Value Added Intellectual Coefficient (M-VAIC) propounded by Nimtrakoon (2015). This is an optimized framework that improvises the popular and widely - used Value Added Intellectual Coefficient (VAIC™) model of Pulic (2000, 2004, 2008) as addition of new variables to the VAIC™ model improves its explanatory power.

Findings : The Indian auto component manufacturing companies seemed to be performing effectively by utilizing their IC as seen by the empirical results during the period from 2008 - 2013 in spite of the economic recession of 2008 and its aftermath.

Research Limitations/Implications : The results suggested that stakeholders still perceive the performance of firms in terms of tangible assets as the sole driver of organization success and less in terms of IC. This opens up avenues for further discovery/ findings to prove/disprove the same in other industries.

Practical Implications : There is an imperative need for researchers, academics, business practitioners, and policy makers to get aware of IC and pitchfork it into the core of business. This study would benefit all stakeholders to achieve financial performance.

Originality/Value : This is one of the pioneering attempts to measure IC and its relationship with the traditional measures of corporate performance in the Indian auto - component industry. This paper added to the existing literature by providing a new dimension of performance measurement.

Keywords : **Intellectual capital, value added intellectual coefficient (VAIC™), modified value added intellectual coefficient (M-VAIC), linear multiple regression (LMR), structural equation modeling (SEM), value add (VA)**

JEL Classification : C12, L21, L62

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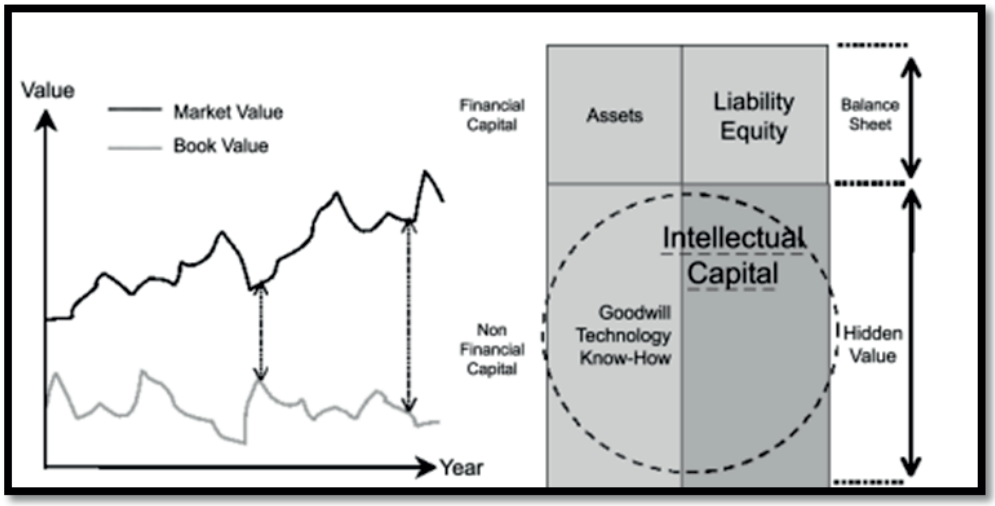
Intellectual capital (IC) is the core asset of the third millennium enterprise (Brooking, 1996) because IC can lead to multiplication effect to provide greater value creation in the organization and the national economy than the value of the original investment, thereby offering sustainability to the organization (Lentjušenkova & Lapina, 2016). Authors assumed that if a company is economically successful, it will exhibit a healthy and profitable financial state of affairs, which is going to reverberate on its stock market performance (Zeghal & Maaloul, 2010).

Research Issue

According to Kujansivu and Lönnqvist (2007), there are two main ways of determining the value of a company: based on the company's financial statement (balance sheet) or based on its market value (stock market). Nowadays, the two values differ quite a lot (Edvinsson & Malone, 1997). Market value is often much higher than book value. To acquire external financing (Bontis, 2003) and to sell/purchase a knowledge - intensive organisation, book value may represent only a small portion of a company's actual (or assumed) value. Performance measures are based on financial statement information, but the balance sheet captures only a small portion of IC. However, a company's profits are created as a result of all its existing resources – including IC. So, companies may be underestimated in the markets unless they can prove their actual worth, that is, prove the value of their IC.

The value of companies being worth more than their book value was authenticated by the study of Lev (2001), who showed that the market-to-book value ratios of U.S. Standard and Poor's (S&P) corporations increased from slightly above 1 to over 5. This implies an irony that about 80% of the corporate market value is not reflected in financial reporting (Figure 1). This gap may be largely justified with the absence of IC from financial statements. Thus, traditional accounting systems do not fully reflect the success of a company. Despite the importance of IC during the last two decades (Serenko & Bontis, 2004), many organizations are still struggling with IC management because of measurement difficulties (Dzinkowski, 2000). This leads to the need for research to comprehend the power of IC in business value through a measurement methodology (Wijaya, Tandelilin, Rahayu, & Hermeindito, 2016). Hence, the need for this study.

Figure 1. Gap Between Market Value and Book Value



Source: Reproduced from Market Intelligence Centre, Taiwan (2003)

Literature Review

(1) Intellectual Capital and VA : According to Stewart (1997), IC is intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth by developing competitive advantage in an organization. The classification of IC came into being only from the late 1990s (Zeghal & Maaloul, 2010). IC components include human capital, structural capital, relational capital (Goebel, 2015), and physical and financial capital (Pulic, 2004 ; Sveiby, 1997). Goebel (2015) studied 22 prior IC research frameworks and identified 39 items in human capital, 43 items in structural capital, and 41 items in relational capital.

Sveiby (2010) studied the 42 IC measurement models by classifying them into four broad categories – direct

Table 1. Calculus of VAIC™ Coefficient

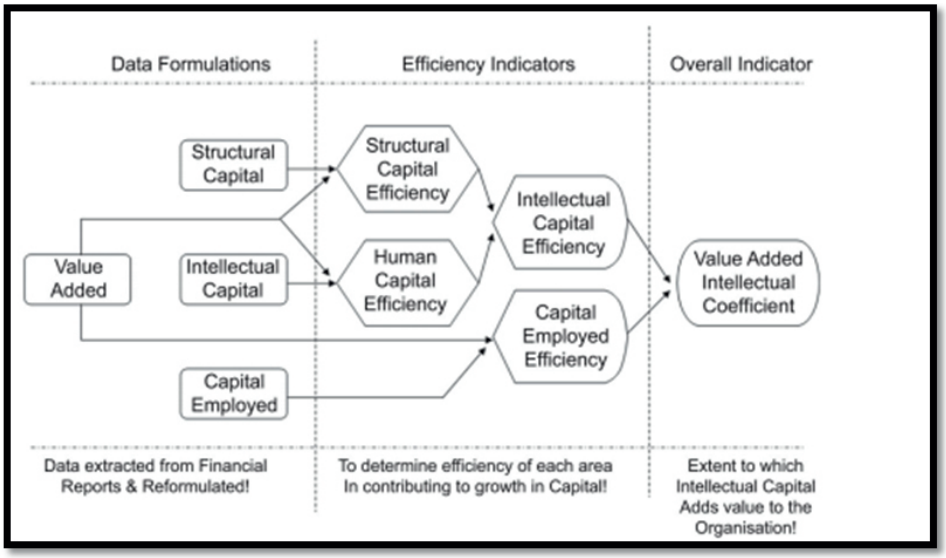
Steps	Title formula	Variables operationalized	Source	Comments
1	Value added *(VA)* *VA=OP+EC+D+A*	*OP*=Operating profit; *EC* = Employee costs *D* = Depreciation *A* = Amortization	Profit and loss statement; Notes to financial statement.	Employee costs are added back to operating profit because these costs are now treated as part of the IC (i.e. a form of asset).
2	Intellectual Capital *(IC)* *IC=EC+SC*	*SC* = Structural capital *HC* = Human capital *SC = VA - HC*	Profit and loss statement; Notes to financial statement.	
3	Human Capital Efficiency *HCE = VA / HC*		Fiat measure (derived)	Human capital efficiency is the indicator of the efficiency of human capital resources to add value.
4	Structural Capital Efficiency *SCE= SC / VA*		Fiat measure (derived)	
5	Intellectual Capital Efficiency *(ICE)* *ICE= HCE + SCE*		Fiat measure (derived)	"...IC reflects the efficiency of value created by IC employed (Kujansivu & Lonnqvist, 2007, p. 276).
6	Capital employed efficiency *(CEE)* *CEE = VA / CE*	*CE* = Book value of net assets	Balance sheet statement; Notes to financial statement.	Capital employed efficiency indicates how much of the added value is generated from the capital employed
7	Value added intellectual coefficient *(VAIC)* *VAIC = ICE + SCE*		Fiat measure (derived)	"VAIC" measures how much new value has been created as per invested monetary unit in each resource. A coefficient indicates a higher value creation using the company's resources (Pulic, 2004, p. 65). ".....VAIC does not present the monetary value of IC. Instead, it considers different efficiency factors related to IC, and in so doing, evaluates how effectively the organization's IC adds value to the organization (Kujansivu & Lonnqvist, 2007, p. 276).

