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## Original Research Article

# The impact of intellectual capital on financial performance: An empirical investigation of Indian technology industry

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## ABSTRACT

This paper examined the association of intellectual capital and physical capital with financial performance (productivity and profitability) and market valuation (MB) in technology sector of India. IC efficiency of the companies was measured through Value added intellectual coefficient (VAIC<sup>TM</sup>) methodology. To examine the relationship of intellectual capital with financial performance and market valuation, the panel regression models have been employed in the study. The results evinced that value added intellectual capital coefficient (VAIN) has no relationship financial performance measures (ATO and ROA) and market valuation (MB) respectively. The results also found that physical and financial capital (VACA) has a significant influence on productivity and profitability of the organization. It is divulged that Indian technology-intensive firms still depend on tangible assets for organizational efficiency. This study is an eye opener for policy makers, government officials and other stakeholders to analyze the factors for non-existence relationship of intellectual capital with financial performance and market valuation respectively.

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## 1. Introduction

With the emergence of technology and information systems, the growth in technological firms has been significant during the last ten years (Sriram, 2008). Companies in knowledge-intensive industries experience rapid change and have complex intangibles, which makes accounting numbers less useful to the investors (Beisland et al., 2008, Lev and Zarrowin, 1999). Financial reporting of the companies which mainly assesses the physical and financial capital of the organizations is losing its relevance among the stakeholders especially in technological sectors which are dominated by knowledge intensive organizations. The IC is gaining importance in the knowledge era because now both tangible and intangible assets are perceived as potential strategic assets (Kamath, 2006).

Conventional accounting measures are not enough to evaluate the performance of the knowledge based firms, thus, not considered sufficient to underline the importance of intangible assets as a source of economic wealth (Mehralian, 2012). IC is that capital which is hidden from financial statements and leads the organization to get the competitive advantage (Yang and Lin, 2009; Chen et al., 2005; Pablos, 2003). It is expected that efficiency of intellectual capital to have a direct influence on the financial performance of the companies, thus, it becomes an important and interesting issue for managers and investors (Tan et al., 2008). If IC has any potential link with financial performance and market valuation of the companies then companies and investors would be immensely benefitted from IC measurement and disclosure.<sup>1–10</sup>

Indian technology industry is selected for the study as it is one of the knowledge intensive sectors of the economy. The primary aim of this study is to examine the relationship

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between intellectual capital and traditional financial performance measures i.e., productivity, profitability and market valuation respectively. This research paper has applied value added intellectual coefficient (VAIC<sup>TM</sup>) developed by Pulic (1998) for IC efficiency measurement. Data has been collected from PROWESS database for a ten years period from 2009-10 to 2018-19 and is examined through correlation and regressions analysis respectively.<sup>11-16</sup>

The remaining part of the paper is further organized as follows. The second section provides review of literature on IC and its association with firms' performance by different researchers in the past. Section three discusses the research methodology, variable definitions, data sample and research models used in the study. Hypotheses are also developed in this section. Section fourth analyzes the results of correlation and regression analysis in a detail. Implications of the study are provided in this section. The final section deals with conclusion and ideas for future research respectively.<sup>17-20</sup>

## 2. Literature Review

### 2.1. Intellectual capital

The concept of IC is still obscure to many because it is difficult to measure in expressed terms (Lytras & Pablos, 2009). There is no agreement on a universal definition of IC (Meca & Martinez, 2007 and Montequín et al., 2006).

According to Edvinsson (1997) "The intellectual capital of a firm is its possession of the knowledge: apply experience, organizational technology, customer relationship and professional skill that provide it with a competitive edge in the market". Guthrie (2001) defined intellectual capital as the difference between a company's market value and its book value. Stewart (1997) defined IC as "packaged useful knowledge". According to Chu et al. (2006) "Intellectual capital is the group of knowledge assets that are attributed to the value creation of an organization".

