Intellectual Capital and Firm Performance: A Review of Empirical Literature Based On VAIC™ Model

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Abstract

The importance of intellectual capital (IC) has been a growing subject of discussion in academic, business and policy circles. Also, there has been quite a number of innovations in its concepts, measurements and valuations. One of such innovative measurement model is the Value added Intellectual Capital Coefficient (VAIC™) proposed by Pulic (2000). Although the model has been criticised in literature as a result of the reliance of its measures on financial account figures. However, available evidence showed that it is one of the widely used model for measuring IC. This paper presents a survey of empirical IC - performance literature by focusing on studies that used Pulic's VAIC™ as proxy to measure intellectual capital. Review and evaluation of the milestones in the developments and contributions to IC research are essential. It could foster an understanding of the context within which IC came into being as a vital organisation element in today's business world. In summary, our findings revealed that the results of these studies mainly demonstrate that VAIC™ and its components influence performance variables positively, except in few noticeable situations.

Keywords: Intellectual Capital, VAIC™, Firm Performance

I.   Introduction

Human resources have been assigned a vital role in the achievement of developmental objectives of any economy, both at the macro and micro levels. A number of studies have documented interesting empirical and policy evidence on these roles. From the macroeconomic perspective, empirical studies found human capital as an essential component in achieving sustainable development goals. Similarly at the microeconomic level, the development of a vibrant knowledge-based economy has prompted firms to change their focus from the traditional emphasis on accumulation of physical assets to intangibles or intellectual capital (IC). IC has been documented to serve a strategic asset to the firms as it is difficult to easily imitate by other firms. Hence, it gives firms competitive

advantages and thus ensure better performance of the firms and the economy at large (Razafindrambinina & Anggreni, 2011; Wang, 2012).

The bulk of early studies carried out on intellectual capital (IC) attempts to overcome the limitations of conventional indicators based on tangible assets that are used to explain, measure, and manage organisational performance. As captioned in these studies, intellectual capital comprises vast categories of knowledge-based non tangible resources. Hence, these studies examined intellectual wealth from different and comprehensive perspectives in order to construct methods for identifying, describing, measuring, reporting, and valuating intangibles in organizations, regions, networks, and nations (Kianto, Ritala, Spender, & Vanhala, 2014). This is also evident by the large amount of literature and conceptual works on the nature, components as well as tools for reporting intellectual capital (Edvinsson & Malone, 1997; Viedma, 2000; Pulic, 2000; Andriessen, 2003).

Prominent results of these conceptual researches came up with a three dimensional categorisation of intellectual capital into human, organisational and relationship components, and these categories have since been established as standard in building models of intellectual capital (Inkinen, 2015). The human capital component of intellectual capital captures the organisations' employees alongside their competence, skills, knowledge, attitude, and capabilities. The organisational component, also referred to as the structural component, comprises the organisational culture and abilities. It encapsulates investments in tools, patents, information systems, databases and corporate philosophy among others. Relational capital consists of connections and relationships with the external audience and environment of the organisation. It consists of the relationship values and ideals of the organisation with its customers, suppliers, strategic partners, employees and the government.

The fact that no uniform definition exists when defining IC also attests that a single valuation model cannot easily describe its value which thus makes them even harder to manage. The impossibility of assigning monetary values to intellectual capital has not deterred the consideration and comprehension of the process of value creation by organisations. Through the contribution of various disciplines, a significant amount of different measurement models of intellectual capital have evolved (Sveiby, 1997). Prominent among these contributions are the balance score card (Kaplan & Norton, 1996), Performance prism (Cranfield school of management), knowledge assets map (Marr & Schiuma, 2001), Scandia

navigator, Calculated Intangible Value (Stewart, 1997), Intangible Driven Earnings (Lev, 2001) and Value Added Intellectual Capital Coefficient (VAIC™) by Pulic, (2000).

Evaluation of the historical perspective and milestones in the developments and contributions to intellectual capital research is essential. It could foster an understanding of the context within which intellectual capital came into being as a vital organisation element in today's business world. Quite a number of authors have traced the sequence of events involved in the development of intellectual capital. Few among these authors include Brennan and Connell (2000), Guthrie (2000), Bontis (2001), Serenko and Bontis (2004; 2013), Abhayawansa (2014), Inkinen (2015).