Source: Laing, Dunn, & Hughes-Lucas (2010)

intellectual capital (DIC) methods, market capitalization methods (MCM), return on assets (ROA) methods, and scorecard (SC) methods. Amongst these, the MCM and ROA methods require aggregate inputs and measure IC at an organizational level. In comparison, the DIC and SC methods use individual (component-wise) inputs for finer valuation of IC. A popular ROA method for studying the impact of IC on corporate performance is the value added intellectual coefficient (VAIC) model that is used in this study as a measure of IC efficiency.

(2) Value Added as an Indicator of IC (the Pulic VAIC™ Method) : An approach that has potential for practical application in the analyses of information from the financial reports of a business is the VAIC™ methodology developed by Pulic (2000). Andriessen (2004) said it is a better tool for analyzing IC being a simplified process derived from audited information (Firer & Williams, 2003) which when combined, provides a far more objective and verifiable data set (Pulic, 2000). VAIC™ measures and monitors the total value creation efficiency in the company and represents the most widely used measure of IC efficiency (Dženopoljac & Janoševic, 2016). The VAIC™ model requires the calculation of a number of variables and coefficients to arrive at the final indicator (Pulic, 2004) comprising of seven steps (Table 1). To provide further insight into the outcomes of the process, an overview of the VAIC™ model is presented in the Figure 2.

Figure 2. Overview of the Theoretical VAIC™ Model of Pulic



Source: Reproduced from G. Laing, J. Dunn, & S. Hughes - Lucas (2010). Applying the VAICTM model to Australian hotels (p. 276). *Journal of Intellectual Capital, 11* (3), 269 - 283.

This aggregated indicator (VAIC) shows how much new value is created by each monetary unit invested in resources. The higher this coefficient, the better is a company's IC in creating value for its stakeholders more and more efficiently (Pulic, 2008). The information required to undertake the seven steps are available from published financial statements of the sample companies.

(3) IC Benchmark Values : Pulic's VAIC™ indicates the total efficiency of value creation from all resources employed, reflecting the efficiency of value created by the IC employed (Kujansivu & Lönnqvist, 2007). A quick evaluation of firm performance is shown in the Table 2. Pulic (2008) calculated benchmark values for VAIC for a

Table 2. IC Efficiency and Measure of Performance

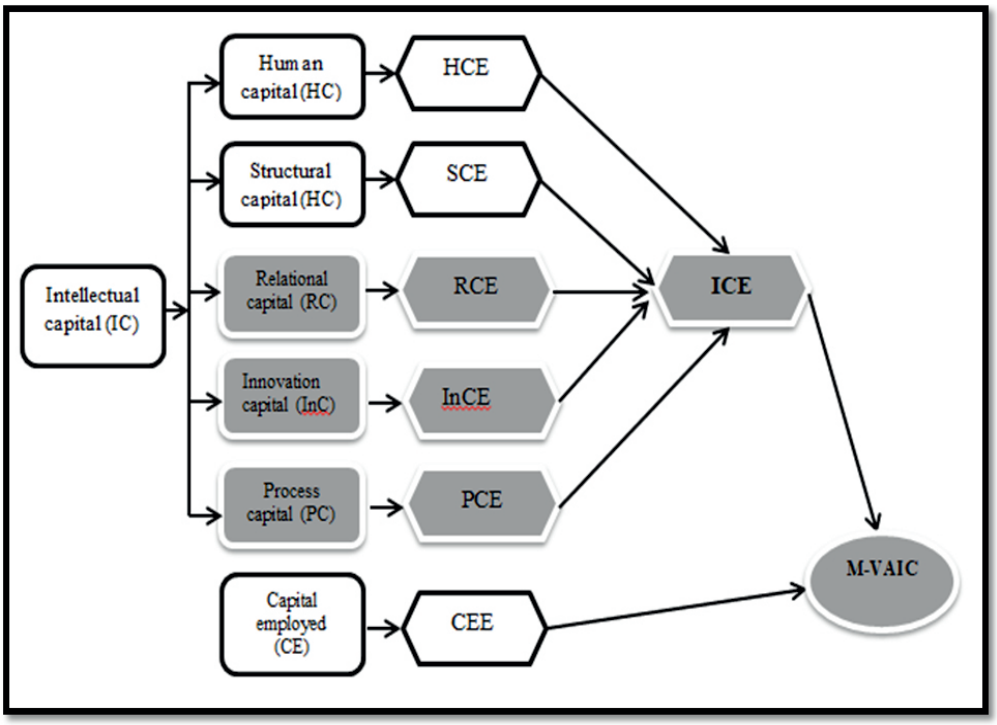
Intellectual Capital Efficiency *(VAIC)*	Human Capital Efficiency *(HCE)*	Structural Capital Efficiency *(SCE)*	Judgement
1	1	0	Worse performance (much worrying, edge of survival)
1.25	1.13	0.12	Low performance (worrying)
1.75	1.44	0.31	Relatively good performance
2.00	1.62	0.38	Good performance
≥ 2.5	≥ 2	≥ 0.5	Successful performance

Source: Pulic (2008) and Iazzolino & Laise (2013)

quick evaluation of firm performance (Column #1). HCE (Column #2) and SCE (Column #3) values were calculated by Iazzolino and Laise (2013).

(4) Modified VAIC Method – The Proposed Model : According to Vishnu and Gupta (2014), Pulic's VAIC™ model measures efficiencies of human capital, structural capital, and capital employed. Although celebrated, VAIC™ has been criticized by Stahle, Stahle, and Aho (2011) for theoretical inconsistencies and non-inclusion of relational capital (RC) in the model. In the light of this criticism, this research study has modified Pulic's original VAIC™ model. Most researchers in the past have used VAIC™ model in its original form (Maditinos, Chatzoudes, Tsairidis, & Theriou, 2011). However, some researchers modified and extended the original model (Nimtrakoon,

Figure 3. Overview of Theoretical Modified VAIC Model (M-VAIC)



Source: Adapted From Nimtrakoon (2015)

2015) to address the limitations of the VAIC™. It is found that the addition of new variables to VAICTM model improves its explanatory power.

This study is an advancement over the work of past researchers. The research study modifies and extends Pulic's VAIC™ by adding extra components of value creation based on the works of Nimtrakoon (2015) by adding two new variables (innovation capital and process capital) that affect company performance. Following Nimtrakoon (2015), we improved our M-VAIC model in this study as shown in the Figure 3. This research seeks to fill gap in the literature, aiming to extend the scope covered by Nimtrakoon (2015).

