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The Role of Intellectual Capital in Determining Differences between Stock Market and Financial Performance

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Abstract

This paper empirically examines the role of intellectual capital (IC) in determining market value and financial performance of organizations by taking a sample of 100 UK firms listed on the London Stock Exchange (LSE) from three industries—banking, automobile and high-tech using financial data for the year 2009. The study used Pulic's (1998, 2000, 2002, 2004) framework of Value Added Intellectual Coefficient (VAIC) to measure intellectual capital components. This paper is the first to VAIC application that uses credit rating Qui Score as a control variable to measure the impact of IC on firm's stock market and financial performance. The empirical results confirms that greater IC efficiency leads to better financial performance although no strong evidence could be established regarding the relationship between IC and stock market performance. Human capital was identified as the most significant contributor of IC in a firm. In addition, comparison of the results with Zeghal and Maaloul's (2010) study on 2005 data indicated that UK firms created less value in the recession year 2009 than on the years before the credit crisis.

Keywords: Intellectual Capital, VAIC, Stock Market Performance, Financial Performance, Human Capital, Structural Capital.

1. Introduction

1.1. Research Problem and Background

The difference between market and book value of a firm has always been a research interest for academicians (Cezair, 2008). Although a firm's market and book values have rarely been the same, the fact that the gap has been increasing over the past few decades has drawn wide attention for researchers to explore any invisible value unattended in the financial statements (Lev and Zaowin, 1999; Lev, 2001; Al-Ali, 2003; Lev and Radhakrishnan, 2003; Lev and Daum, 2004). Lev (2001) found that over the twenty-five year period of 1977-2001 the market to book value ratios of S&P 500 corporations increased by five times (from slightly over 1 to above 5). This implies that over 80% of corporate market value has not been reported in financial statements (Lev and Sougiannis, 1999). Edvinson and Malone (1997) explained the growing gap between market value and financial performance by stating that the source of economic value is no longer simply captured by the production value of material goods, but also by the creation and utilization of intangibles such as intellectual capital (Lev and Daum, 2004). Intellectual capital (IC) is not recognized in traditional financial statements (Lev, 2001; Cezair, 2008). Malhotra (2000) asserted that the issue of valuing and measuring IC is critical as it

enables us to understand where value lies in the firm and for developing measures for assessing success and growth of the firm (Cezair, 2008). Given the significant contribution of economically emerging nations to the overall well-being and balance of the global economy, it is important to establish an understanding of the development of IC in different corporate and economic settings (Gu and Lev, 2001; Lee and Guthrie, 2010).

The growing gap between the market and book values of firms have drawn broad interest into investigating ways for measuring firms' IC to see if the capital market is efficient with IC (Chen et al, 2005). Recent studies inform that knowledge and information are actually subject to increasing returns, as opposed to the decreasing returns typical of the traditional resources like physical assets (Bontis et al, 1999; Cezair, 2008), which implies that knowledge and information become even more valuable to companies than before. Having a sound knowledge base in the corporation means that in the future years, the company can start leveraging that base to create even more knowledge, and attain competitive advantage (Arthur, 1996; Cezair, 2008). The fact that investors and financial markets attach value to the skills and expertise of CEOs and other top management can be understood by observing stock prices reacting to changes in management (Bontis, 2001). If IC did not exist in organizations then stock prices would not have reacted to actions such as changes in management, an element of human capital not recognized in financial statements as assets (Lev and Zaowin, 1999; Lev, 2001; Bontis, 2001). This fact questions the reliability and adequacy of traditional accounting methods used by firms in the present information age, the basics of which were developed a few centuries ago to help merchants in the feudal era. Unfortunately, being invisible and intangible, the value of knowledge cannot be captured very well by any traditional measure—accounting or otherwise, that corporations master in their everyday operations (Rastogi, 2000; Lev and Radhakrishnan, 2003). IC can be an objective proxy for the value of corporate knowledge (Malhotra, 2000; Chang and Lee, 2008). Companies therefore require a reliable, accurate, and adequate measure of financial performance which objectively reflects the intrinsic components of IC and sufficiently demonstrates its true impact on company value at the market to narrow the gap between book and market values (Lev, 2001; Cezair, 2008).

1.2. Purpose

The purpose of the study is twofold. The study attempts to empirically investigate if there is any association, firstly, between a firm's IC and stock market performance, and secondly, between a firm's IC and financial performance in the context of UK companies selected from three different industries—banking (both retail and investment), automobile and high-tech. Firms in each of these industries should require IC for value creation efficiency for value creation and survival, although the degree to which IC is needed may vary across these industries (Goh, 2005; Shih et al, 2010; Zeghal and Maaloul, 2010). The possibility of any association between stock market and financial performance with IC is to be investigated by applying Pulic's (1998) concept of Value Added Intellectual Coefficient (VAIC). Findings from this study should assist to determine if UK firms continue to rely on traditional resources for wealth creation (land, labor and capital), or are shifting towards greater IC factors of production in driving financial performance and market valuation (Ting and Lean, 2009; Zeghal and Maaloul, 2010).

1.3. Significance and Originality

The concept of intellectual capital is still relatively new in the business world, and so far not many studies on the application of VAIC have been conducted on UK firms (Zeghal and Maaloul, 2010). Some academic researchers have applied VAIC on different European countries, although its application in the industry is still limited (Zhang et al, 2006). In addition, most of the previous analyses on IC focused only one industry (Zeghal and Maaloul, 2010), where as Pulic informs that his VAIC is a standardized measure that could be applied over a range of companies of different sizes, taken from

different sectors and across different countries (Pulic, 1998, 2001, 2004). Taking this into consideration, the present study includes companies from three different business sectors—banking, automobiles, and high-tech. Given the presumable ability of IC to influence the wealth of an organization, it is critical that executives learn to make use of these assets to improve company performance and market value, i.e. stock market performance (Muhammad et al, 2006; Zhang et al, 2006; Zeghal and Maaloul, 2010).

1.4. Research Approach

Since the study attempts to explore the relationship between IC and firm's stock market and financial performance by using company data, the research can be categorized as positivist from epistemological orientation and objectivist from ontological orientation (Saunders et al, 2000). Consistent with this need a predominantly quantitative approach is used for the study. However, most studies are neither completely qualitative nor quantitative but a rather combination of the two (Saunders et al, 2000). A wealth of literatures have been reviewed to understand the characteristic of IC and pave way for choosing an appropriate methodology, and this would constitute qualitative data.