Guthrie and Petty (2000) and Abhayawansa (2014) both analysed the timeline of developments on major intellectual capital practice, research milestones and reporting. The different models utilised in the evaluation of intellectual capital were reviewed and summarised by Bontis (2001). Serenko and Bontis (2004) did a meta-review of the citation impacts and research productivity rankings of intellectual capital literature. Guthrie, Ricceri, Dumay (2012) focusing on accounting research, did a review of literature on intellectual capital accounting research. Dumay and Garanina (2013) reviewed intellectual capital models and their utilisation in empirical research. Serenko and Bontis (2013) reviewed literature on the current state and impact of intellectual capital as an academic discipline. Recently, Inkinen (2015) presents an empirical review on the systematic influence of intellectual capital on performance of firms. The study excludes studies that are based on accounting approach. However, despite the shortcomings put forward as the limitations of this category of studies, quite a number of empirical studies have documented interesting results that have culminated into sound body of knowledge on IC and firm performance relationship.

From the foregoing discussions, the objective of this study is to present a detailed review of empirical literature on intellectual capital and firm performance. This study differs from existing literature surveys as it focuses on empirical papers that used the Pulic's VAIC™ as proxy to measure intellectual capital. Although the VAIC™ has been criticised on a number of grounds as a yardstick for measuring organisation's intellectual capital (See Andriessen, 2004; Stahle, Ståhle, & Aho, 2011), the model has been applied in quite a number of empirical studies on intellectual capital for three principal reasons. First, the model provides consistent

and standardised basis of measuring IC, hence, it facilitates the effective conduct of international comparison. Second, since all data used in the computation of IC are audited information, computations are therefore objective and could be verified. Lastly, the computation procedure is straightforward such that it enhances cognitive understanding and ease of application by internal and external stakeholders.

Volkov (2012) provided a schematic bibliography of published journal articles that pertain to the use of the VAIC™ model. The paper showed that, since its inception, VAIC™ has been widely used as a proxy for measuring IC. Hence, this study seeks to explore the findings of empirical researches that have applied the VAIC™ methodology to investigate the relationship between IC and performance of firms. The rest of the paper is structured as follows. The next section details the computation procedures of the VAIC™ model. Section three discusses empirical outcomes of VAIC™ and performance literature, while the last section concludes the paper.

II.   The VAIC™ Model

This section details the computation procedures involved in the VAIC™ model. Pulic (2000) proposed the VAIC™ (also referred to as value creation efficiency of intellectual capital, Pulic 2004), as a monitor and measure of the value creation efficiency in a firm based on audited accounting figures. The basic parameter of the VAIC™ index are the created values and the resources involved in creating those values by the organisation which encompasses both intellectual and financial capital.

Value added is ascribed as the single most appropriate indicator for the performance of an organisation (Pulic, 2004). It is calculated as the difference between firm's output and input. Mathematically:

$$VA = OUT - IN$$

VA is valued added for the company; OUT is the total turnover or revenue; and IN is the cost of components, materials and services purchased. Using the companies audited financial accounts, value added can be calculated as:

$$VA = OP + EC + D + A$$

OP is the operating profit of the firm; EC is the employee costs which comprise salaries, pensions and other associated payments for the services of the human resources; D is depreciation and A is defined as amortisation.

The intellectual capital aspect of VAIC™ comprises two components – human and structural capital. Intellectual capital computation discusses human capital resources (employees) of the firm by treating them as investment rather than cost. Hence, the investment in knowledge and skills of employees are reflected in the created value of the company. The efficiency of human capital is computed as:

$$HCE = VA / HC$$

HCE is the human capital efficiency; VA is value added and HC is the total payments to the employees of the firm.

