Abstract

This paper is a guide on the literature and methodological issues that are necessary to consider on for assessing the value added impact of intellectual capital components, primarily human and structural capital, on measures of productivity, profitability and market value of a firm by employing the Value Added Intellectual Coefficient (VAIC) technique. The importance of intellectual capital for improving firm efficiency and resources has been discussed, along with a review of intellectual capital components. The steps of calculating human and structural capital coefficients are illustrated, followed by suggestions on sampling and relevant methodological issues.

Keywords
Human capital, Intellectual capital, Structural Capital, VAIC

Introduction

Innovation and value creation, being seen as vital for sustainable competitive advantage, are a primary matter of interest for managers, investor, economic institutions and governments and are hence explored in both in the academic sector and the industry (Zeghal and Maaloul, 2010). According to OECD (2008), most companies invest significantly in employee training and development, R&D, customer relations, management control and administrative systems, etc. which is referred to as intellectual capital (hereafter IC) investments. These investments are growing as fast as capital investments, especially in the developed countries (OECD, 2007). This change in investment structure can be attributed to the emergence of the knowledge-based economy (Stewart, 1997; Zeghal and Maaloul, 2010) and are often considered as the main source of value creation in the present era (Edvinsson, 1997; Sveiby, 1997; Lynn, 1998).

IC is typically described as being composed of human and structural capital (Brooking, 1997; Bontis, 1998; Guthrie and Petty, 2000). Hence human capital and structural capital are referred to as IC components (Pulic, 1998). A firm’s performance is subject to an organization’s ability to acquire, manage and utilize IC resources in such a way that it develops sustainable competitive advantage (Walker, 2001). Firm performance can be evaluated in three dimensions—productivity, profitability and market valuation by employing Value Added Intellectual Capital (VAIC) methodology and taking sample from UK firms listed in the LSE. Each of these performance dimensions are expected to be positively influenced by both human and structural capital (Chen et al, 2006).

A greater human and structural capital efficiency signals higher growth prospects of a firms, and hence if markets are efficient, shareholders are likely to place higher values on firms with greater human or structural capital efficiency (Firer and Williams, 2003; Riahi-Belkaoui, 2003). In addition, the value creation from a company’s human and structural capital (here IC) can be interpreted as indicators for subsequent business performance (Roos and Roos, 1997).

There can be two broad set of objectives for such a study. The first set of objectives seeks to examine if there are any relationships between human and structural capital, with the productivity, profitability and market valuation of the firm, and if so, to determine the nature of the relationship. Subsequently, the study would also like to investigate if there are any differences in the nature of relationships between the said IC components with productivity, profitability and market value between the three chosen industry groups, i.e. high-tech, traditional and service as classified by UK Department of Trade and Industry (DTI).

Given the above stated objectives, an ideal thesis statement can be stated as follows: “Companies with greater human and structural capital efficiency have proportionally higher productivity, profitability, and market value and hence overall better financial performance”.

Literature Review

Intellectual Capital and Its Components Broadly speaking, intellectual capital (IC) is a collection of resources which determines the value and competitiveness of an organization (Itami, 1991; Smith, 1994; Rastogi, 2003). Early scholars such as Galbraith (1969) defined IC as a type of brainpower activity that uses knowledge to create value (Shih et al, 2010). Itami (1991) defined IC as intangible assets comprising of technology, brand name, reputation, customer information and corporate culture that are invaluable to a firm’s competitive power (Choong, 2008). Subsequently, Brooking (1996, p. 13) stated that IC was composed of ‘market assets, human-centered assets, intellectual property
assets and infrastructure assets’ (Choong, 2008). Stewart (1998) defined IC as the knowledge, information, intellectual property, experience, etc. that can be put together to create wealth. More recently, Sullivan (2000) described IC as a form of knowledge that can be converted into profit (Choong, 2008). Petty and Guthrie (2000) asserted that IC indicates the economic value of two categories of intellectual assets of an economy—organization and human capital. Rastogi (2003) described IC as the capability of the organization to coordinate and deploy its knowledge resources, thereby creating value to attain future goals.