1.5. Research Questions

The research questions for the study are derived from two assertions about relationships between a firm's level of IC, its stock market and financial performance. First, a greater IC efficiency signals higher growth prospects of firms, and hence if markets are efficient, shareholders are likely to place higher values on firms with greater IC efficiency (Firer and Williams, 2003; Riahi-Belkaoui, 2003; Zhang et al, 2006; Zeghal and Maaloul, 2010). This suggests a greater IC is likely to increase the market value of a firm (Firer and Williams, 2003; Zhang et al, 2006). Second, the growth of a company's IC can be interpreted as an indicator for subsequent business performance (Roos and Roos, 1997; Zeghal and Maaloul, 2010). This suggests greater IC will lead to better financial performance (Roos and Roos, 1997). Drawing from these assertions this study addresses two broad research questions:

1. Can IC efficiency determine the stock market performance of an enterprise?
2. Can IC efficiency determine the financial performance of an enterprise?

1.6. Objectives and Thesis Statement

The objectives of the study stem from the above mentioned research questions:

1. To investigate if there is a relationship between IC and stock market performance of UK firms and if so, to assess the nature of that relationship.
2. To investigate if there is a relationship between IC and financial performance of UK firms and if so, to assess the nature of that relationship.
3. To determine if there are differences in the relationship of IC with stock market and financial performance of firms between the three selected industries (high-tech, banking, and automobile), and the nature of the relationship.

The above stated objectives, the following thesis statement can be proposed for the study:

Intellectual capital, which is not adequately recognized in traditional financial statements, is becoming increasingly important in determining the stock market and financial performance of organizations as opposed to traditional assets. Greater intellectual capital leads to higher market value and greater profitability.

1.7. Organization of the Paper

This paper is organized into five chapters. The introductory chapter describes the research problem and its background, discusses the purpose and significance of the study including identification of the

objectives and states the resulting research questions. The second chapter reviews the existing literature and attempts to define IC and classify its different components. The section further discusses the relationship between IC, measures of stock market and financial performance, and discusses the various ways of measuring IC—particularly the concept of VAIC. The third chapter explains the research methodology, including a description of the VAIC framework as well as the research design including data sources, sample selection and data collection procedure. The empirical results are discussed in the fourth chapter, including descriptive statistics, correlation and regression analysis. The results are then discussed, including the managerial implications of the findings. The final chapter concludes the study by summarizing the major findings, indentifying the limitations of the study and giving a few suggestions of further research.

2. Literature Review

2.1. Definitions of Intellectual Capital

Intellectual capital (IC), in its broadest sense, can be defined as a collection of resources which determines the value and competitiveness of an organization (Itami, 1991; Smith, 1994; Rastogi, 2003). Probably the earliest scholar to use the term was Galibraith (1969) who 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). Several other definitions of IC covering its scope and functionality have been given by researchers in recent times. For instance, Stewart (1998) defined IC as intellectual material, i.e. knowledge, information, intellectual property and experience, that can be put together to create wealth. 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.

Some IC definitions suggest the existence of an inherent relationship between IC of a firm and its knowledge base, but in different ways. For instance, where as Bontis (1999) defined IC as the knowledge instilled in both the workers and the organization, Pulic (2001) purported that all employees and their abilities create value at various organizational processes which in turn is translated in the market as IC. In the same go, Lonnqvist (2004) defined IC as non-physical resources of value related to the capabilities of employees and the manner in which an organization is operated. Mason (2006) indicated that IC is an intangible asset that exists as an aggregation of the internal structure and employees in a firm. Chen et al (2006, p. 1331) defined IC as 'the total stocks of all kinds of intellectual assets, knowledge, capabilities and relationships at employee and organizational levels within a company'. While these definitions seem to revolve within the realm of intangible assets, Edvinsson and Malone (1997) emphasized that IC concerns not only intangibles, but also the competence or expediency of an institution's processes, databases, brands and systems (Zeghal and Maaloul, 2010). Table 1 accumulates some of the most widely used definitions of intellectual capital.

Table 1: List of Intellectual Capital Definitions

Author(s)	Term Used	Definition
Itami (1991)	Intellectual Capital	IC is intangible asset comprising not only of technology, brand name and reputation, but also of customer information and corporate culture that are invaluable to a firm's competitive power.

Table 1: List of Intellectual Capital Definitions - continued

Smith (1994)	Intellectual Property	Intellectual properties are intangible assets containing all elements of a business that exist in addition to working capital and tangible assets. They are often the primary contributors of the earning power of the enterprise. Their existence is dependent on the presence or expectation of earnings.
Brooking (1997)	Intellectual Capital	IC consists of market assets, human centered assets, intellectual property assets and infrastructure assets.
Edvinsson and Malone (1997)	Intellectual Capital	IC concerns not only intangibles, but also the competence or expediency of an institution's processes, databases, brands and systems.
Nahapiet and Ghosal (1998)	Intellectual Capital	IC is the knowledge and knowing capability of a social collectivity, such as organization, intellectual community or professional practice.
Stewart (1998)	Intellectual Material	Intellectual material knowledge, information, intellectual property and experience that can be put together to create wealth.
Sullivan (2000)	Intellectual Capital	IC is knowledge that can be converted into profit.
Petty and Guthrie (2000)	Intellectual Capital	IC is indicative of the economic value of two categories (organization and human capital) of intellectual assets in an economy.
Pablos (2003)	Intellectual Capital	A broad definition of IC states that it is the difference between the company's market value and its book value. Knowledge based resources that contribute to the sustained competitive advantage of the firm form IC.
Rastogi (2003)	Intellectual Capital	IC may properly be viewed as the holistic or meta-level capability of an enterprise to co-ordinate, orchestrate, and deploy its knowledge resources towards creating value in the pursuit of future vision.
Lonnqvist (2004)	Intellectual Assets	Intellectual assets are non-physical resources of value related to the capabilities of employees and the manner in which an organization is operated.
Mouritsen et al (2004)	Intellectual Capital	IC mobilizes 'things' such as employees, customers, IT, managerial work, knowledge. It cannot stand by itself as it merely provides a mechanism that allows the various assets to be bonded together in the productive process of the firm.
Chen et al (2006)	Intellectual Capital	IC comprises of the total stocks of all kinds of intellectual assets, knowledge, capabilities and relationships at employee and organizational levels within a company.

A wealth of recent studies suggest building IC paves way for knowledge creation in the enterprise (Petty and Guthrie, 2000; Rastogi, 2000; Marr et al, 2003; Afiouni, 2007; Greiner et al, 2007; Chang and Lee, 2008; Curado, 2008; Liew, 2008; Schiuma and Lerro, 2008; Shih et al, 2010). As a result, while defining IC many researchers appear to state some form of relationship between IC and knowledge creation, whether it be for an individual or an enterprise (Shih et al, 2010). These assertions are included in Table 2 and suggest that as knowledge management is becoming an important strategy in corporate competition (Drucker, 1993; Mayo, 2001; Al-Ali, 2003), organizations can be redefined as 'platforms' that can create knowledge by accumulating IC (Shih et al, 2010).