(5) Prior IC Research In India : The first IC report in the world was born in 1994 in the Swedish insurance company, Skandia. According to de Pablos (2005), three big Indian companies – Reliance Industries Limited, Balrampur Chini Mills Limited, and Shree Cement Limited – published their first IC report in 1997. In spite of being an early bird, IC research in India is a new phenomenon (Vishnu & Gupta, 2014). India has immense IC potential. Hence, measurement of IC efficiency and its association with organisational performance - financial, economic, and stock market - will be of interest to business leaders, managers, academicians, investors, and other stakeholders at large.

Research Objective and Hypotheses – The Conceptual Model

The objective of this study is to empirically assess the impact of IC under the following triptych: economic performance (OI/S : Model 1), financial performance (ROA: Model 2 and ROE: 3), and stock market performance (MB: Model 4).

(1) Economic Performance Model : There are four types of value analyzed in the scientific literature - economic value, environmental and social value, customer value, and information value (Lentjušenkova & Lapina, 2016 ; Maji & Hazarika, 2016). Performance is defined by operating profitability which represents an economic surplus or an economic margin acquired by the difference between income and production costs (Cappelletti & Khouatra, 2004). Economic income = operating income/sales (OI/S). We would investigate the following hypotheses :

- **H1a :** There is a significant and positive association between *HCE* and *OI/S*.
- **H1b :** There is a significant and positive association between *SCE* and *OI/S*.
- **H1c :** There is a significant and positive association between *CEE* and *OI/S*.
- **H1d :** There is a significant and positive association between *VAIC* and *OI/S*.
- **H1e :** There is a significant and positive association between *M-VAIC* and *OI/S*.

(2) Financial Performance Model : Many authors strongly believed that IC could have a positive effect on a company's financial performance to achieve competitive advantages (Chen, Cheng, & Hwang, 2005). IC intensive companies are more competitive than other companies and are more successful (Youndt, Subramaniam, & Snell, 2004). Many researchers have suggested the potential IC contributions to productivity (Petty & Guthrie, 2000). We would investigate the following hypotheses with return on asset (ROA) and return on equity (ROE) as proxies for financial performance :

- **H2a :** There is a significant and positive association between *HCE* and *ROA*.
- **H2b :** There is a significant and positive association between *SCE* and *ROA*.

- **H2c :** There is a significant and positive association between *CEE* and *ROA*.
- **H2d :** There is a significant and positive association between *VAIC* and *ROA*.
- **H2e:** There is a significant and positive association between *M-VAIC* and *ROA*.
- **H3a :** There is a significant and positive association between *HCE* and *ROE*.
- **H3b :** There is a significant and positive association between *SCE* and *ROE*.
- **H3c :** There is a significant and positive association between *CEE* and *ROE*.
- **H3d :** There is a significant and positive association between *VAIC* and *ROE*.
- **H3e :** There is a significant and positive association between *M-VAIC* and *ROE*.

(3) Stock Market Performance Model : Lev (2001) was of the view that the increasing gap between a company's market and book value could be a result of not taking IC into account in financial statements. This gap is usually exhibited in market-to-book (MB) ratio. This indicates that investors perceive IC as a source of value for a company, although it is not present in the company's book value. IC intensive companies are valued more in the stock market than are other companies, according to Skinner (2008). Investors would place higher value on companies with greater IC (Firer & Williams, 2003). Nevertheless, investors would not limit their investments to companies with greater IC, but select their portfolios of companies that have a track record of continuous creation of VA in an efficient and sustainable way (DTI, 2006). Hence, we investigated the following hypotheses with market-to-book (MB) ratio as a proxy for stock market performance :

- **H4a :** There is a significant and positive association between *HCE* and *MB*.
- **H4b :** There is a significant and positive association between *SCE* and *MB*.
- **H4c :** There is a significant and positive association between *CEE* and *MB*.
- **H4d :** There is a significant and positive association between *VAIC* and *MB*.
- **H4e :** There is a significant and positive association between *M-VAIC* and *MB*.

Research Methodology

(1) Source Documentation, Sample Selection, and Data Collection : Forty two (42) companies affiliated to the Automotive Components Manufacturers Association (ACMA) of India were selected based on the following : (a) companies should report their intangibles in their annual reports (Joshi, Min, Deshmukh, & Jaffar, 2016), (b) companies for which some data were missing (unavailability of annual reports in consequence of merger, repurchase, suspension, delisting) were excluded, (c) companies with negative book value of equity or companies with negative human capital or structural capital values were excluded from the sample (Shiu, 2006), and (d) to control the presence of "outliers," companies with selected variables situated at the extremities of every distribution were eliminated. This longitudinal research study spans 5 years (2008 - 2013) that coincides with the economic recession and its aftermath.

(2) Definition of Variables :

(i) Dependent Variables

- ***OI/S* :** This is economic income. This ratio of the operating income divided by total sales is used as a proxy for

economic performance (Lev, 2004).

↳ **Return on Assets *(ROA)* :** It is a common, traditional accounting performance measure used as a key performance indicator of profitability of companies in their annual reports. It is computed as the ratio of operating income to book value of the total assets of a company.

↳ **Return on Equity *(ROE)* :** It is the ratio of earnings after interest and taxes divided by book value of total assets, used as a proxy measure for financial performance.

↳ **Market - to - Book Value *(MB)* :** It is the ratio of the total market capitalization (share price times number of outstanding common shares at year-end) to book value of net assets, used as a proxy for stock market performance (Firer & Williams, 2003).

(ii) Independent Variables : The measures of independent variables are :

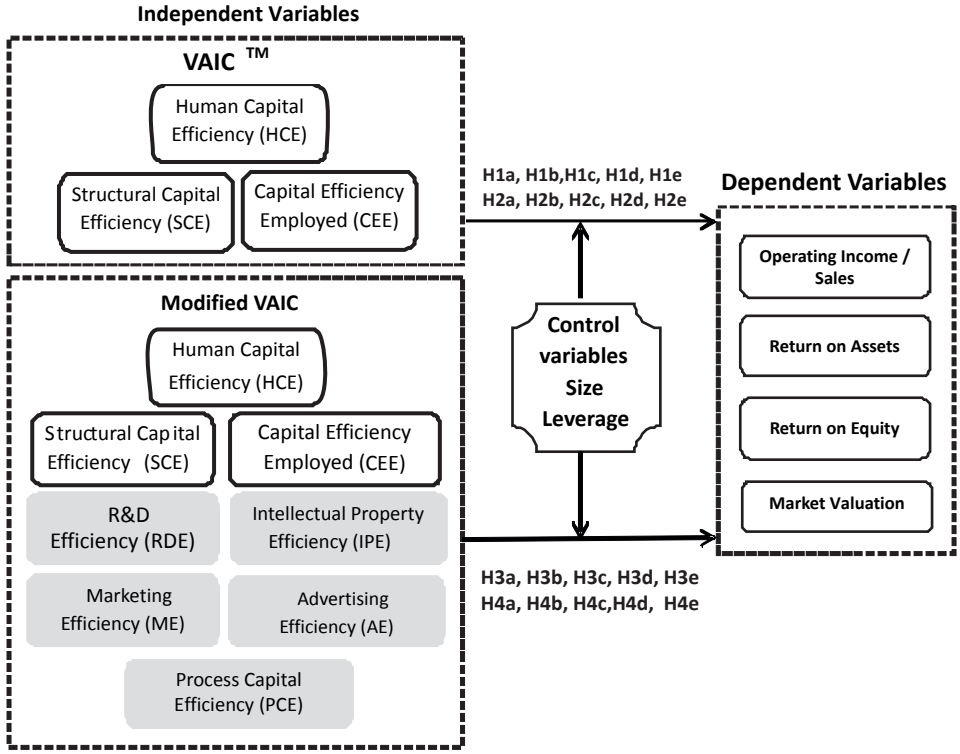
↳ **Capital Employed Efficiency *(CEE)* :** This is an indicator of VA efficiency of capital employed.