IC is composed of human capital and structural capital (Brooking, 1997; Sveiby, 1997; Bonits, 1998; Guthrie and Petty, 2000; Choong, 2008). Although the precise definition of human capital depends on the nature of the job and its associated situational factors (Appuhami, 2007), many early economic theories refer to it simply as labor (one of three factors of production), and consider it to be a fungible resource—homogeneous and easily interchangeable (Mohiuddin et al, 2006). The first hardcore business definition of human capital was proposed by Schultz (1961) and subsequently approved by Hermanson (1964) and Sackman et al (1989), all of whom described it as ‘the summation of knowledge, skills, innovativeness and capabilities of a firm’s employees to reach its target’ (Chen et al, 2006, p. 1325). Bonits (1998), Sullivan (1998) and Stewart (1994, 1998) further asserted that human capital was ‘the source and momentum of revolution and innovation for organizations’ (Chen et al, 2006, pp. 1325-1326), and it constituted employee’s innovativeness, experience, attitude, wisdom, capabilities and commitment (Grantham and Nochols, 1997; Ulrich, 1998; Elias and Scarbrough, 2004). Human capital is embedded in the employees and not in the firm, and can be developed through education and training (Miller and Wurzberg, 1995). Hence human capital will also evaporate from the organization when an employee leaves the firm (Edvinsson, 1997; Bonits, 1999; Zeti, 2005; Muhammad et al, 2006).

Structural capital constitutes enabling structures that allow the organization to exploit IC (Muhammad et al, 2006), which may range from patents, copyrights, trademarks, databases, software systems and processes to corporate culture, accountability, efficiency, and trust among employees (Seetharaman et al 2004; Muhammad et al, 2006). Some scholars have also suggested that structural capital includes a firm’s management philosophy, information and networking systems and financial relations (Sveiby, 1997; Guthrie and Petty, 2000; Lee and Guthrie, 2010). Ashton (2005) described structural capital as comprising of various types of internal value drivers of a firm including processes, routines, databases, customer files, work literature or manuals, and organization structures. As structural capital results from outputs, products or systems created by the firm over time they are not necessarily embedded within an individual or employee (Ashton, 2005). Hence unlike human capital, structural capital remains within an organization even after employees leave (Muhammad et al, 2006; Appuhami, 2007; Muhammad and Aida, 2007).

Other Constructs and Rationale
The broad constructs of firm performance can be narrowed down into specific measures of performance (Walker, 2001). Three measures of firm performance can be employed—productivity, profitability and market valuation. First, the study intends to examine the firm’s productivity, which can be defined as the efficiency with which a firm converts its inputs into outputs. A measure of productivity is the ‘Value Added’ by a firm, which according to the Theory of Stakeholder View (Donaldson and Preston, 1995) is the difference between the outputs and inputs during a specific time period, i.e VA = OUTPUTt - INPUTt (Pulic, 1998, 2004). Output represents the total income generated by the firm from all products and services sold during the period, while input represents all the expenses incurred by the firm during at that time except cost of labor, tax, interest, dividends and depreciation (Pulic, 1998; Riahi-Belkaoui, 2003; Zhang et al, 2006; Zeghal and Maalou, 2010). Second, the study proposes to examine profitability, which is the firm’s revenue generating capability; the degree to which a firm’s revenue exceeds its costs (Walker, 2001). One of the most widely used measure of profitability is Return on Assets (ROA), which is the relative comparison of earnings during a specified period and the value of assets used to generate that earning (Firer and Williams, 2003; Chen at al, 2005; Shiu, 2006). Third, as Walker (2001) has predicted, if the firm is not performing well in its operations, the shareholders not expected to sell its shares as profitably as it values its assets in the book, hence its market value would be limited to the net value of its physical and financial assets. Hence excess market value can be conceptualized as a premium resulting from firm operations, and market-to-book value ratio can be considered as a measure of firm performance (Sullivan, 2000; Walker, 2001).

Given the importance of human capital in value creation and sustaining an organization’s competitive advantages, the following three propositions can be made:

Ceteris paribus, the greater the value of human capital in a firm:
- the greater is the firm’s productivity
- the greater is the firm’s profitability
- the greater is the market-to-book value of the firm.

Given the significance of structural capital in creating value and sustaining an organization’s competitive edge, the following three propositions can be made:

Ceteris paribus, the greater the value of structural capital in a firm:
- the greater is the firm’s productivity
- the greater is the firm’s profitability
- the greater is the market-to-book value of the firm.

In addition, although the focus is primarily on human and structural capital, physical and financial is also an important contributor to productivity and profitability, as the greater the physical and financial assets available, the higher is the likelihood that employee productivity would
increase. However, since this increased productivity is not a direct product of human capital, it should be differentiated in the theoretical model, and therefore is termed as capital employed.