Table 2: Defining Intellectual Capital in Terms of Knowledge Creation

Author(s)	**Definition**
Drucker (1993)	In the present era, knowledge is not just another factor of production beside land, labor and capital, but is the only meaningful resource today (also see Bontis, 1999; Pulic, 2004). (Where as)…the most important, and indeed the truly unique contribution of management in the 20th century was the fifty fold increase in the productivity of manual worker in manufacturing, the most important contribution management needs to make in the 21st century is to increase the productivity of knowledge and knowledge workers… The most valuable asset of a 20th century company was its production equipment while the most valuable asset of a 21st century institution will be its knowledge workers and their productivity.

Table 2: Defining Intellectual Capital in Terms of Knowledge Creation - continued

Dzinkowski (2000)	IC is the total inventor of knowledge and capital-based resources owned by a firm, i.e. intellectual assets or properties that can be transferred by knowledge.
Bontis et al (2002)	IC is the stock of knowledge at a given time (also see Bontis 2004; Moon and Kym, 2006).
Mayo (2001)	IC is a synonym of knowledge, information, intellectual properties, experience and other intangible assets; it comprises of intangible assets within the firm.
Al-Ali (2003)	IC is the knowledge stored in the systems, workflows, database, cultures and management philosophy in the organization as well as the knowledge, experience and brainpower of employees that facilitates value creation (similar to Galbraith (1969) and Edvinsson and Malone (1997); also see Shih et al, 2010)
Schiuma and Lerro (2008)	IC involves improving organizational flows and management techniques to create knowledge assets.
Shaikh (2004)	Any knowledge capabilities resulting from the creativity and innovation, manpower, organizational structure or affiliated parties can be termed as IC, as long as it can store, translate and convert the implicit knowledge of employees into explicit knowledge for structuring the organization (also see Phusavat and Kanchana, 2007; Shih et al, 2010)

2.2. Classification of Components of Intellectual Capital

Exactly what constitutes IC has remained a matter of academic debate as scholars have sub-categorized it in various ways (Choong, 2008). Some scholars regarded IC as a form of intangible assets and has classified it accordingly, whereas others viewed IC from a non-accounting perspective. Considering IC as an intangible asset, Brooking (1996, 1997) classified it as a combination of market assets, human-centered assets, intellectual property assets, and infrastructure assets (Moon and Kym, 2006). One of the first to classify IC from a non-accounting perspective was Sveiby (1997) who proposed IC can be categorized into three sub-categories: employee (individual) competence, internal structure and external structure. Identical classifications were also adopted by Guthrie and Petty (2000), excepting that 'employee competence' was replaced by the term 'human capital'. Brooking (1997) added a fourth category to Sveiby (1997): 'intellectual property assets', which refers to the value of intellectual properties stated in the financial statements, i.e. the values of patents, trademarks, brands, etc. Edvinsson (1997) adopted the three categorizations of Sveiby (1997), but termed them as human capital, organizational capital and customer capital respectively. Further, Edvinsson (1997) recognized IC as part of an organization's assets, and stated that non-disclosure of such assets constitutes items that are hidden from the conventional financial statements (Choong, 2008). Similar groupings were also adopted by Edvinsson and Malone (1997), Bontis (1998) and Sullivan (1998). However researchers such as Knight (1999) and Duffy (2000) broadened the concept of Sveiby's (1997) external structure (customer capital) and termed them as relational capital. Even though Stewart (1998) adopted the classifications of Sveiby (1997), he named them as IC, structural capital and customer capital respectively. Hence in this context organizational capital and structural capital essentially means the same.

2.2.1. Human Capital

Sveiby's (1997) 'individual competence' refers to the skills and expertise of employees that adds value to the organization. This is said to vary in degrees within individuals in a firm, and has been referred to as 'human capital' by Edvinsson (1997) and others. It is difficult to construct a precise definition of human capital as it depends on the nature of the job and firm as well as the situational factors related to the job (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). Other conceptions of labor dispense with these assumptions. The concept of human capital was originally proposed by Schultz (1961) and subsequently by Hermanson (1964) and Sackman et al (1989), who defined 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). A

different school, led by Ulrich (1998) and Elias and Scarbrough (2004) asserted that human capital has two determinants—employees' capabilities and their commitment. However both schools agreed that human capital is embedded in the employees and not in the firm, and can be developed through education and training (Miller and Wurzberg, 1995). Bontis (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 and capabilities (Grantham and Nochols, 1997).

Several scholars informed that the human capital can be developed so as to enhance the efficiency of tangible and intangible assets within an organization (Bontis, 1999: Fitzenz, 2001; Sullivan and Sheffrin, 2003). Bozbura (2004) suggests that human capital can be recognized as an accretion of general knowledge acquired by employees during their work tenure, leadership skills, the ability to take risks while performing the job and making decisions, and the ability to solve problems (Appuhami, 2007). Guthrie and Petty (2000) stated that human capital consisted of the employee and their education, training, work-related knowledge and entrepreneurial spirit. The study identified employee training and development, worker's pay, labor disputes, lay-offs, recruitment, director's dealings, executive pay and management moves as measures of human capital (Guthrie and Petty, 2000; Lee and Guthrie, 2010).

Drawing from Sveiby's (1997) 'individual competence', a notable feature of human capital is that it is entrenched in individuals and not organizations (Zeti, 2005; Muhammad et al, 2006). Adhering to this particular characteristic of human capital, Edvinsson (1997) predicted that human capital would evaporate as employees leave the firm, since human capital depends on capabilities of employees such as competence, commitment, motivation, loyalty, and similar attributes. Hence although human capital is being recognized as the heart of creating IC, it may disappear as employees exit (Bontis, 1999). In the context of globalization, high class human capital today has become a prerequisite to success and not merely opulence (Muhammad et al, 2006). As a result, companies in the present knowledge era invest significant amount of their money in human capital development in order to achieve competitive advantages in the global market (Ulrich, 1997; Appuhami, 2007).