↳ **Human Capital Efficiency *(HCE)* :** This is an indicator of VA efficiency of human capital.

↳ **Structural Capital Efficiency *(SCE)* :** This is an indicator of VA efficiency of structural capital.

VAIC™ is a composite sum of three separate indicators, which are :

Figure 4. Overview of the Conceptual Model for Research



Source: Adapted from Zeghal and Maaloul (2010) and Nimtrakoon (2015)

$$VAIC_i = HCE_i + SCE_i + CEE_i$$

where, $VAIC_i$ is the value added intellectual coefficient for the firm i ; CEE_i is the capital employed efficiency coefficient for firm i, HCE_i is the human capital efficiency coefficient for the firm i, and SCE_i is the structural capital efficiency coefficient for firm i.

(iii) Control Variables : To minimize the impact of other variables that may explain observed relationships with firm performance of the 42 sample companies, two control variables are included within the regression models: They are as follows :

- **Size of the Firm:** It is measured by the natural log of total market capitalization.
- **Leverage :** It is total debt divided by book value of total assets (Firer & Williams, 2003) as reported in the annual report. A high proportion of debt may lead a firm to primarily focus on the needs of debt holders (Williams, 2001). Alternatively, firms that rely heavily on debt may lack the security required to attract investors, and will likely have higher interest payments, reflecting on the riskiness and returns of the firm.

(3) Empirical Model : Marr and Schiuma (2004) emphasized the importance of IC to create value and to apply rigorous research methods to measure the effectiveness of the existing model. The Figure 4 summarizes all the hypotheses in the proposed conceptual research model of the study.

(4) Regression Equations : In order to respond to our research objective, we propose to empirically test the following regression equations relating to the economic (Model 1), financial (Model 2 and Model 3), and stock market (Model 4) models as given in the Table 3.

Table 3. Regression Equations

Model	Regression equation
1	$OI/S = \beta_o + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 Size + \beta_5 Lev + \mu$
2	$ROA = \beta_o + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 Size + \beta_5 Lev + \mu$
3	$ROE = \beta_o + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 Size + \beta_5 Lev + \mu$
4	$MB = \beta_o + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 Size + \beta_5 Lev + \mu$
5	$OI/S = \beta_0 + \beta_1 VAIC + \beta_2 Size + \beta_3 Lev + \mu$
6	$ROA = \beta_0 + \beta_1 VAIC + \beta_2 Size + \beta_3 Lev + \mu$
7	$ROE = \beta_0 + \beta_1 VAIC + \beta_2 Size + \beta_3 Lev + \mu$
8	$MB = \beta_0 + \beta_1 VAIC + \beta_2 Size + \beta_3 Lev + \mu$
9	$OI/S = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 RDE + \beta_5 IPE + \beta_6 PCE + \beta_7 ME + \beta_8 AE + \beta_9 Size + \beta_{10} Lev + \mu$
10	$ROA = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 RDE + \beta_5 IPE + \beta_6 PCE + \beta_7 ME + \beta_8 AE + \beta_9 Size + \beta_{10} Lev + \mu$
11	$ROE = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 RDE + \beta_5 IPE + \beta_6 PCE + \beta_7 ME + \beta_8 AE + \beta_9 Size + \beta_{10} Lev + \mu$
12	$MB = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 RDE + \beta_5 IPE + \beta_6 PCE + \beta_7 ME + \beta_8 AE + \beta_9 Size + \beta_{10} Lev + \mu$

(5) Research Method : Descriptive analysis, Pearson correlation, one-way ANOVA, LMR, and SEM are applied to test the hypotheses. LMR is used to compare IC efficiency, while SEM is employed to investigate the association between IC efficiency and measures of corporate performance.

Table 4. Descriptive Statistics

	N	Minimum	Maximum	Mean	Median	Std. Deviation	Skewness	Kurtosis
DEPENDENT VARIABLE								
OI/S	42	-0.07	0.28	0.12	0.12	0.06	0.21	0.68
ROA	42	1.94	6.81	4.73	14.5	6.84	0.25	0.12
ROE	42	3.27	8.07	5.24	16.9	0.74	-2.33	13.11
MB	42	0.71	7.05	3.41	11.65	5.4	3.58	16.52
INDEPENDENT VARIABLE								
HCE coefficient	42	0.94	8.21	3.09	2.72	1.25	1.28	1.61
SCE Coefficient	42	0.07	0.88	0.63	0.63	0.14	1.03	3.41
ICE Coefficient	42	0.87	9.09	3.72	3.36	1.37	1.11	1.22
CEE Coefficient	42	0.04	0.88	0.44	0.45	0.17	0.27	0.56
VAIC	42	0.91	9.5	4.16	3.85	1.36	1.13	1.52
R & DE	42	0.06	7.54	0.41	0.13	0.97	5.02	29.32
IPE	42	0.09	8.27	4.94	12.01	8.99	4.6	22.94
PCE	42	0.01	0.87	0.47	0.46	0.21	-0.21	-0.72
ME	42	0.03	0.46	0.05	0.04	0.18	2.11	3.41
AE	42	0.05	1.92	0.15	0.03	0.28	3.24	13.05
Modified VAIC	42	0.84	10.4	4.93	4.62	1.56	0.97	1.11
CONTROL VARIABLE								
SIZE	42	3.49	11.23	7.26	7.21	1.55	0.31	0.01
LEV	42	0.53	2.41	0.59	0.48	0.28	2.19	11.97

Empirical Analysis and Results

(1) Descriptive Statistics : The Table 4 presents the minimum, maximum means, standard deviations, skewness and kurtosis values of the dependent and independent variables in the research model. The mean of aggregate *VAIC* of 4.16 indicates that the Indian auto - component companies created ₹ 4.16 for every ₹ employed. As per the theoretical expectation, the mean aggregate of modified *VAIC* which is ₹ 4.93 indicates that companies created ₹ 4.93 for every ₹ employed. This shows that the modified *VAIC* has got more explanatory power than *VAIC* (Clarke, Seng, & Whiting, 2011) because of inclusion of relational capital, innovation capital, and process capital. Secondly, the mean of *HCE* coefficient is about 3.09 against the mean *SCE* coefficient of 0.63. This shows that human capital in the Indian auto - component industry gets primacy over structural capital. Thirdly, the mean score of *SCE* coefficient is 0.63 and capital employed efficiency is 0.44 ; whereas, the value of *HCE* is 3.09. The possible reason could be that the Indian auto-component companies were frugal as regards structural capital and physical & financial capital and invested in human capital to reap rich dividends to tide over the economic recession.

Table 5. One - Way ANOVA Test

	n	*Sum of squares*	*Df = n-1*	*Mean square*	*F*	*Sig.*
OI/S	42	.423	41	.010	7.876	0.000
ROA	42	6357.290	41	155.056	7.614	0.000
ROE	42	50263.351	41	1225.935	5.194	0.000
MB	42	176907.981	41	4422.700	9.218	0.000

Note: Level of significance at 1%.