Many researchers have adopted a consensus view that IC has three major categories i.e. human capital, structural (also called organizational) capital and relational (also called customer) capital respectively (Edvinsson and Malone, 1997; Bontis, 1998; Chu et al., 2006 and Tai & Chen, 2009). Human capital is the knowledge that employees take with them when they leave the organization. It includes the knowledge, skills, experiences and abilities of people (Ricceri, 2008). Structural capital is the capital, which remains in the organization when the employees leave the office or organization. It is the sum of all assets referring to the organization includes vision of the firm, management philosophy, culture, processes, strategies, systems and information technology (Martinez-Torres, 2006). Relational capital is "all resources linked to the external relationships of the firm with customers, suppliers or R&D partners

(Beattie & Thomson, 2007). It is the sum of all the assets which arrange and manage the firm's relationship with the environment (Lee, 2010).<sup>21-27</sup>

### 2.2. Previous studies on association between IC and financial performance

On the field of empirical research, many studies have empirically applied VAIC<sup>TM</sup> methodology for their research on measuring IC efficiency and its relationship with financial performance and market valuation respectively.

Deep and Narwal (2014) analyzed 100 companies from Indian textile industry to examine the relationship between intellectual capital and financial performance of the companies. The result found that intellectual capital had a significant association with profitability of the companies.

Emad Rezaei (2014) analyzed 111 companies of Tehran and came up with the results that IC was significantly related with P/E ratio and revenue growth (RG) respectively. It was also revealed from the study that HC was significantly associated with EVA index and P/E ratio, while SC had a significant relation with EVA index, GR and ROA respectively. The study concluded that Tehran companies were not responsive to IC. Physical assets are still given much emphasis at the time of companies' evaluation.<sup>28-35</sup>

Budiandriani & Mahfudnurnajam-uddin (2014) took 158 companies from Indonesia to analyze the relationship between IC and financial performance found that physical and structural capital had a significant influence on financial performance and market value of the organization. It was also divulged from the study that human capital was having a non-significant association with financial performance and market value of the firm. The study summed up by describing that investment in IC is very important to improve the financial performance of the companies.

Mehri et al. (2013) examined 92 Bursa Malaysian companies and established the results that IC had a significant influence on ATO, ROA, ROE and MB respectively. Structural and physical capital was found to have a significant effect on financial performance measures. It was concluded that through the efficient use of intangible assets companies can achieve sustainable competitive advantage.

Mehralian et al. (2012) analyzed 19 pharmaceutical companies of Iran to measure relation between IC efficiency and corporate performance. The study found that IC performance was significantly associated with profitability but not with productivity and market valuation of the organization. Study also revealed that physical capital played a major role in increasing the profitability of the organizations. Researchers concluded that an urgent and immediate need exists for government and corporate managers to start voluntary disclosing information on IC. Pal & Soriya (2012) took 105 pharmaceutical and 102 textile companies of India to measure the difference

between Intellectual capital efficiency of both sector and found that there was a significant relationship IC and profitability in both the sectors. In the study it was also found that IC had no significant relationship with productivity and market valuation of the companies. Authors concluded that reflection of the IC is not proportionally observed in the financial performance of the companies.

Maditions et al. (2011) studied 96 companies of Greece and found that IC was no having any significant relationship with ROA and MB ratio. A significant relationship was found between human capital and return on equity (ROE) respectively. The study came up the conclusion that human resources development was seemed to be the most important factor for the economic success.

Murale et al. (2010) analyzed 13 Indian companies and found a significant positive relationship between IC and market to book value of the company. HC was found to be a major factor which had significant impact on financial performance of the companies. Researchers concluded that effective utilization of IC generates capital gain on shares and as a result attracts investors in the market.

Richerie et al. (2008) in his study took 1000 biggest Brazil companies for measuring the IC and found that IC had a significant association with the ROA, ROE and return on sales (ROS) respectively. It was also found from the study that tangible assets of the companies had a negative influence on profitability and value creation. Researchers evinced that while determining companies' value creation capacity IC was equally relevant.

### 3. Research Methodology

#### 3.1. Research objectives, sample size and data collection

The objective of the present study is to measure the efficiency of intellectual and physical capital in Indian technological sector and to find out the impact of intellectual capital efficiency as well as of physical capital efficiency on the financial performance and market valuation of the company. The present study has selected a sample of top 50 companies in the technology sector of India on the basis of their market capitalization in the year 2019 respectively. The time period of the study is 10 years i.e. from 2009-10 to 2018-19. The Data have been taken from the Prowess database, which is maintained by Centre for Monitoring Indian Economy (CMIE). The selected companies are listed on both NSE and BSE. For the analysis, Correlation and panel data regressions have been applied to examine the relation of IC on the financial performance and market valuation respectively. Value added intellectual coefficient (VAIC<sup>TM</sup>) methodology developed by Prof. Pulic has been used for measuring the IC efficiency.