The second component of intellectual capital, structural capital (SC), is calculated as the difference between value added and human capital. That is:

$$SC = VA - HC$$

The structural capital is also dependent on the value created and it is the reverse proportion of value added invested in human capital. The efficiency of structural capital (SCE) computed as:

$$SCE = SC / VA$$

The sum of the human capital efficiency and structural capital efficiency gives the Intellectual Capital Efficiency (ICE) component of the VAIC. Mathematically:

$$ICE = HCE + SCE$$

The third component, capital employed efficiency (CEE), is calculated as the ratio of value added (VA) and capital employed (CE). Mathematically:

$$CEE = VA / CE$$

The overall value creation index (VAIC™) is the aggregation of the three indicators and this is given as:

$$VAIC™ = ICE + CEE$$

The aggregate indicator measures the overall intellectual ability of a company. It explains how much new value a firm creates per invested monetary units of resources, human, structures and physical. Despite some of its limitations, there are clear indication and justification why VAIC™ has been widely adopted in empirical research as proxy for IC. The method has been adjudged to straightforward and easy to apply. It is also verifiable as the data used in its computation are readily available in firms' financial reports. The value obtained

for VAIC™ is also objective and facilitates inter-industry and cross national comparisons among related and unrelated firms. Lastly, firms use it internally as a yardstick to evaluate their own performance in terms of their IC performance. Empirical studies that have applied the VAIC™ approach to measure IC in their studies are reviewed in the next section.

III.   Intellectual Capital and Firm Performance: Empirical Outcomes

This section detailed the finding of studies since early 2000s when the VAIC™ approach to measuring IC came into being. VAIC™ has been widely adopted in empirical literature on IC for its quantifiable attribute and the ease in obtaining its measurement components. The summarised results of systematic literature showed that most of these studies found positive relationship between performance of firms and IC and its components (See Table 1).

Different methodological procedures have been applied in investigating the relationship between VAIC™ performance ranging from correlation analysis, Analysis of Variance (ANOVA), Data Envelop Analysis (DEA) and the popular regression analysis. The reported results by these studies still largely revealed positive. However, the exact nature of the relationship between IC and performance varies. For example, Nuryaman (2015) using regression analysis found that the relationship between IC and Indonesian manufacturing firms' performance is significantly positive. In another study by Sumedrea (2013) carried out on Romanian non-financial firms during the 2011 also revealed that IC and firms' performance are still strongly related despite economic crisis. Ekwe (2014) and Nimkatroon (2015) using ANOVA both confirmed that firms with IC recorded high financial performance for Nigerian banks and ASEAN technology firms respectively.

The components of VAIC™ have also been recorded to affect the financial performance of firms differently. Some empirical results suggest that the different dimensions of IC possess only little value and impact on the performance of firms when considered separately, but they established a very strong performance driver when combined (Inkinen, 2015). Clarke, Seng, & Whiting (2011), Chizari, Mehrjardi, Sadrabadi, & Mehrjardi (2016) and Dzenopoljac, Janoševic, & Bontis (2016) all established a positive and significant impact of the capital employed component of IC on performance.

Some empirical sources have suggested that the human capital component of IC provides the necessary skills and knowledge needed in the organisation for performance enhancement. It has also been established that the structural capital

facilitates the contribution of human capital. For example, Janosevic, Dženopoljac, & Bontis (2013) found that structural capital and human capital of VAIC™ significantly influence performance of real sector firms in Serbia.

Another dominant theme in VAIC™ literature is the evaluation of its impact on other yardstick for measuring firms' performance different from the traditional financial performance measures. Prominent financial performance measures found in most empirical studies include return on assets (ROA), return on equity (ROE), net profit, operating profit and revenue. Studies have explored the VAIC™ methodology to investigate the impact of IC on other prominent factors like board structure (see Ho & Williams, 2003; Swartz & Firer, 2005), market value (see Chen, Cheng, & Hwang, 2005; Tseng & James Goo, 2005; Yalama & Cuskun, 2007; Wang, 2008; Maditinous, Chatzoudes, Tsairidis, & Theriou, 2011; Ferraro & Veltri, 2011; Mosavi, Nekoueizadeh, & Ghaedi,, 2012), capital gains (Appuhami, 2007), export performance (Pucar, 2012) and corporate social responsibility (Razafindrambininna & Kariodimedjo, 2010; Aras, Aybars, & Kutlu,2011).