The VAIC Framework

Value Added Intellectual Coefficient (VAIC) is an analytical tool for measuring IC to evaluate the performance of a company (Pulic, 1998, 2001, 2002; Boremann, 1999; Van der Zahn, et al, 2004). It was originally developed by Ante Pulic through a series of studies conducted from 1993 to 1997. VAIC is useful in measuring human capital, structural capital as well as physical and financial capital to create the value added by the company (Boremann, 1999; Zeghal and Maaloul, 2010). VAIC measures the total value creation efficiency of a firm (Pulic, 1998). Value creation is assumed to be derived from physical and IC resources, and is referred to as ‘Value Added’ in the VAIC framework (Kujansivu and Lonnqvist, 2005). The execution of VAIC is convenient as the data needed to calculate VAIC can be found in financial statements (Kujansivu and Lonnqvist, 2005). The firm’s ability of using the capital and IC for value added is termed as ‘Intellectual Capacity’, while ‘Value Added Intellectual Coefficient’ is used to express the sum of capital value added coefficient and intellectual potential value added coefficient (Zhang et al, 2006). Since VAIC is calculated as the sum of capital employed efficiency, human capital efficiency and structural capital efficiency, a higher value for VAIC demonstrates a greater efficiency in the use of firm capital (Pulic, 1998, 2004; Muhammad et al, 2006).

There are three major benefits of applying the concept of VAIC which address the deficiencies stated in other methods. First, VAIC provides a standard and consistent basis of measuring the value of IC and thereby firm value, allowing effective conduct of an international comparative analysis using a large sample across various industrial sectors (Pulic, 1998, 2001; Pulic and Boremann, 1999). Hence it facilitates both time-series and cross-sectional studies across different industries for firms of different sizes (Pulic, 1998, 2001). Alternative IC measures such as the balanced scorecard (BSC), human resource accounting (HRA) or economic value added (EVA) are limited in that they either exploit information related to a selected group of company or nations, such as stock data, or that they engage unique financial and non-financial indicators that can be readily pooled into a single comprehensive measure (Roos et al, 1997; Zhang et al, 2006). Second, all data used in the VAIC calculation is based on audited information taken from financial statements (Pulic, 1998, 2001) such as the balance sheet and the profit and loss account, and therefore, the calculations can be considered as objective and verifiable (Roos et al, 1997; Sullivan, 2000). Other intellectual measures have been criticized due to the subjectivity associated with their fundamental indicators (Sveiby, 2000; Williams, 2001). Third, VAIC is a straightforward technique that enhances cognitive reasoning and enables ease of calculation by various internal and external stakeholders (Schneider, 1999). Ease of calculation is a feature that has enhanced the universal acceptance of many traditional measures of corporate performance and market value such as ROA or market-to-book ratio (Sullivan, 2000). Alternative intellectual measures are limited as they only be calculated by internal parties or rely upon sophisticated models, analysis and principals. Finally, the VAIC method is increasingly used as it is receiving more and more research attention (Sullivan, 2000; Sullivan and Sheffrin, 2003).

Calculation of VAIC Components Using the Theory of Stakeholders View (Donaldson and Preston, 1995), Value Added (VA) will be calculated by adding up the respective year’s total interest expenses, depreciation expenses, dividend, corporation taxes, profits retained for the period, and wages and salaries for the period:

\[
VA_t = DP_t + W_t + I_t + D_t + T_t + R_t
\]

(\(VA_t\) = value added for the period; \(I_t\) = total interest expenses; \(DP_t\) = depreciation expenses; \(D_t\) = dividends; \(T_t\) = corporate tax; \(R_t\) = profits retain for the period; \(W_t\) = wages and salaries, and other training costs for the period)

The IC component coefficients will be calculated following Firer and Williams (2003) and Zeghal and Maaloul (2010). First, Capital Employed Efficiency will be first calculated as follows:

\[
CE_{VA} = VA_{VA} / CE_{it}
\]

(\(CE_{it}\) = Capital Employed = Physical Assets + Financial Assets = Total Assets – Intangible assets at the end of t period; \(CE_{VA}\) = The value created by one unit of capital employed during the t period)

Second, the Value Added Human Capital Coefficient will be calculated as follows:

\[
HC_{VA} = VA_{HA} / HC_{it}
\]

(\(HC_{it}\) = investment in human capital during the t period or total salary and wages including all incentives and training schemes; \(HC_{VA}\) = value added by one unit of human capital during the period of t)

Third, the Value Added Structural Capital Coefficient will be calculated as follows:

\[
SC_{VA} = SC_{it} / VA_{it}
\]

(\(SC_{it}\) = structural capital during the period t calculated by the difference between Value Added and Human Capital (\(VA_{it} - HC_{it}\); \(SC_{VA}\) = the proportion of total Value Added accounted by structural capital)

Finally, the Value Added Intellectual Capital Coefficient (VAIC\(_it\)), which denotes corporate value creation efficiency on firm resources, will be calculated by adding the coefficients of efficiency for each of the three components:

\[
VAIC_{it} = CE_{VA} + HC_{VA} + SC_{VA}
\]