#### 3.2. Hypothesis Development

In the present study, to determine the association of intellectual capital and physical capital with financial performance and market valuation in technological sector of India, the following hypotheses have been proposed:

1. H<sub>1a</sub>: Higher performance of “value added intellectual capital (VAIN)” tends to have higher productivity.
2. H<sub>1b</sub>: Higher performance of “value added intellectual capital (VAIN)” tends to have higher profitability.
3. H<sub>1c</sub>: Higher performance of “value added intellectual capital (VAIN)” tends to have higher market valuation.
4. H<sub>2a</sub>: Higher performance of “value added capital employed (VACA)” tends to have higher productivity.
5. H<sub>2b</sub>: Higher performance of “value added capital employed (VACA)” tends to have higher profitability.
6. H<sub>2c</sub>: Higher performance of “value added capital employed (VACA)” tends to have higher market valuation.

#### 3.3. Independent Variables

For measuring intellectual capital efficiency, Value added intellectual coefficient (VAIC) method has been applied. For measuring VAIC, first of all, Value Added of the company is calculated as follows:

$$VA = W + I + T + NI$$

Where,

W = Wages and salaries;

I = Interest expenses;

T = Taxes paid and

NI = Profit after taxes.

VAIC as intellectual capital efficiency measurement includes three independent variables as human capital efficiency, structural capital efficiency and capital employed efficiency (Pulic 1998). After calculating VA, next step is to assess the relation between VA and HC. The value added human capital coefficient (VAHC) indicates how much VA has been created by one financial unit invested in employees (Zeghal and Maaloul, 2010). It is calculated as:

$$VAHC = VA/HC$$

The next step is to find the relation between VA and SC. The values of SC is obtained by deducting the value of human capital (HC) from value added (VA) The value added structural capital coefficient (VASC) express the contribution of SC in creation of value added. The value of SC is dependent on the calculated VA and is in reverse relation to HC. It is calculated as:

$$VASC = SC/VA$$

The next step is to calculate the value added intellectual capital coefficient (VAIN), which shows the contribution of intellectual capital in creation of value added. It is obtained by adding VAHC and VASC respectively.

$$VAIN = VAHC + VASC$$

The next step is to calculate the relation between VA and physical capital employed (CA). The value added capital employed coefficient (VACA) shows how much value has been generated by investment in capital employed. The VACA indicates the ability of capital employed in value creation. It is calculated as:

$$VACA = VA/CE$$

Finally, VAIC<sup>TM</sup> measures how much value is created by per unit investment in each resource. It is calculated as:

$$VAIC = VAHC + VASC + VACA$$

3.4. *Dependent Variables*

To conduct the analysis, three traditional accounting performance measures namely, productivity (ATO), profitability (ROA) and Market to book value (MB) has been used as dependent variables respectively. These variables are calculated as:

1. Assets turnover ratio (ATO): It reflects the productivity of the firm. It is calculated as:
2.  $ATO = \text{Total Revenue}/\text{Average total assets}$
3. Return on assets (ROA): It measures the profitability of the companies and calculated as:
4.  $ROA = \text{Net income}/\text{Average total assets}$
5. Market to book value (MB): It reflects the market valuation of the companies. It is calculated as:

$$MB = \text{Market capitalization}/ \text{Book value of common stock}$$

3.5. *Control variables*

Two control variables such as Leverage and company SIZE have also been used for their effect on financial performance and market valuation.

1. Leverage (DER): Financial leverage is used to control for the impact of debt on financial performance. It is calculated as:
  - a.  $DER = \text{Total debt}/\text{Total equity}$
2. Size of the firm (size): Size of the firm as measured by the natural log of total assets, used here to control for the impact of size on value creation.