Table 1:   Empirical Studies on VAIC™ and Firms' Performance

Author (Year)	Country	Industry	Research Objective	Methodology	Findings
Chen, Cheng, & Hwang(2005)	Taiwan	Multi-sector	To investigate empirically the relation between the value creation efficiency and firms' market valuation and performance	Regression Analysis	The findings of the study support the hypothesis that firms' IC has a positive impact on previous financial performance and it's an indicator of future performance.
Yalama and Coskun (2007)	Turkey	Banking	To test the effect of IC performance on profitability	Data Envelopment Analysis	The result showed that the efficiency of transforming IC into profitability of these banks is about 61.3 percent.
Bharathi (2008)	India	Pharmaceutical	To study the relationship between IC, and its components, with performance of firms	Correlation and Regression Analysis	VAIC rankings show that domestic Indian firms seems to be performing well and efficiently utilising their IC. The human capital component has the highest impact
Ghosh and Modal (2009)	India	Software and Pharmaceutical	To estimate the relationship between IC and corporate conventional performance measures	Regression Analysis	Results suggests that IC can explain profitability but not productivity and market valuation of considered firms

Gan and Saleh (2008)	Malaysia	Technology-Intensive Companies	To investigate whether value creation efficiency can be explained by market valuation, profitability and productivity	Correlation and Regression Analysis	Each component of VAIC commands different impacts on performance compared to the aggregate measure. Physical capital efficiency has the highest impact
Jin and Wu (2008)	China	Multi-Sector	To investigate empirically the relation between IC and sustainable growth ability of firms	Panel Data Regression	Positive relationship between IC as well as its components on Growth ability of firms
Majid Makki and Lodhi (2009)	Pakistan	Multi-Sector	To investigate the relationship between VAIC™ and ROI	Regression Analysis	IC contributes significantly to ROI
Ting and Lean (2009)	Malaysia	Financial Institutions	To examine the IC performance and its relationship with financial performance	Correlational Analysis	It was found that VAIC and ROA are positively correlated
Aras , Aybars, & Kutlu (2011)	Turkey	Multi-sector	To provide empirical evidence of the interaction between Corporate Social Responsibility and IC	Regression Analysis	Result failed to provide any significant relationship between CSR and VAIC
Chu Chan, & Wu (2011)	China	Multi-sector	To investigate whether IC has an impact on the financial aspects of organisational performance	Regression Analysis	Evidence was found to suggest that IC was positively associated with profitability of businesses, with structural capital as a key component.
Clarke, Seng, & Whiting (2011)	Australia	Multi-sector	To examine the effect IC has on performance of firms	Regression Analysis and ANOVA	The results suggest that there is a direct relationship between VAIC and performance. High with CEE and HCE has the least impact.
Maditinos,Chatzoudes, Tsairidis, & Theriou (2011)	Greece	Multi-sector	To examine the impact of IC on firms' market value and performance	Regression Analysis	Results failed to confirm positive relationship between IC, its components and performance. Except for human capital efficiency that has positive and statistically significant coefficient.
Razafindrambinina and Anggreni (2011)	Indonesia	Consumer Goods	To investigate the relationship between IC and corporate performance	Regression Analysis	Result suggests that IC affect but present and future performance of firms
Joshi, Cahill, Sidhu, & Kansal (2012)	Australia	Financial Sector	To examine the IC performance as well as the relationship amongst constituents of IC performance and financial performance	Regression Analysis	The size of the banks in terms of their total assets, number of employees and shareholders' equity has little or no impact on the performance of IC

Pal and Sariya (2012)	India	Pharmaceutical and Textile	To make comparison on the impact of IC on performance between pharmaceutical and textile industries	Correlation and OLS regressions	Results indicated that profitability and intellectual capital are positively associated in both industries.
Pucar (2012)	Bosnia and Herzegovina	Multi-sector	To analyse the impact of IC on export performance of firms	Regression Analysis	Results showed significant and positive influence of VAIC and its components on export performance.
Salman (2012)		Manufacturing	To examine the impact of IC components on ROA	Regression Analysis	Relationship exists between IC components efficiencies and performance. Human capital has more influence than the structural and physical capital components.
Wang (2012)	Taiwan	Information and Electronic	To examine value relevance on valuation methods of IC and its role on corporate governance	Regression Analysis	IC has positive relationship with firm value
Zehri (2012)	Tunisia	Non-financial sector	To investigate the impact of added value created by the components of IC on the performance of firms	Regression Analysis	Positive relationship is observed between IC components and performance
Janosevic, Dženopoljac, & Bontis (2013)	Serbia	Real Sector	To analyse the impact of IC on financial performance of firms	Regression Analysis	Mixed results. While net profit, operating profit and operating revenue are not consequences of the efficient use of IC, ROE and ROA are both affected by the human and structural capital components of IC. Physical capital only influence ROE.
Mehri, Umar, Saeidi, Hekmat, & Naslmosavi (2013)	Malaysia	Technology, Trading and Services, Consumer Products and Hotel Sectors	To examine the effect of the aggregate measure of IC and its components on firm performance	Regression Analysis	Results revealed that aggregate measure of IC has positive impact of performance variables, while the different components showed mixed results.
Sumedrea (2013)	Romania	Non-financial sector	To study the relationship between financial performance of firms and their IC during crisis period of 2010-2011	Regression Analysis	The positive link between IC and performance is confirmed even during crisis period for the country.