Variables and Research Models The study will employ a multiple linear regression models to identify the relationship between share price denoting market value, financial performance and the three components of IC coefficient VAIC\(_it\); capital employed efficiency (\(CE_{VA}\)), human capital efficiency (\(HC_{VA}\)), and structural capital efficiency (\(SC_{VA}\)). Two other control variables are proposed to be added, including firm size (measured by Total Net Assets) and financial leverage creditworthiness (measured by Qui Score). Value Added (\(VA_{it}\)) is used as a proxy for productivity,
Return on Assets (ROA) as a proxy for profitability, and Market-to-Book Value Ratio (M/B) as a proxy for excessive market value over the value of physical and financial assets. Consequently, the following multiple regression models are proposed:

\[ VA_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it} \]  
(Model 1)

\[ ROA_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it} \]  
(Model 2)

\[ M/B_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it} \]  
(Model 3)

Previous Applications of VAIC Although relatively new, VAIC has been occasionally applied in academic research over the past few years. For instance, Pulic (2001) identified that firm’s market value have been created by human and structural capital, and he further found a significant relationship between the average value of VAIC and the firm’s market value by using data of 30 UK companies from 1992 to 1998. Subsequently Pulic (2002) employed the VAIC model to measure the IC performance from Croatian banks for the period 1996-2000 and found significant differences in terms of bank ranking and performance. Williams (2001) discovered that companies with higher level of VAIC try to reduce their disclosure in respect of IC when the performance reaches a threshold level since it might reduce competitive advantages. Using a sample of 81 US multinationals, Riahi-Belkaoui (2003) documented a significant positive relationship between IC and financial performance. While investigating the impact of IC on traditional measures of corporate performance like ROA, ROE, turnover, and market to book value ratio using 75 public companies in South Africa, Firer and Williams (2003) found that the associations between the efficiency of value added (VA) and profitability, productivity and market valuation are mixed. Goh (2005) found that value creation capability of commercial banks in Malaysia is primarily attributed to human capital efficiency. Using a sample of listed companies in Taiwan, Ming et al (2005) found that IC has a positive impact on market value and financial performance and as well as positive impact of research and development expenditure on profitability and firm value (Ting and Lean, 2009). Saenz (2005) conducted a study in Spanish banks and identified a clear positive relationship between human capital and market-to-book value ratios. Zeghal and Maaloul (2010) employed VAIC on 300 UK companies and found that IC has a positive impact on economic and financial performance but its association with market values was not clear.

Suggested Sampling Technique As VAIC is a standardized measure that can be used to make cross-industry comparisons regardless of the nature of firm operations; the study should take advantage of this attribute and include a relatively large sample from different industries rather than focusing any particular sector. For example, if the data is chosen for firms on London Stock Exchange (LSE), the data should include companies from an array of sectors such as banking and financial intermediaries, automobiles, pharmaceuticals, energy, information technology, construction, telecommunication, health services, food, etc. Considering that the contribution of IC to a company’s productivity, stock market or financial performance could vary by industry (Abdolmohammadi, 2005; Tan et al, 2007), the study should subsequently categorize all the firm into three groups of sectors—high-tech (e.g. heath or automobile), traditional (e.g. construction or telecommunications) and services (e.g. banks or food), as has been classified by UK DTI (2006, p. 49). Either simple random or convenience sampling could be used for choosing the companies.

Expected Results

Most prior studies have suggested a positive relationship between IC efficiency and financial performance, i.e. profitability (Chen et al, 2005; Zhang et al, 2006; Zeghal and Maaloul, 2010). However not many studies have been able to show a significant correlation between IC and market value of a firm, perhaps owing to the high volatility of the P/E ratio (Zeghal and Maaloul, 2010). Given the outcome of these studies, it is anticipated that a definite relationship between IC and financial performance would be established but there is some doubt as to whether the same result would be achieved for the relationship of IC and market values of firms. Since prior studies have not been conducted on the influence of productivity on IC components, the outcome is difficult to anticipate, but following the rationale stated behind hypothesis formulation, it is expected that a positive relationship could be traced between both human and structural capital and productivity.

Knowledge and Skills Required

In order to develop the research framework, sufficient knowledge on the nature and characteristics of human and structural capital is required. It is also important to understand their likely relationships with productivity, market value and financial performance, for which it is essential to review relevant research papers. The researcher needs to have prior working knowledge on software programs such as Stata, SPSS and MS Office, which is essential for conducting the study. In addition, a modest understanding of the chosen country’s capital market,
specially the high-tech, banking and automobile industry is essential for analysis and interpretation, and this can be acquired by reading relevant newspaper articles, and previous studies conducted on these three industries in UK, both of which sources can be obtained from the University’s library and electronic network.

REFERENCES


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