(2) Results of One - Way ANOVA Test : ANOVA is to compare the variance of the dependent variable with the variances of each set of effects included in the model. In Table 5, an ANOVA test was administered to find any

Table 6. Pearson Correlation Summary Analysis

Variables		*OI/S*	*ROA*	*ROE*	*MB*
Human Capital Efficiency coefficient	Pearson Correlation	0.68	0.471	0.295	0.486
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Structural Capital efficiency Coefficient	Pearson Correlation	0.713	0.471	0.302	0.404
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Intellectual Capital efficiency Coefficient	Pearson Correlation	0.691	0.476	0.299	0.483
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Capital Employed efficieincy Coefficient	Pearson Correlation	0.125	0.693	0.522	0.059
	Sig. (2-tailed)	0.071	0.000	0.000	0.403
VAIC	Pearson Correlation	0.713	0.57	0.369	0.496
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
R&D efficeincy	Pearson Correlation	0.434	-0.048	-0.054	-0.021
	Sig. (2-tailed)	-0.054	0.489	0.433	0.77
Intellectual Property Efficiency	Pearson Correlation	0.858	-0.134	-0.111	-0.023
	Sig. (2-tailed)	0.014	0.09	0.158	0.771
Process capital efficency	Pearson Correlation	0.285	0.238	0.171	0.078
	Sig. (2-tailed)	0.000	0.002	0.025	0.313
Marketing efficiency	Pearson Correlation	0.959	-0.082	-0.219	0.107
	Sig. (2-tailed)	0.004	0.235	0.001	0.126
Adveritsing Efficeincy	Pearson Correlation	0.629	0.176	-0.103	0.492
	Sig. (2-tailed)	0.033	0.01	0.136	0.000
Modified VAIC	Pearson Correlation	0.689	0.569	0.329	0.556
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
SIZE	Pearson Correlation	0.417	0.381	0.286	0.733
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
LEV	Pearson Correlation	-0.234	-0.345	-0.54	-0.111
	Sig. (2-tailed)	0.001	0.000	0.000	0.115

significance of difference between the means of the measures of corporate performance. The Table 5 indicates the *F*-values at 7.87, 7.61, 5.19, and 9.21. With desirable level of significance, there is a statistically significant difference in *OI/S, ROA, ROE,* and *MB*. The one-way ANOVAs relating cluster membership to the four performance indicators prove to be a strong validator of the homogeneity-within-and-difference-between criterion ($p < 0.001$).

(3) Correlation Analysis : Pearson's *r* between each pair of independent variables does not exceed 0.85. The results in Table 6 indicate that none of the squared correlations are close to 0.85 to suggest a problem with multicollinearity among the variables. The correlation is significant at 0.05 and 0.01 level, respectively (two-tailed).

(4) Hypotheses Verification

(i) Linear Multiple Regression (LMR) Results of *VAIC* Individual Components : Following Nimtrakoon (2015) and Dženopoljac and Janoševic (2016), regression is used to find the coefficients and linear best fit. The LMR models in Table 7 are explained below:

↳ ***OI/S* Model:** In Panel A, the adjusted R^2 is 0.557, explaining more than 55.7% of the variance in the dependent variable by using *VAIC* components after controlling for firm size and leverage. The model fit ranks at 55.7 %. *HCE* is positively associated with *OI/S* with β coefficient = 0.257 ($p < 05$), *SCE* with *OI/S* (β coefficient = 0.495; $p < 001$), physical and financial capital *(CEE)* with *OI/S* (β coefficient = 0.201; $p < 001$). This is in line with the

Table 7. LMR Results (*VAIC*™ Model)

	Panel A: OI/S			*Panel B:ROA*			*Panel C:ROE*			*Panel D:MB*		
N	42			42			42			42		
Adjusted R^2	0.557			0.814			0.546			0.55		
F-Statistic	52.005			79.122			49.879			50.696		
Significance	0.000***			0.000***			0.000***			0.000***		
	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.
Intercept		-2.986	0.003 ***		-6.62	0.000 ***		-2.45	0.015**		-6.976	0.000***
Independent variables												
HCE	0.257	2.545	0.012**	0.329	5.045	0.000***	0.157	1.539	0.125	0.331	3.258	0.001***
SCE	0.495	5.036	0.000***	0.243	3.812	0.000***	0.129	1.297	0.196	-0.203	-2.051	0.042**
CEE	0.201	4.15	0.000***	0.738	23.598	0.000***	0.481	9.847	0.000***	0.076	1.566	0.119
Control variables												
SIZE	0.014	0.249	0.804	0.045	1.235	0.218	0.045	0.788	0.432	0.666	11.79	0.000***
LEV	-0.06	-1.239	0.217	-0.108	-3.421	0.001***	-0.406	-8.239	0.000***	0.059	1.199	0.232

Note : *, **, and *** represent level of significance at 10 % (statistical significance at the level of 90%), 5 % (statistical significance at the level of 95%), and 1% (statistical significance at the level of 99%), respectively.

findings of Firer and Williams (2003) in South Africa that physical capital is the most basic factor influencing business performance for an emerging market (like India). Firm size and leverage have an insignificant association with *OI/S*.

↳ ***ROA* Model :** In Panel B, the adjusted R^2 is 0.814, exhibiting a high degree of fit and explaining more than 81.4 % of the variance in the dependent variable by using *VAIC* components after controlling for firm size and leverage. The model fit ranks at 81.4 %. The explanatory power of the independent and control variables on firm value are quite high in this model. This model also has the highest *F*-value of 79.122. The model shows *HCE* (β coefficient = 0.329 ; $p < 0.001$) and *SCE* (β coefficient = 0.243; $p < 0.001$) being significant. The high standardized coefficient of physical and financial capital *(CEE)* (β coefficient = 0.738; $p > 0.001$) is consistent with the finding of Zeghal and Maaloul (2010). For firm size and leverage, company resources have insignificant association with *ROA*.

↳ ***ROE* Model :** In Panel C, the adjusted R^2 is 0.546, explaining more than 54.6 % of the variance in the dependent variable by using *VAIC* components after controlling for firm size and leverage. It also shows that the model fit ranks at 54.6%. As regards physical and financial capital *(CEE)*, this variable's regression coefficient has proved to be statistically significant and having a positive (β coefficient = 0.481; $p < 0.001$) relationship with *ROE*. Coefficients of *HCE* and *SCE* indicate a non-significant association with *ROE*, which may be disastrous for the firm in the long run (Kamath, 2007). For both the control variables of firm size and leverage, the results indicate that the company resources have insignificant association with *ROE*.

↳ ***MB* Model :** In Panel D, the adjusted R^2 is 0.550, explaining more than 55% of the variance in the dependent variable by using components of *VAIC* after controlling for firm size and leverage. It also shows that the model fit ranks at 55%. Here, only *HCE* has a positive and significant association with *MB* (β coefficient = 0.331; $p < 0.001$). β coefficient of *SCE* has a negative value (- 0.203) but has significant *p*-value, thereby negatively correlating with *MB*. *CEE* coefficient is not significantly associated with market valuation (β coefficient = 0.076; $p > 10$). In this context, we concur with Ghosh and Mondal (2009) that the Indian capital market is still unaware about the earning capability of IC.

To summarize the four regressions of the individual $VAIC^{TM}$ components, except the negative beta coefficient of *SCE* with *MB* (- 0.203), all the independent variables have positive values to impact the dependent variables. Both firm size and leverage are found to have less significant control influence. The adjusted R^2 of all the four panels and their related significance levels each show that they seem enough for a good model. The power of the *F* and *t* - tests and the regression coefficients derived using normal scores are meaningful (Haniffa & Cooke, 2002). The summary of regression results (Table 8) shows eight of the 12 hypotheses having a positive relationship between the three independent *(VAIC)* and (dependent) performance variables. This is according to the theoretical expectation that IC is increasingly recognized as an important strategic asset for sustainable competitive advantage.