2.2.2. Structural (or Organizational) Capital

Sveiby's (1997) 'internal structure' typically means the organizational processes, databases and internal control systems. This has been referred to as either structural capital (Edvinsson, 1997; Bontis, 1998; Sullivan, 1998) or organizational capital (Stewart, 1998) by other scholars. Structural capital comprises of enabling structures that allow the organization to exploit IC (Muhammad et al, 2006). These structures range from tangible items offered by an organization, such as patents, copyrights, trademarks, databases, software systems and processes to intangibles such as corporate culture, accountability, efficiency, and trust among employees (Seetharaman et al 2004; Muhammad et al, 2006). 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. Following Sveiby (1997), Guthrie and Petty (2000) asserted that organizational capital consists of internal capital, which includes intellectual property, management philosophy, corporate culture, management processes, information and networking systems and financial relations (Guthrie and Petty, 2000; Lee and Guthrie, 2010). Sources to enhance internal capital include competitive intelligence, corporate governance, supply chain, information technology, or capital markets (Guthrie and Petty, 2000).

Conventionally, structural capital referred to the processes and procedures formed by employees' intellectual input (Carson et al, 2004). Moon and Kym (2006) conceptualized structural capital in terms of organizational culture, processes, information systems and intellectual property. Organizational culture, which refers to distinguishing set of practices, behavior standards and expectations that prevails in a firm (Lund, 2003) is reflected in the firm's market orientation, strategy direction, human resource practices, internal networks and information sharing (Band, 1991; Moon and

Kym, 2006). Organizational processes refer to the manner in which people actually use the information and knowledge in their day to day activities (Hobley and Kerrin, 2004). Information systems refer to 'the information technology used in managing knowledge' (Moon and Kym, 2006, p. 258). Systems alone do not have a great effect on organizational performance, but when coupled with enhanced work processes, they leverage IC into increasing the value of a business (Soh and Markus, 1995). Moon and Kym (2006) also considered intellectual property as part of structural capital as it is the most explicit and tangible asset of IC since it can be legally protected, and is considered by Brooking (1996) and Stewart (1998) as the starting point in developing and managing IC.

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). Hence Edvinsson (1997) and other scholars suggest that the management should try to transform the firm's human capital knowledge into structural capital components to ensure value creation in the long run (Bontis et al, 2006; Appuhami, 2007). It is believed that organizations possessing strong structural capital are highly likely to develop a supportive corporate culture permitting their employees to try new things in the workplace, to learn, and to practice those (Bontis et al, 2000).

2.2.3. Relational (or Customer) Capital

Sveiby's (1997) 'external structure' relates to the knowledge brought in by other stakeholders that contributes to the value of the firm (Choong, 2008). Typically this has been defined as relational capital by most scholars (Knight, 1999; Duffy, 2000; Lev, 2001). Capello (2002) defined relational capital as the set of all relations that a firm establishes with other firms, institutions and research centers (Chen et al, 2006). Ashton (2005) defined relational capital as external value drivers such as relationships with customers, suppliers and alliance partners (Appuhami, 2007). Chen et al (2006) furthered this concept by asserting that relational capital incorporate strong levels of understanding, trust, relationship and collaboration among strategic alliance partners, and therefore includes 'stocks of connections, interactions, linkages, closeness, goodwill and loyalty between a firm and its upstream suppliers, downstream clients, strategic partners or external stakeholders' (p. 1332). Relational capital has been described by Guthrie and Petty (2000) as 'external capital', which included brands, customers and customer satisfaction, company names, distribution channels, business collaborations or licensing agreements (Lee and Guthrie, 2010). They cited sources to enhance external capital as marketing efforts, joint ventures, company profiles and contracts or orders (Guthrie and Petty, 2000).

The most important feature of relational capital is considered to be customer capital, as the new business environment requires firms to be customer-oriented rather than being product-oriented (Moon and Kym, 2006). A loyal and sufficiently large customer base is vital to achieving economic success (Aaker, 1991; Keller, 1993; Fornell et al, 1996). In addition, Moon and Kym (2006) included community capital, which refers to the trust relationships, cooperation and collective action between stakeholders (Kogut and Zander, 1996; Nahapiet and Ghoshal, 1998).

2.3. Traditional Methods of Measuring Intellectual Capital and their Deficiencies

The traditional measures of IC valuation include the Balanced Scorecard (BSC), Human Resource Accounting and the Economic Value Added (Bontis et al, 1999). Unfortunately, each of these measures carries some disadvantages and none are completely reliable for an accurate valuation. Balanced Score Card (BSC) is a multi-dimensional measurement system developed by Kaplan and Norton (1996) with leading and lagging indicators of management focusing on both internal and external aspects of a company. The BSC organizes its measurement system in four perspectives—financial, customer, internal business and learning and growth (Kaplan and Norton, 1996). The deficiencies are that this method is qualitative (hence subjective), quite inflexible, non-dynamic and

company specific, thereby providing little possibility for external comparison (Bontis et al, 1999; Rodov and Leliaert, 2002).

Human Resource Accounting (HRA) attempts to quantify the economic value of the people working in an organization (Sackmann et al, 1989). Bontis (2001) identifies three types of HRA measurement tools used by researchers—Cost Models, Human Resource Value Models, and Monetary Emphasis. Cost Models emphasize on historical or acquisition cost (Brummet et al 1968), on replacement costs (Flamholtz, 1973) and on opportunity cost (Hekimian and Jones, 1967). Human Resource Value Models emphasize on non-monetary behavior (Likert, 1967) or may alternatively be further combined to include monetary economic value models (Likert and Bowers, 1973; Gambling, 1974). Monetary Emphasis has been termed as a discounted earnings or wages approach by some scholars (Morse, 1973). The HRA system, instead of typically classifying wages as an expense on the income statement, classifies a discounted cash flow of total wages in the balance sheet (Bontis, 2001). This poses difficulty in projecting the size of the company for future periods. In addition, Bontis, et al (1999) believe that certain assumptions held in the calculation of HRA such as turnover and salary increases or tenure per employee are most likely to be educated guesses at best. Like BSC, HRA system suffers from subjectivity, uncertainty and lack reliability in their measures which cannot be audited with assurance.

Economic Value Added (EVA), a comprehensive financial management measurement system that can be used to tie together capital budgeting, financial planning, goal setting, performance measurement, shareholder communication and incentive compensation (Stewart, 1991; Ehrbar, 1998), is calculated by identifying the difference between net sales and the sum of operating expenses, where capital charges are calculated by the weighted average cost of capital multiplied by the total capital invested (Bontis et al, 1999). However, the EVA performance measure may not be appropriate when applied to quantifying the value of intangible assets as the use of book value of assets relies on historical cost giving no indication of replacement or current market value (Ehrbar, 1998). In addition, most empirical research could not demonstrate conclusively that EVA is a reliable and highly efficient predictor of stock price and the variations within (Bontis et al, 1999).