Al-musali and Ismail (2014)	Saudi Arabia	Banking	To examine the influence of IC and its components on financial performance, namely ROE and ROA	Regression Analysis	IC performance is low and positively associated with performance indicators. The different components showed varying results.
Britto, Monetti, & Rocha Lima (2014)	Brazil	Real Estate	To clarify whether value created by real estate firms can be evaluated better using IC elements or traditional performance measures	Correlation and Cross sectional OLS	IC has a significant inverse relationship with market value of firms.
Ekwe (2014)	Nigeria	Banking	To determine whether deviations in performance in performance could be explained by deviations in IC variables	Duncan Multiple Range Test of ANOVA	There are differences in the behaviour of both performance and IC indicators across banks. It is also established that banks with high IC recorded high performance
Nimtrakoon (2015)	ASEAN	Technology	To compare the extent to which IC and its four components influence financial performance	Kruskal-Wallis one-way ANOVA	VAIC is modified to include Relational Capital Coefficient (RCE). However, no significant difference in IC coefficient of all countries. Also, positive relationship between IC and performance is confirmed.
Nuryaman (2015)	Indonesia	Manufacturing	To determine the effect of IC on firm's value with financial performance as intervening variable	Regression Analysis	Positive relationship is observed between IC and performance.
Berzkalne and Zelgrave (2016)	Baltic Countries	Multi-sector	To make an empirical investigation of the impact of IC on company value	Correlation Analysis	Positive and statistically significant relationship between company's value and IC for firms in Latvia and Lithuania, but contrary for Estonia
Chizari et al. (2016)	Tehran	Pharmaceutical	to examine the effect of IC on Tehran pharmaceutical companies	Regression Analysis	The VAIC coefficient has significant impact on market performance variables with CEE having the greatest impact.
Dzenopoljac, Janoševic, & Bontis (2016)	Serbia	ICT	To reveal the existence and nature of the relationship between IC and performance	Regression Analysis	Only capital employed coefficient among the three components of VAIC has a significant positive impact on selected measures of performance.

Ozcan (2016)	Turkey	Banking	To analyse the relationship between IC performance and Turkish banks' performance	Regression Analysis	The study found that there is positive relationship between VAIC, as well as its components, and performance.

Finally, one of the major criticisms put forward as the shortcoming of VAIC methodology is that its components are computed from firms' financial statements. However, this has also been one of its strong points as these information are readily available and thus facilitate ease of empirical computations. Studies have further modified the VAIC™ components to address some of the other grey areas pointed out by critics. Chen, Cheng, & Hwang (2005) argued that a prominent drawback in the Pulic's VAIC™ is the failure to incorporate innovative and relational capital. To addressed this shortcoming, Nimtrakoon (2015) modified and extended the VAIC™ to include relational capital (proxy by marketing costs) to investigate the relationship between IC and performance. However, no significant difference is found on the impacts of the traditional VAIC™ as proposed by Pulic and the modified version on performance.

IV.   Conclusion

Since the inception of IC concept, attempts have been devoted towards its measurement and valuation. Pulic's developed VAIC™ model which is based on value creation efficiency analysis of firms identify both size and efficiency capacity of firms in creating and sustaining IC, rather than quantities and prices. Our review of empirical VAIC™ literature revealed that the different dimensions of IC increase firm performance through their interactions.

Furthermore, studies have critiqued the model with concerns over some of its assumptions and source of computations. However, as shown by some of the reviewed empirical paper, VAIC™ should not be regarded as rival to other IC measurement and valuation approaches. Instead, it should be included as an indicator among other multidimensional indicators such as the Balance Scorecard, Scandia Navigator and Performance Prism.

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