Table 8. Summary of Hypotheses Testing Results of the Individual Components of $VAIC^{TM}$ Model Using LMR

VAIC variables	*OI/S*		*ROA*		*ROE*		*MB*	
	Hypotheses	Result	Hypotheses	Result	Hypotheses	Result	Hypotheses	Result
HCE	H1a	+ve	H2a	+ve	H3a	-ve	H4a	+ve
SCE	H1b	+ve	H2b	+ve	H3b	-ve	H4b	-ve
CEE	H1c	+ve	H2c	+ve	H3c	+ve	H4c	-ve

(ii) The Association Between Composite *VAIC* and *M-VAIC* as Aggregate IC Indicators and Corporate Performance : The three *VAIC* components have significantly greater explanatory power than when they are combined into the single *VAIC* index. However, it is found that addition of new variables to $VAIC^{TM}$ model improves its explanatory power (Chang & Hsieh, 2011).According to Nimtrakoon (2015), *M-VAIC* adds one new measurement that is called relational capital efficiency.

Hence, as a first step, we followed Chan (2009) and examined *VAIC* (Pulic, 1998, 2000) as a separate measure to totally reflect the IC assets of the firm. As a second step, we employed the *MVAIC* as it adds greater insight into the explanatory power of these components on firms' market (Nimtrakoon, 2015). For the first time, we employed eight individual coefficients; namely, physical capital and financial capital, human capital, structural capital, marketing, advertising (relational capital), R&D, intellectual property (innovation capital), and process capital.

↳ **Linear Multiple Regression Results :** The Table 9 illustrates the results of multiple regression results for $VAIC^{TM}$ and *M-VAIC* explanatory variables to empirically examine their association with the dependent performance variables of *OI/S, ROA, ROE,* and *MB*.

The overall model fit can be assessed through the adjusted coefficient of determination R^2 and *F* - statistical test. We explain below the statistical significance of the models :

Table 9. Linear Multiple Regression Results of the Composite $VAIC^{TM}$ and *M-VAIC* as Aggregate IC Indicators

	Panel A: *OI/S*			Panel B: *ROA*			Panel C: *ROE*			Panel D: *MB*		
n	42			42			42			42		
Adjusted R^2	0.434			0.843			0.652			0.679		
F-Statistic	10.582			68.254			24.243			27.403		
Significance	0.000 ***			0.000 ***			0.000 ***			0.000 ***		
	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.	Std Beta	*t* stat	sig.
Intercept		-2.574	.011**		-7.58	.000***		-2.623	.010***		-0.984	0.327
Independent variables												
VAIC	0.809	8.696	0.000***	0.714	6.447	0.000***	0.357	2.416	0.024**	0.667	5.592	0.000***
R&DE	2.155	0.702	0.484	-0.323	-0.200	0.842	-1.568	-0.650	0.517	-1.847	-0.799	0.426
IPE	0.098	1.396	0.165	-0.011	-0.298	0.766	0.012	0.213	0.831	0.026	0.489	0.626
PCE	2.652	0.636	0.526	-0.574	-0.261	0.794	-2.292	-0.699	0.486	-2.503	-0.797	0.427
ME	1.309	0.622	0.535	-0.306	-0.276	0.783	-1.286	-0.777	0.439	-1.142	-0.720	0.473
AE	-0.201	-2.183	.031**	-0.026	-0.530	0.597	-0.258	-3.574	.001***	0.432	6.234	.000***
MVAIC	0.769	7.614	0.000***	0.701	6.217	0.000***	0.233	1.449	0.155	0.706	6.233	0.000***
Control variables												
SIZE	0.050	0.479	0.633	0.016	0.295	0.769	-0.052	-0.632	0.529	0.422	5.350	.000***
LEV	0.089	1.075	0.285	-0.010	-0.220	0.827	-0.296	-4.565	.000***	-0.213	-3.427	.001***

Note: ** and *** represent level of significance at 5% (statistical significance at the level of 95%) and 1% (statistical significance at the level of 99%) level, respectively.

↳ ***VAIC and M-VAIC-> OI/S:*** In Panel A, the adjusted R^2 is 0.434, explaining more than 43.4 % of the variance in the dependent variable by using *VAIC* after controlling for firm size and leverage. The model *F* - value of 10.58 is not significant. Contrary to theoretical expectation, *VAIC* has a greater explanatory power (β coefficient = 0.809 ; $p < 001$) than *M-VAIC* (β coefficient = 0.769; $p < 001$). None of the additional components of *M-VAIC* are statistically significant. The reason could be reliance on three mainstream IC than the five components of *M-VAIC* during the economic recession being hard on firms' purse strings. Or, there is a time lag between the development thrust given and the harvesting of new capabilities (Kujansivu & Lönnqvist, 2007) that are not reflected in the results of this study. For firm size and leverage, the results indicate that the company resources have insignificant association with *OI/S* performance.

↳ ***VAIC and M-VAIC-> ROA*** **:** In Panel B, the adjusted R^2 is 0.843, exhibiting a high degree of fit and explaining more than 84.3% of the variance in the dependent variable by using *VAIC* after controlling for firm size and leverage. The *F*-value is 68.25. It also shows that the model fit ranks at 84.3 %. This shows that this model is highly reliable. None of the additional components of *M-VAIC* are statistically significant. Contrary to theoretical expectation again, *VAIC* has a greater explanatory power (β coefficient = 0.714; $p < 001$) than *M-VAIC* (β coefficient = 0.701; $p < 001$). For both the control variables of firm size and leverage, the results indicate that the company resources have insignificant association with *ROA* performance.

↳ ***VAIC and M-VAIC-> ROE*** **:** In Panel C, the adjusted R^2 is 0.652, indicating that the model is able to explain more than 65.2% of the variance in the dependent variable by using components of *VAIC* after controlling for firm size and leverage. It also shows that the model fit ranks at 65.2%. This model has the *F*-value of 24.24. None of the additional components of *M-VAIC* is statistically significant. Contrary to theoretical expectation, *VAIC* has a greater explanatory power (β coefficient = 0.357; $p < 05$) than *M-VAIC* whose β-value is positive ; whereas, the *p*-value is negative. For both the control variables of firm size and leverage, the results indicate that the company resources have an insignificant association with *ROE* performance.

↳ ***VAIC* and *M-VAIC-> MB*** **:** In Panel D, the adjusted R^2 is 0.679, indicating that the model is able to explain more than 67.9% of the variance in the dependent variable by using *VAIC* after controlling for firm size and leverage. It also shows that the model fit ranks at 67.9%. According to theoretical expectations, *M-VAIC* has a greater explanatory power (β coefficient = 0.706; $p < 001$) than *VAIC* (β coefficient = 0.667; $p < 001$) (Nimtrakoon, 2015). As regards the influence of control variables, firm size has a positive association with market valuation (β coefficient = 0.422; $p < 001$). However, a statistically positive association can be seen in case of advertising efficiency, a component of *M-VAIC* with the performance variable of *MB* (β coefficient = 0.422 ; $p < 001$). This is the only regression model that reveals a significant impact of the control variable of size on an indicator of financial performance.

The results of the hypotheses tests are summarized in the Table 10.