The more recently developed techniques of measuring IC include Calculated Intangible Value (CIV), Intangibles Scorecard (Hurwitz et al, 2002) and Weightless Weight Tool Kit (Andriessen, 2004). Weightless Wealth Tool Kit is designed to be used as an internal management tool kit and it relies on the assessment of mangers of the firm (Kujansivu and Lonnqvist, 2005). Apart from the possibly of internal managers being biased on their evaluations, the method itself cannot be applied for cross-sectional comparison, as different managers in different firms may set different assumptions for the measurement of firm wealth. Intangibles Scorecard is partly based on expected future earnings of a firm, which itself have to be measured on the basis of numerous assumptions about the company's ability to generate future revenue (Hurwitz et al, 2002). Future earnings are hence difficult to estimate without a thorough understanding of the status of a company. It is not feasible to apply this kind of method to a large number of companies for comparison purposes (Kujansivu and Lonnqvist, 2005). Calculated Intangible Value (CIV) can only be applied to certain types of companies as it is based on the assumption that a company's premium earnings—the earnings greater than an average company's earnings within the industry—result from the company's IC (Stewart, 1997; Kujansivu and Lonnqvist, 2005). The execution of CIV involves six complicated steps for separating tangible and intangible asset classifications, implying that the execution method can be completed only when the return of tangible assets of the company is greater than the return of tangible assets in the industry (Stewart, 1997; Kujansivu and Lonnqvist, 2005). Further, data for three successive years is necessary for completing the execution of CIV (Stewart, 1997).

2.4. Measuring Intellectual Capital by Value Added Intellectual Coefficient (VAIC)

Value Added Intellectual Coefficient (VAIC), developed by Ante Pulic through a series of studies conducted from 1993 to 1997, 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). VAIC is useful in measuring the sources of all kinds of resource contribution—human capital, structural capital (including relational capital) as well as physical and financial capital to create the value added by the company (Bornemann, 1999; Zeghal and Maaloul, 2010). VAIC measures the total value creation efficiency of a firm. 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). Referring Drucker's (1993) crucial organizational necessity of developing knowledge workers for the present era, Pulic (2004) describes the VAIC model as follows:

"I would like to introduce the VAIC—Value Added Intellectual Coefficient (also known as the Value Creation Efficiency Analysis) as my solution to the above stated issue. It meets the basic requirements of contemporary economy of a 'measurement system' indicating the real value and performance of a company, region or nation, enabling benchmarking and predicting future abilities in a relatively objective way. It is useful to all participants in the value creation process—employers, employees, management, investors, shareholders and business partners and can be applied at all levels of business activity."

Initially, VAIC was developed by Pulic (1998, 2004) only as a tool for measuring the 'value added' by firm resources. However, due to the perceived increasingly important role of IC in firm value creation, VAIC is a suitable measure of a firm's IC (Zeghal and Maaloul, 2010). VAIC enables a firm to measure its value creation efficiency (Pulic, 2001, 2002). Pulic (2001) identified that a firm's market value is created by physical and intellectual capital. The VAIC method uses data from the income statement and balance sheet of a firm to calculate the efficiency coefficient on three types of capital—human capital and structural capital (which constitutes IC) and capital employed (which constitutes physical capital) based on the assumption that the market value of the company is made up of capital operation and IC (Edvinsson, 1997; Pulic, 1998, 2001, 2002; Boreman, 1999). Relational capital components are considered as part of structural (external organizational) capital (Pulic, 1998, 2001). The evaluation of performance includes evaluation of the efficiency of capital value added and the intellectual potential value added, which are expressed respectively by capital value added coefficient and intellectual potential value added coefficient (Pulic, 1998; Zhang et al, 2006). Hence despite using accounting data, VAIC focuses on the efficiency of resources that create the value of the firm, rather than focusing on the costs of a firm (Pulic, 1998; Boremann, 1999).

The capacity of the enterprise 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, the VAIC method 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 Bornemann, 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 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). In addition, some are adapted to fit the profile of individual company or nations, which diminishes the ability to apply alternative IC measures consistently across a large and diversified sample for comparative analysis (Sullivan, 2000; Sullivan and Sheffrin, 2003). 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).

2.5. Previous Applications of the VAIC

The potential of VAIC to provide a standardized and consistent measure of corporate performance across various sectors locally and internationally is motivated by growing trace in literature, much of the research stemming from the work of Pulic (1998). Over the years, VAIC has been used in many academic research publications and business sectors (Pulic 1998, 2001; Firer and Williams, 2003). Using survey data in a pilot study Bontis (1998) has obtained a very strong and positive relationship between Likert-type measures of IC and business performance. Bornemann (1999) found that companies which manage their IC better enjoyed competitive advantage on their rivals, and enterprises which strengthen their own IC management often perform better than other companies. Bontis et al (2000) found that IC has a profound relationship with business performance regardless of industry sector in Malaysia. Carrol and Tansey (2001) used the case study of the Intel to illustrate that proper recognition and utilization of IC helps a company to become more efficient, effective, productive and innovative. Pulic (2001) identified that firm's market value have been created by capital employed (physical and financial) and IC, 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 top reduce their disclosure in respect of IC when the performance reaches a threshold level since it might reduce competitive advantages. On the basis of resource-based stakeholder views, Riahi-Belkaoui (2003) documented a significant positive relationship between IC and financial performance, using 81 US multinational enterprises. 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. Research performed by Mavridis (2004) confirmed the existence of significant performance differences among various sets of Japanese firms (Ting and Lean, 2009). At about the same time a study conducted by Pulic (2004) showed that in the present era of value creation, quantity is not relevant. In Taiwan, Wang and Cheung (2004) suggested an integrated theoretical model to investigate the impact of IC on business performance. Goh (2005) found that value creation capability of commercial banks in Malaysia is primarily attributed to human capital efficiency. Ming et al (2005) found that IC have a positive impact on market value and financial performance and identified positive impact of research and development expenditure on profitability and firm value using a sample of listed companies in Taiwan (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. Using the data of 80 listed technological firms in Taiwan, Shiu (2006) suggested that firms could transfer its intangible assets such as IC to high value added products or services. Zeghal and Maaloul (2010) applied VAIC on 300 UK companies divided into high-tech, traditional and services and found that IC has a positive impact

on economic and financial performance but its association with market values is significant only for high-tech firms.

2.6. Direction of Subsequent Research

Examining the characteristics of the IC components directed the development of a two-staged research framework (section 3.1). Among others, the empirical findings of Turnball (1997), Pulic (1998, 2004), Firer and Williams (2003), Riahi-Belkaoui (2003), Mohiuddin et al (2006), Zhang et al (2006), Lee and Guthrie (2010) and Zeghal and Maaloul (2010) regarding the relationships between VAIC, stock market and financial performance were utilized in developing the study hypotheses (section 3.2), as well as in determining the VAIC application procedures (section 3.3), the sampling techniques and data analysis procedures (sections 3.4 to 3.6). Finally, where relevant, the rationale behind their findings was used in the results and discussion part (section 4.1 and 4.2).