3.6. *Regression models*

The following regression models examine the association between VAIN and financial and market performance ratio. These models are used to analyze hypotheses developed in the study.

$$ATO = \alpha_{it} + \beta_1 VAIN_{it} + \beta_1 VACA_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

$$ROA = \alpha_{it} + \beta_1 VAIN_{it} + \beta_1 VACA_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \varepsilon_{it} \dots \dots \dots (2)$$

$$MB = \alpha_{it} + \beta_1 VAIN_{it} + \beta_1 VACA_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \varepsilon_{it} \dots \dots \dots (3)$$

Where,  $\alpha_{it}$  = Constant term; VAIN = Value added intellectual capital coefficient; VACA = Value added capital employed coefficient; ATO = Assets turnover ratio; ROA = Return on asset; MB = Market to book value; DER = Debt equity Ratio; SIZE = Log of total asset and  $\varepsilon_{it}$  = Error term.

For the purpose of finding relationship between intellectual capital and financial performance, correlation and multiple regression technique will be applied. Firstly, the correlation analysis will be exercised to find out any correlation between the dependent variable and independent variables respectively. Multiple linear regression analysis will be executed to determine the strength or the extent of relationship among the variables.

4. **Results and Analysis**

4.1. *Descriptive statistics*

Table 1 presents the descriptive statistics of all the variables used in the study. The mean value of VAIN is 3.121 indicating that companies in technological sector generates rupees 3.12 from each rupees invested in intellectual capital respectively. The average value of return on asset is 0.187, which states that stockholders get a fair return on their investment. The mean value of ATO is 0.733, which implies that the technological companies are not facilitating its assets efficiently. The mean MB ratio is 8.26 indicating that investor value the sample companies in excess of the book value. The MB ratio shows that around 88 percent of the company’s market value is not reflected by the financial statement of the company.

$$\text{Hidden value} = [(8.260-1.000)/8.260]*100 = 87.89 \text{ percent}$$

This finding supports the increasing gap between market and book value of the companies. The comparison between VAIN and VACA suggests that during the study period more value was created from the intellectual capita (3.121) than from capital employed (0.481) This finding is supported with previous studies which found that in this knowledge era, intellectual capital is the most important resource in creating wealth for the organization (Gavious & Russ, 2009; Yang & Lin, 2009; Sonnier, 2008; Meca & Martinez, 2007). The average value of DER is 0.488 which is quite low implying that companies in technological sector have low debt in their balance sheet.

4.2. *Correlation analysis*

To find whether there exists any relation between independent and dependent variables, the correlation coefficient was estimated. As depicted in Table 3, VAIN is showing a significant relation with productivity (ATO), whereas VACA shows a significant positive relation with ATO and ROA, and a negative correlation with MB. A significant negative relation is found between SIZE and productivity (ATO) of the firms. There is a no

**Table 1:** Descriptive analysis

	VAIN	VACA	ATO	ROA	MB	DER	SIZE
Mean	3.121	0.481	0.733	0.187	8.260	0.488	2.407
Std. Dev.	4.216	0.554	0.880	0.172	27.797	0.744	0.766
Maximum	49.336	8.333	16.959	1.378	27.406	5.210	4.081
Minimum	-7.932	-0.854	0.001	-1.269	0.026	0.000	-1.096
Observations	491	486	483	489	412	344	489

significant relationship between VAIN, ROA, MB, DER and SIZE variable respectively. Overall, VAC has a significant correlation with productivity and profitability, but, a significant negative correlation with MB ratio. It implies that physical and financial capital is still the most important component having a significant relationship with productivity and profitability in Indian technological industry.

The diagnostic statistics also confers that there is no issue of multicollinearity among the independent and dependent variables. It would be a case of multicollinearity if correlation between explanatory variables exceeds 0.8 (Kennedy 1985). This is evidenced by correlation analysis table which shows a low level of pair wise correlation between the explanatory variables (ranges from 0.016 to 0.071). As such the data is free from the problem of multicollinearity and implying that measures are independent from each other.

#### 4.3. Regression Analysis

Table 1 present the results of regression analysis where VAIN and VACA has been used as independent variables, whereas, productivity (ATO), profitability (ROA) and market valuation (MB) has been used as dependent variable. For conducting the regression, both fixed effect and random effect model has been applied. For the selection of a particular model, the Hausman specification test (1978) has been used in the study. When, the Hausman  $X^2$  result is found significant, the fixed effect model is exercised and when the result is found insignificant, the random effect model is opted for the analysis. Presents the results taking into.