Table 10. Summary of Hypotheses Testing Results of *VAIC* and *M-VAIC* Using LMR

Variables	*OI/S*		*ROA*		*ROE*		*MB*	
	Hypotheses	Result	Hypotheses	Result	Hypotheses	Result	Hypotheses	Result
VAIC	H1d	+ve	H2d	+ve	H3d	+ve	H4d	+ve
M-VAIC	H1e	+ve	H2e	+ve	H3e	- ve	H4e	+ve

Figure 5. The Structural Equation Model : Path Coefficients for the Individual Components of *VAIC*

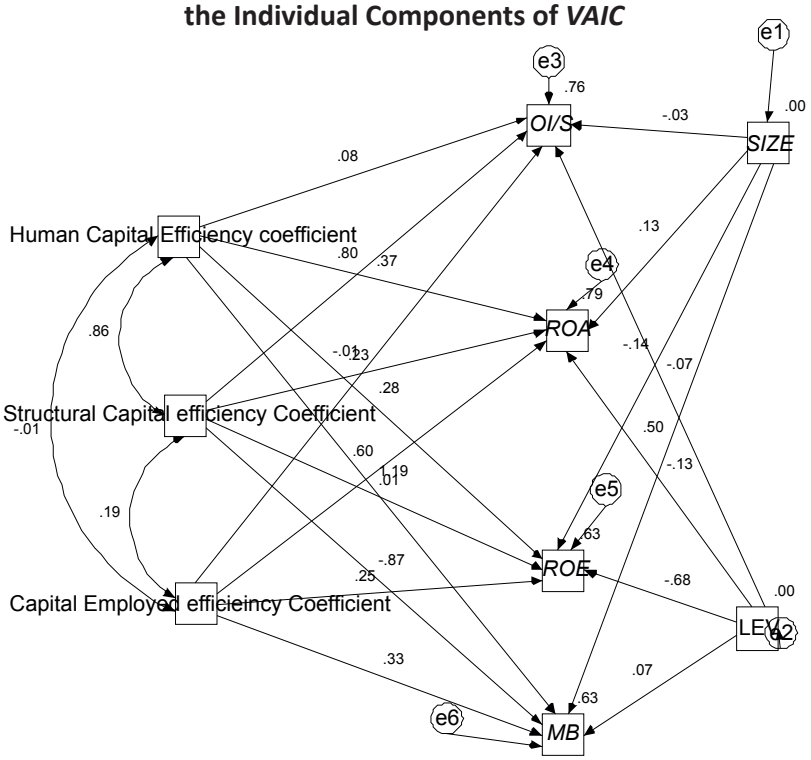


Figure 6. The Structural Equation Model : Path Coefficients of *VAIC* and Modified *VAIC (M-VAIC)* as Aggregates of IC Measurement

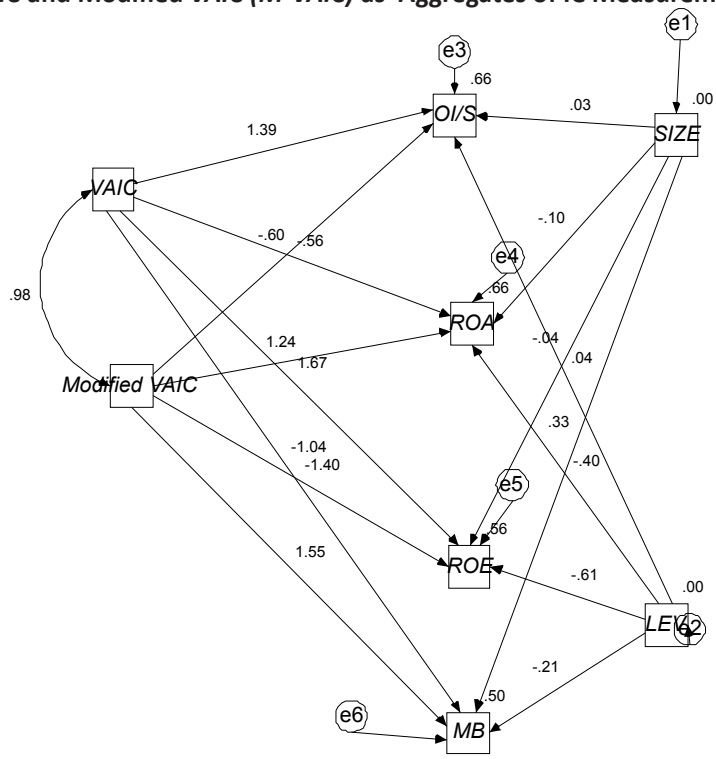


Table 11. Structural Model Path Analysis : Statistical Relationship Between *HCE, SCE, CEE, VAIC*, and *M-VAIC* and the Four Corporate Measures of Performance

Model	Path	From	To	Beta	*S.E.*	*VIF*	F^2	Q^2	R^2	*t* - value	*p* - value Significance	Conclusion at 5% level
1	H1a	*HCE*	*OI/S*	0.080	0.004	2.257	1.257	0.890	0.557	2.668	0.008	Supported
1	H1b	*SCE*	*OI/S*	0.370	0.039	2.257	1.257	0.890	0.557	5.257	***	Supported
1	H1c	*CEE*	*OI/S*	0.230	0.015	2.257	1.257	0.890	0.557	4.522	***	Supported
5	H1d	*VAIC*	*OI/S*	1.390	0.004	2.890	1.890	0.914	0.654	8.696	***	Supported
9	H1e	*M-VAIC*	*OI/S*	-0.560	0.002	2.449	1.449	0.898	0.592	13.674	***	Supported
2	H2a	*HCE*	*ROA*	0.800	0.328	5.376	4.376	0.964	0.814	5.460	***	Supported
2	H2b	*SCE*	*ROA*	0.230	3.017	5.376	4.376	0.964	0.814	3.870	***	Supported
2	H2c	*CEE*	*ROA*	1.190	1.127	5.376	4.376	0.964	0.814	25.858	***	Supported
6	H2d	*VAIC*	*ROA*	-0.600	0.552	2.041	1.041	0.905	0.510	6.447	***	Supported
10	H2e	*M-VAIC*	*ROA*	1.670	0.237	1.966	0.966	0.901	0.491	9.713	***	Supported
3	H3a	*HCE*	*ROE*	0.280	1.593	2.203	1.203	0.589	0.546	1.633	0.103	Not supported
3	H3b	*SCE*	*ROE*	0.010	14.649	2.203	1.203	0.589	0.546	1.362	0.173	Not supported
3	H3c	*CEE*	*ROE*	0.250	5.472	2.203	1.203	0.589	0.546	10.621	***	Supported
7	H3d	*VAIC*	*ROE*	1.240	3.055	1.145	0.145	0.209	0.127	2.416	0.020	Supported
11	H3e	*M-VAIC*	*ROE*	-1.400	0.741	1.053	0.053	0.140	0.050	4.148	***	Supported
4	H4a	*HCE*	*MB*	0.600	2.740	2.222	1.222	0.656	0.550	3.344	***	Supported
4	H4b	*SCE*	*MB*	-0.870	25.187	2.222	1.222	0.656	0.550	-2.047	0.041	Supported
4	H4c	*CEE*	*MB*	0.330	9.409	2.222	1.222	0.656	0.550	1.698	0.089	Not supported
8	H4d	*VAIC*	*MB*	1.040	4.705	1.802	0.802	0.576	0.445	5.592	***	Supported
12	H4e	*M-VAIC*	*MB*	1.550	1.051	1.997	0.997	0.617	0.499	4.150	***	Supported

Notes: $n = 42$. ***Significant at the 0.05 level. Three independent variables are inadequate ($p > 0.05$).

To summarize both the regression models (Table 8 and Table 10) of the individual components of *VAIC* on the one hand and *VAIC* and *M-VAIC* on the other, empirical evidence shows that 15 of the 20 hypotheses are found to be statistically significant.

(iii) Structural Equation Modeling : Maditinos et al. (2011) recommended use of SEM to better understand the interrelationships between IC components and their cumulative impact on dependent variables. Dženopoljac and Janoševic (2016) applied both LMR analysis and SEM in a study of 13,989 Serbian information communication technology (ICT) companies during 2009-2013. To corroborate the robustness of statistical results of the LMR models, we apply SEM.

[i] Individual Components of *VAIC*™ : By employing SEM, the relationship between components of *VAIC*™ and measures of corporate performance *OI/S, ROA, ROE,* and *MB* including the control variables of size and leverage to improve investigation of the relationship is presented graphically (Figure 5).