3. Methodology

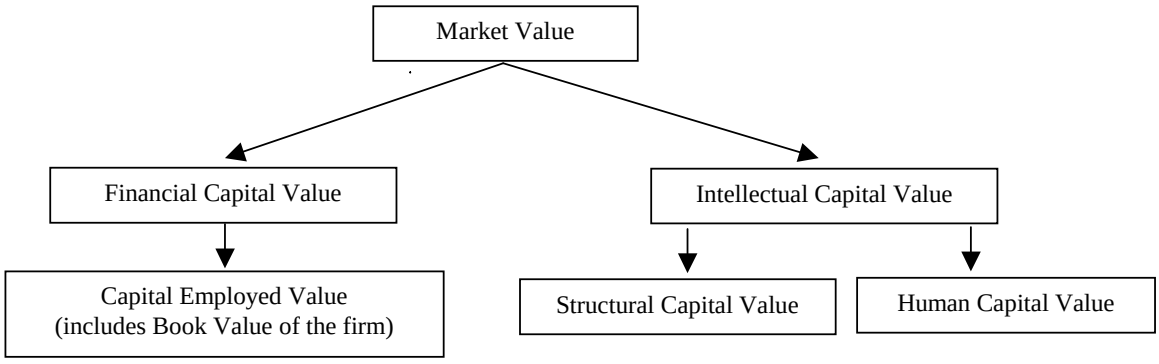
3.1. Research Framework

The process of using VAIC to determine the relationship of IC with market value and financial performance can be developed into a two stage research framework—conceptual and operational.

3.1.1. The Preliminary Phase

The market value components in the VAIC Model (Pulic, 1998, 2001, 2002) can be diagrammatically depicted as follows:

Figure 1: Framework Stage I—The Preliminary Phase

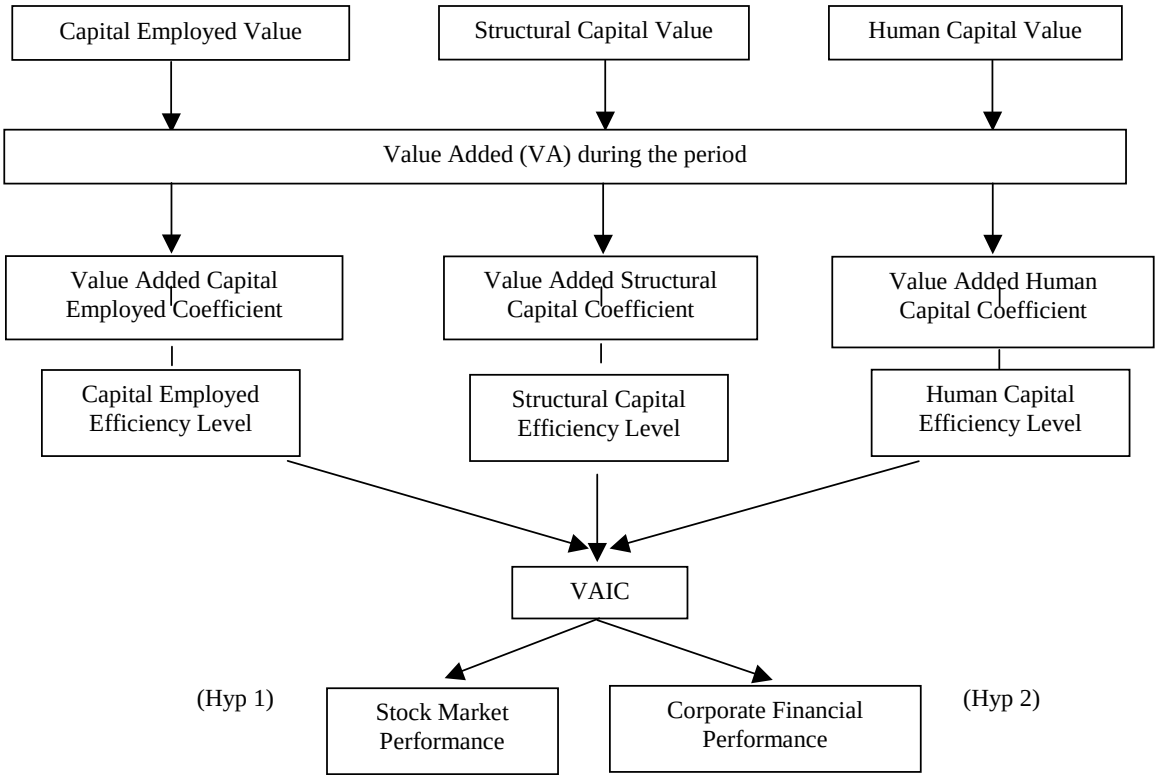


The financial capital value includes the values of both monetary and physical capital, hence comprising of the value of capital employed in the business as shown in the financial statements. The book value of the firm is a part of the capital employed and is the common stock equity (nominal share value) appearing in the balance sheet—total assets less liabilities, preferred stock and intangible assets such as goodwill (which are part of IC) while the two components of IC are structural capital and human capital (Kujansivu and Lonnqvist, 2005; Muhammad et al, 2006).

3.1.2. The Operational Phase

The market value components of the firm are adjusted individually with the Value Added (ability of the firm to create value) during the period to derive the efficiency coefficients for each of the components of market value, namely Value Added Capital Employed Coefficient, Value Added Structural Capital Coefficient, and Value Added Human Capital Coefficient. This can be diagrammatically depicted as follows:

Figure 2: Framework Stage II—The Operational Phase



The research framework has been developed in line with the basic idea of the study that companies with greater IC have higher proportional market value and better financial performance. This diagrammatical depiction should pave the way for testing both of these relationships through the development of specific hypotheses.