Consideration hypothesis  $H1_a$  to  $H2_c$  (Model 1-3) respectively.

Hausman  $X^2$  result found that fixed effect model has been preferred for model 1 and model 2 as the value of Hausman test is found significant in both the models. Whereas random effect model has been preferred for model 3 as Hausman test value is found to be insignificant. The value of adjusted  $R^2$  is 0.219 for productivity model, 0.352 for profitability model and 0.010 for market valuation model respectively. It implies that the model is able to explain 21.9 percent of the variance in the productivity model, 35.2 percent for the profitability model and 1.0 percent for the market valuation model respectively. These values

depict that only profitability model is having a satisfactory explanatory power.

Despite the low predictive power and lower F-statistics values, results evince that VAIN is not having any significant relationship with ATO, ROA and MB respectively. Hence, in the light of above result  $H1_a$ ,  $H1_b$  and  $H1_c$  is not accepted implying that intellectual capital is not playing any significant role in increasing the financial performance of the companies in technological sector respectively. In addition, results of also show that there is a significant relationship between VACA and productivity (ATO) and profitability (ROA), whereas no relation is found between VACA and market valuation (MB) respectively. Hence,  $H2_a$  and  $H2_b$  are confirmed from empirical data, while  $H2_c$  is not supported from the analysis.

In spite of the growing importance of intellectual capital, its reflection is not proportionally observed in the financial performance of the companies (Karampal and Soriya, 2012).

When the effect of control factors is examined, it is found that DER is having no impact on any dependent variable. Control variable SIZE has a significant negative effect on productivity and profitability, implying that larger size of the organization tends to be less productive and profitable respectively. It also shows a significant effect on market valuation implying that the size of the company has a significant effect on the market valuation.

#### 4.4. Implications for researchers and practitioners

The concept of intellectual capital is still in its infancy stage in developing country like India. It has not been fully analyzed by most organization especially technology-intensive companies. This study provides some contribution in promoting the concept with in Indian technological sector. There is an immediate need for managers to start measuring and managing their intellectual capital for a sustainable competitive advantage. As there is a saying in the management that if you can't measure, you can't manage. The present study is an eye opener for policy makers, government officials and other stakeholders to analyze the factors for non-existence relationship between IC and financial performance respectively. The companies are demanded to provide training programs to the employees at a regular basic. Talent and skills of the Employees plays an important role in reducing the production cost

**Table 2:** Correlation analysis

	VAIN	VACA	ATO	ROA	MB	DER	SIZE
VAIN	1.000						
VACA	-0.211*	1.000					
ATO	-0.186*	0.711*	1.000				
ROA	0.058	0.170*	0.379*	1.000			
MB	-0.075	-0.133**	0.016	-0.015	1.000		
DER	-0.086	-0.001	0.008	0.038	-0.092	1.000	
SIZE	0.095	-0.005	-0.153*	-0.041	-0.008	0.082	1.0000

Note: \* and \*\* represents Significance at 1 percent and 5 percent respectively.

**Table 3:** Regression results of IC and financial performance

	ATO		ROA		MB	
	Fixed	Random	Fixed	Random	Fixed	Random
Intercept	1.240* (4.099)	0.875* (4.566)	0.244* (5.603)	0.205* (5.617)	-2.720 (-0.381)	1.371 (-0.187)
VAIN	-0.010 (-0.355)	0.000 (0.031)	0.004*** (1.674)	0.005** (2.370)	-0.493 (-1.463)	-0.507 (-1.571)
VACA	0.358* (3.276)	0.677* (8.405)	0.049* (3.115)	0.069* (4.984)	-0.707 (-0.164)	-2.367 (-0.598)
SIZE	-0.267** (-2.363)	-0.199* (-2.782)	-0.034** (-2.121)	-0.026** (-2.004)	5.657** (2.213)	4.357** (1.843)
DER	0.042 (0.388)	0.061 (0.930)	-0.004 (-0.259)	0.006 (0.486)	-1.551 (-0.655)	-2.178 (-0.990)
Adjusted R <sup>2</sup>	0.219	0.190	0.352	0.081	0.574	0.010
F statistic	2.845*	22.676*	4.580*	8.277*	8.938*	1.769
Hausman Test	X <sup>2</sup> (4) = 20.785*		X <sup>2</sup> (4) = 11.556**		X <sup>2</sup> (4) = 3.234	