[ii] Composite *VAIC* and Modified *VAIC* : SEM in Figure 6 graphically presents composite *VAIC* and *M-VAIC* regression models to get performance relationships. A table of study variables that reveals the quality of the structural model and summarizes the standard regression weights and significance level of path coefficients

substantiating the hypotheses along with the models can be found in the Table 11.

We explain the 20 hypotheses as follows :

↳ **H1a – H1e :** A statistically significant relationship exists between *HCE->OI/S* (β coefficient = 0.080 ; t = 2.668 ; p < 0.08), *SCE->OI/S* (β coefficient = 0.370 ; t = 5.257 ; p < 0.05), *CEE->OI/S* (β coefficient = 0.230; t = 4.522; p < 0.05), *VAIC->OI/S* (β coefficient = 1.390; t = 8.696; p < 0.05), and *M-VAIC->OI/S* (β coefficient = -0.560; t = 13.674; p < 0.05). This finding is consistent with the "new economy" literature that shows that every sector of the economy has felt the IC impact in creating value and economic wealth (Bhartesh & Bandyopadhyay, 2005).

↳ **H2a – H2e:** The *ROA* regression models see direct positive effect of *HCE->ROA* (β coefficient = 0.800 ; t = 5.460 ; p < 0.05), *SCE-> ROA* (β coefficient = 0.230; t = 3.870 ; p < 0.05), *CEE-> ROA* (β coefficient = 1.190; t = 25.858; p < 0.05), *VAIC-> ROA* (β coefficient = -0.600; t = 6.447; p < 0.05), *M-VAIC-> ROA* (β coefficient = 1.670; t = 9.713; p < 0.05). *HCE->ROA* result is confirmed by research outcomes of Ting and Lean (2009). As regards *SCE->ROA*, Firer and Williams (2003) also observed the same results. The positive association between *CEE* and *ROA* in this study is supported by Dženopoljac and Janoševic (2016). The positive relationship of *VAIC->ROA* is in line with the study results of Zeghal and Maaloul (2010). *MVAIC* is expectedly found to be significantly and positively associated with *ROA* as supported by the study of Nimtrakoon (2015).

↳ **H3a – H3e :** Contrary to theoretical expectations, the relationship between *HCE* and *ROE* and *SCE* and *ROE* is insignificant : (*HCE->ROE*: β coefficient = 0.280; t = 1.633; p < 0.103; *SCE-> ROE* : β coefficient = 0.010 ; t = 1.362; p < 0.173, respectively). Thus, H3a and H3b are not supported by empirical data. These results are in contradiction with previous research findings of Chen et al. (2005), which shows a positive association of *HCE* and *ROE*. The study of Chan (2009) found a statistically significant relationship between *SCE* and *ROE*. However, in this study, *CEE-> ROE* (β coefficient = 0.250; t = 10.621; p < 0.05), *VAIC-> ROE* (β coefficient = 1.240 ; t = 2.416; p < 0.020) and *M-VAIC-> ROE* (β coefficient = -1.400; t = 4.148; p < 0.05) are significantly and positively correlated. The positive *CEE->ROE* finding is congruent with the findings of Dženopoljac and Janoševic (2016). The *VAIC->ROE* finding tends to confirm the findings of earlier research by Chan (2009). The presented regression model for the individual components of *VAIC (HCE, SCE, and CEE)* has a moderate degree of fit because the R^2 value reaches 0.546.

↳ **H4a – H4e:** *HCE* has a positive influence on *MB* (β coefficient = 0.600 ; t = 3.344 ; p < 0.05), which is consistent with the firms in Hong Kong (Chan, 2009). H4b suggests that *SCE* positively correlates with *MB* results (β coefficient = -0.870; t = -2.047; p < 0.041). This result matches earlier research finding (Chen et al., 2005). The predicted significant and positive impact of *CEE* on *MB* is not supported by the result (β coefficient = 0.330; t = 1.698 ; p < 0.089). This is contrary to theoretical expectations with the results indicating a non-significant association between *CEE* and *MB*. However, the findings of Zeghal and Maaloul (2010) show that the *CEE->MB* has a significant relationship. We discovered strong direct ties between *VAIC* and *MB* (β coefficient = 1.040; t = 5.592; p < 0.05). This confirms the results of the prior studies (Shiu, 2006). A path coefficient result of the hypotheses of this study suggests that *M-VAIC* is positively significant with *MB* (β coefficient = -1.550; t = 4.150; p < 0.05). This result is consistent with the previous findings of Nimtrakoon (2015), confirming that firms with greater IC efficiency tend to have higher market value.

Discussion

To sum up, our findings show that of the 20 logical and distinctive hypotheses conceptualized and tested, 17 are supported and three are not supported. From the statistics, it is argued that the results of this study are contrary to theoretical expectations that addition of new variables to *VAIC*^{TM} model improves its explanatory power. Though *M-VAIC* is considered to have better explanatory power (Nimtrakoon, 2015), *M-VAIC* (with six coefficients) better explains its association only with *ROA* and *MB*, while *VAIC*^{TM} (with three coefficients) has a significant relationship with *OI/S* and *ROE*.

Implications for Theory, Research, Education, Business Practices, and Policy Makers

M-VAIC methodology of this study based on robust theoretical foundations is theoretically consistent with new models for praxis (Pulic, 2008), thereby freshly adding to the body of IC knowledge. This supports the need for reliable basis for theories, indicators, and calculations (Stahle, Stahle, & Aho, 2011) to improve the explanatory power of the *VAIC*^{TM} model. This paves the way for *M-VAIC* to evolve to be a *de facto* standard. Regarding research, to put IC to work for building strong organizations (Dumay, 2013), the study addressed the third stage performative IC research that calls for critical field studies which will provide empirical studies of IC in action. By applying the appropriate analysis technique of SEM in addition to LMR (Nimtrakoon, 2015), it added methodological robustness responding to the call of Maditinos et al. (2011). For those scholars who use secondary data for IC assessment, this study presents alternative models for IC valuation (Vishnu & Gupta, 2014).

Regarding *education,* the model of this study would facilitate universities to identify measure, manage, and value their intangible assets. Our study provides a scorecard and dashboard on financial performance that is common to both industry and higher education (Kong, 2010).For *business practice*s, the results of this study would be interesting for managers to apply the M-VAIC method as a tool to better control and manage their IC and to benchmark against competition and retain their competitive position in the national, regional, and global markets. Our study will facilitate the suggestion of Maditinos et al. (2011) for chief financial officers to work towards the development of an IC model that will be in compliance with the International Accounting Standard Board (IASB) for financial reporting. Our study, like those of other scholars, would provide the building blocks for *policy makers* to appreciate the significance of the total stock of IC in building organizations and the country.

Conclusion

A better business model will often beat a better idea or technology (Chesbrough, 2007).*VAIC*^{TM} method has compellingly proved its suitability as a tool for the measurement of IC (Kamath, 2007) and a business measurement model.

Limitations of the Study and Scope for Future Research

Firstly, our study focuses on the Indian auto-component industry and not on the original equipment manufacturers whom the auto-component manufacturers cater to. Therefore, the findings may not be generalizable. Cross-border studies may increase the robustness of our conclusions by testing whether the limitations are specific to India or

whether the theory is robust across geographies. Secondly, this study focuses on manufacturing and not on the service sector in India. During 2016-17, the services sector in India accounted for 53.66% of total India's gross value added ; whereas, the industry sector contributed only 29.02%. Thirdly, IC was measured using data from a period of intense volatility (2008 - 2013). Stock market valuation is influenced by international markets, which experienced intense crises during the period studied (2008 - 2013), especially in developing countries. However, the Indian industry underwent a period of market expansion at the same time.

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