3.2. Development of Hypotheses

3.2.1. Stock Market Performance (VAIC and Market Value)

The market value of an object is the monetary value assigned to it as evaluated by the forces existent within the market (Brealy et al, 2006), typically determined by the forces of demand and supply for the object in question. Traditional accounting measures book values from the balance sheet stating it to be the difference between a firm's total assets and liabilities (Lev and Zaowin, 1999). Hence theoretically, if a firm sells off its entire assets and pays for all its liabilities, the remaining amount is the book value. In the traditional accounting measures, assets mainly refer to physical and financial capital (Goh, 2005; Muhammad et al, 2006). Apart from goodwill, most IC components are not recognized as assets in the balance sheet (Goh, 2005). Due to its intangibility, and the possibility of it disappearing from the firm, as in the case of human capital, IC could not be owned and controlled by firm (Goh, 2005). For example, human capital such as the knowledge of an employee cannot be owned or controlled by firm. For this reason, IC is not considered as an asset in the balance sheet. However, the expenses to acquire IC are considered (Chen et al, 2005). For instance, the salaries and remuneration paid to the employees in a firm are treated as expenses rather than assets (Edvinsson and Malone, 1997; Bontis et al, 1999; Lev, 2001). By excluding IC in such a manner, traditional accounting therefore underestimates the true value of firms (Lev and Zaowin, 1999). However, if the market is efficient, investors will place higher value for firms with greater IC (Firer and Williams, 2003; Riahi-Belkaoui, 2003). Therefore, IC is expected to play a significant role in enhancing both corporate value and financial performance (Firer and Williams, 2003). Hence using VAIC as a measure for corporate intellectual ability, one can

theorize that, ceteris paribus, companies with greater IC tend to have higher market values—i.e. greater positive changes in share price (Riahi-Belkaoui, 2003; Youndt et al, 2004):

H1: Companies with greater IC tend to have greater positive changes in share price, ceteris paribus.

Empirical results of Firer and Williams (2003) indicate that the three components of VAIC—capital employed, human capital and structural capital—have higher descriptive power for firm market value, than does the cumulative measure of VAIC, suggesting that investors and market analysts may assign different values to the different components of VAIC (Youndt et al, 2004; Chen et al, 2005). Although VAIC is an accumulative measure for corporate intellectual capability, if investors place different values for the three elements of VAIC, the model using the three components of VAIC will have greater explanatory power than the model using the aggregate one (Pulic, 1998). Therefore, one can additionally put forward that, ceteris paribus, companies having greater efficiencies with structural or human capital will have higher market values—i.e. greater positive changes in share price (Riahi-Belkaoui, 2003):

H1(a): Companies with greater human capital efficiency tend to have greater positive changes in share price, ceteris paribus.

H1(b): Companies with greater structural capital efficiency tend to have greater positive changes in share price, ceteris paribus.

H1(c): Companies with greater capital employed efficiency tend to have greater positive changes in share price, ceteris paribus.

3.2.2. Financial Performance (VAIC and Corporate Performance)

Corporate performance refers to the overall well-being of firms and is typically measured through sales, asset, profit, book and market values (Goh, 2005). Most conventional theories of various business disciplines view the firm as an organization that obtains its resources from its investors, employees and suppliers to produce goods and services for its customers (Donaldson and Preston, 1995). This view primarily describes corporate performance to be the financial returns to a firm's owners from the utilization of tangible resources (Donaldson and Preston, 1995; Riahi-Belkaoui, 2003). However, recent theories suggest investors, employees, suppliers, customers and other relevant stakeholders (such as labor unions, government) both contribute and receive benefits from a firm (Turnball, 1997). These alternative theoretical views perceive firms as being collections of physical and intangible assets and potentials, thereby leading to different views of corporate performance (Skinner, 2008). Advocates of such resource-based theory suggest business performance to be a function of the effective and efficient use of the respective tangible and intangible assets of the firm (Van der Zahn et al, 2004). Value added (also called wealth creation) is considered the appropriate means of conceptualizing business performance rather than the mere financial returns to a firm's owner (Turnball, 1997). Typical measures of financial performance are profitability ratios such as a firm's return on assets (ROA), return on equity (ROE) or return on capital employed (ROCE).

Despite its intangible nature, IC is becoming commonly accepted as a major corporate strategic asset capable of creating sustainable competitive advantage and superior financial performance (Barney, 1991). Firer and Williams (2003) state that traditional measures of corporate performance based on conventional accounting principles of determining income may provide unsuitable accounting in the new economic world, where competitive advantage is driven by IC. Use of traditional measures may lead investors and other relevant stakeholders to make inappropriate decisions when allocating resources (Edvinsson, 1997; Sveiby 1997, 2000; Pulic 1998, 2001). Pulic (2002) refers the driving force of success in business to be IC. Entrepreneurs are increasingly finding IC performance to significantly affect their firms' profit margins and thus it could not be ignored (Zeghal, 2000). The growth of a company's IC has been interpreted as an early indicator for subsequent business performance (Roos and Roos, 1997). In this regard, one can theorize that, ceteris paribus, companies

with greater IC should have better financial performance, typically in the form of greater efficiency in either human or structural capital, or both (Lev and Sougiannis, 1996; Skinner, 2008):

H2: Companies with greater IC tend to have better financial performance, ceteris paribus.

The above hypothesis can further be broken down into each of the different components of VAIC:

H2(a): Companies with greater human capital efficiency tend to have better financial performance, ceteris paribus.

H2(b): Companies with greater structural capital efficiency tend to have better financial performance, ceteris paribus.

H2(c): Companies with greater capital employed efficiency tend to have better financial performance, ceteris paribus.

3.3. Procedure for Application of VAIC

The VAIC model is applied in the study which uses data from the financial statements to calculate the efficiency of capital employed, structural capital and human capital by using five sequential steps. The initial step involves the calculation of Value Added (VA_{it}) by all the resources of the firm during the period concerned, referred to as t. VA_{it} is noted as the difference between the outputs and inputs of the firm during the period, as this output surplus indicates the amount of wealth created during the period (Pulic, 1998, 2004). Hence:

$$VA_{it} = OUTPUT_{it} - INPUT_{it} \quad (1)$$

In equation 1 $OUTPUT_{it}$ is the total income generated by the firm from all products and services sold during the period of t, and $INPUT_{it}$ represents all the expenses incurred by the firm during the period t except cost of labor, tax, interest, dividends and depreciation (Pulic, 1998; Riahi-Belkaoui, 2003; Zhang et al, 2006; Zeghal and Maaloul, 2010). This calculation has been derived from the Theory of Stakeholder View (Donaldson and Preston, 1995) which holds that any party that either influences or is influenced by a firm's activities have a stake (or interest) in the firm including parties such as vendors, employees, customers, directors, the government as well as community members as a whole (Pulic, 1998; Appuhami, 2007). For this reason Riahi-Belkaoui (2003) considered value added by a firm as a wider performance measurement than simple accounting profit that only calculates the return attributable to the shareholders of a firm. Riahi-Belkaoui (2003) further suggested the following formula for calculating the value added of a firm for a particular time period t to be the net earnings retained for a period, as follows:

$$R_{it} = S_{it} – B_{it} – DP_{it} – W_{it} – I_{it} – D_{it} – T_{it} \quad (2)$$