Note: \* and \*\* represents Significance at 1 percent and 5 percent respectively.

and increasing the profitability in the technology sector. The companies are also required to apply the VAIC method to measure and to manage their intellectual capital in an efficient way and to compare it with best competitors in the market. Indian companies may start disclosing intellectual capital as supplementary report in annual financial statements. It is advisable for government officials and academicians to take more active role in the development of IC. The government needs to increase the awareness about importance of IC among the different stakeholders and company managers.

## 5. Conclusion

The present study attempted to analyze how efficiently Indian technological companies utilize its intellectual capital. For the purpose of the study, top 50 technology-intensive companies of India were selected. For measuring the efficiency of intellectual capital, VAIC<sup>TM</sup> method developed by Pulic was used. Findings shows that value added intellectual capital (VAIN) has no association with productivity, profitability and market valuation respectively. When the effect of physical and financial capital (VACA) on financial measures was analyzed, it came up with the findings that tangible assets have a significant role

in increasing the productivity and profitability of the organizations. Present study is confirmed by some previous researches which found that Physical capital has the major impact on the profitability of the firms (Mehralian et al., 2012; Zeghal and Maaloul, 2010; Chen et al., 2005; Mavridis, 2004; Firer and Williams, 2003) implying that Indian stakeholders still analyze the performance of the firms in terms of tangible assets.

It is also found that there is no association between physical capital and market valuation of the companies implying that investors don't consider the physical capital at the time of their investment decisions. The study confirms that Indian technology-intensive companies still depend very much on their physical and financial assets for increasing the financial performance respectively. Malhotra (2003) indicated that valuation in developing countries is mostly based on tangible assets, thus, it seems logical for the VAIC methodology to fail in establishing a significant relation between IC and financial performance measures of the company.

As VAIN is a sum of human and structural capital efficiency, present study found that a non-significant relationship exists between VAIN and financial performance measures. These findings can be attributed to lack of employees training. For effective utilization of human mind,

continuous training program is a vital tool. Human capital is the most important capital a company has, as it is the human mind which makes possible the efficient use of structural and physical capital.

The present study revealed that Indian investors don't pay any attention on intellectual capital and physical capital efficiency at the time of their investment decisions while evaluating a company. It is the SIZE of the company which is considered as an important factor by the investors. In order to increase the efficiency of human and structural capital, one of the important policies for the developing countries is to realize and analyze the value of technological knowledge as in this knowledge era, technological knowledge is the most important factor for attaining and sustaining the competitive advantage. Based on the findings of the study, it is concluded that IC has no effect on financial performance (ATO and ROA) and market valuation (MB) of the Indian technology-intensive companies respectively. Furthermore, the present study has provided evidence that Indian companies and investors place more emphasis on physical and financial capital as strategic assets for increasing the productivity and profitability. Physical assets still plays an important role in enhancing the financial performance of the company.

### 5.1. Future Research Areas

The present research has some avenues for the future research. Firstly, only top 50 companies has been selected for the present study, hence, the results can't be generalized as medium and low level size companies have not been included. In the future, a study with comprehensive sample may be carried out. Secondly, the empirical data obtained could be complemented by qualitative study that would incorporate the qualitative aspects of IC and its relation with financial performance. This mixed method would enhance the reliability and validity of the study. Thirdly, in the present study, the role of physical capital (VACA) has been analyzed in context of increasing the financial performance and market valuation respectively. Since, physical capital includes both physical and financial assets, it's necessary to identify specific type of asset which plays their individual role in financial performance. Fourthly, a comparative study with neighboring countries like China, Pakistan, Sri Lanka, Malaysia, Singapore etc. may be performed in future to analyze and assess the difference between intellectual capital performance and its impact on corporate performance. Finally, other measures of firm's intangible efficiency (e.g. EVA, MVA) can be exercised along with VAIC model, so as to get more conclusive results in order to evaluate firm's IC performance.

### 6. Source of Funding

None.

### 7. Conflict of Interest


None.

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