(where R = retained earnings for the period; S = net sales revenue obtained for the period;

B = cost of goods sold plus all operational and other expenses in the period apart from labor, taxation, interest, dividend and depreciation; DP = depreciation charged during the period;

W = wages and salaries paid to the employees for the period; I = interest expenses paid during the period; D = dividends paid to the shareholders for the period; T = taxes for the period)

Riahi-Belkaoui (2003) suggested that equation 2 can be rearranged as:

$$S_{it} – B_{it} = DP_{it} + W_{it} + I_{it} + D_{it} + T_{it} + R_{it} \quad (3)$$

For equation 3, the left hand side shows the difference between net revenues and all expenses excepting wages, interest, dividend, tax and depreciation. Hence the expression (S-B) is the total value generated by the firm during the particular time period (Firer and Williams, 2003; Riahi-Belkaoui, 2003). The right hand side shows how the firm has distributed its generated revenue among the stakeholders. It includes wages and salaries paid to the employees, interest paid to debt-holders, taxes paid to the government, dividend and retained earnings paid to the shareholders and the provision for depreciation allocated to shareholders (Firer and Williams, 2003; Riahi-Belkaoui, 2003). Hence the right hand side of equation 3 is the total value added to the firm during the given period, and hence can be written as follows:

$$VA_{it} = DP_{it} + W_{it} + I_{it} + D_{it} + T_{it} + R_{it} \quad (4)$$

(where VA_{it} = value added for the period; I_{it} = total interest expenses; DP_{it} = depreciation expenses; D_{it} =dividends; T_{it} = corporate tax; + R_{it} = profits retain for the period; W_{it} = wages and salaries, and other training costs for the period)

After calculating VA_{it} the four subsequent steps involve the calculation of Value Added Intellectual Coefficient ($VAIC_{it}$) and the efficiency coefficients of the three components—capital employed, human capital and structural capital following Pulic (2000) and Firer and Williams (2003). First, capital employed efficiency is calculated by Value Added Capital Employed coefficient (CE_{VAit}—the value created by one unit of capital employed during the t period) as follows (Pulic, 1998, 2004; Zhang et al, 2006; Zeghal and Maaloul, 2010):

$$CE_{VAit} = VA_{it} / CE_{it} \quad (5)$$

(where CE_{it} = Capital Employed = Physical Assets + Financial Assets = Total Assets – Intangible assets at the end of t period)

Second, the Value Added Human Capital coefficient (HC_{VAit}—value added by one unit of human capital during the period of t) is calculated as follows (Pulic, 1998, 2004; Zhang et al, 2006; Zeghal and Maaloul, 2010):

$$HC_{VAit} = VA_{it} / HC_{it} \quad (6)$$

(where HC_{it} = investment in human capital during the t period or total salary and wages including all incentives and training schemes)

Third, the Value Added Structural Capital coefficient (SC_{VAit}—the proportion of total Value Added accounted by structural capital) is calculated as follows (Pulic, 1998, 2004; Zhang et al, 2006; Zeghal and Maaloul, 2010):

$$SC_{VAit} = SC_{it} / VA_{it} \quad (7)$$

(where SC_{it} = structural capital during the period t calculated by the difference between Value Added and Human Capital ($VA_{it} – HC_{it}$). SC_{VAit} determines the contribution of structural capital in value creation)

Pulic (2004) indicates that structural capital is obtained when HC_{it} is deducted from VA_{it}. Hence as equation 7 indicates, SC_{VAit} is not an independent indicator but is dependent on the created value added (VA_{it}), which is why it is in reverse proportion to HC_{VAit}. Subsequently, the Value Added Intellectual Coefficient ($VAIC_{it}$) is calculated by adding the coefficients of efficiency for each of the three components (Pulic, 1998, 2004; Zhang et al, 2006; Zeghal and Maaloul, 2010):

$$VAIC_{it} = CE_{VAit} + HC_{VAit} + SC_{VAit} \quad (8)$$

(where $VAIC_{it}$ denotes corporate value creation efficiency on firm resources)

3.4. Data and Sample Selection

The nature of data used in the study was secondary—it consisted of information from annual reports and accounts of the chosen companies and their share price information for the financial year 2009. Data was initially collected from 100 companies which included 35 banks, 35 automobile firms, and 30 high-tech firms (IT and computer industry). No specific mathematical formula was applied to determine the sample size. All the selected firms were listed in the London Stock Exchange (LSE). The relevant annual report information was collected from company information databases FAME and AMADEUS where the stock price data was collected from the LSE website. Following Zeghal and Maaloul (2010), the data required to calculate value added items were obtained from the Value Added Scorecard available in the website of UK Department of Trade and Industry (DTI). The firms were chosen at random using the table of ‘Random Sample Numbers’ (Saunders et al, 2000, p. 466) and selecting the firm representing the corresponding number from the database search list.

As opposed to most previous studies which examined only a single sector or industry, the originality of this study consists in the examination of three sectors—banking, automobiles and high-tech. Since the study examines the effect of IC on different industries in the same year, it is essentially a cross-sectional analysis. The 35 banks chosen included both retail commercial banks and investment banks. A bank’s core strength is perceived to be IC, as it can combine knowledge from human and

structural capital for investment banking, securities trading, capital generation and asset management (Pulic, 2002). The automobile industry, which is one of the most significant sources of economic revenue in developing countries, employs significant IC in product and process design, manufacturing and marketing motor vehicles (Kenworthy, 2004). Even more so is the sophisticated high-tech sector, which requires both structural and human capital in hardware and software development (Lev, 2001). Hence these three industries were selected for the study as each has felt the impact of increased IC in value creation (Lynn, 1998; Ashton, 2005; Zeghal and Maaloul, 2010). However it is probable that the contribution of the impact of IC to a company's stock market or financial performance would vary by industry (Abdolmohammadi, 2005; Tan et al, 2007). For this reason OECD (2006) suggested application of industry specific standards to accommodate the different roles of IC in different sectors (Zeghal and Maaloul, 2010).

3.5. Data Analysis Procedure

The data collected was processed by applying standard editing and coding procedures. For analyzing the data simple tabulation and cross tabulation formats were utilized. Following the approach of Mohiuddin et al (2006), Zhang et al (2006), Lee and Guthrie (2010) and Zeghal and Maaloul (2010), the applied analytical procedures comprised of descriptive statistics, correlation analysis and multiple regression analysis by employing software package SPSS (Statistical Package for Social Sciences) and Microsoft Excel.

3.6. Definition of Variables

3.6.1. Independent Variables

Following the approaches of Firer and Williams (2003) and Shiu (2006), the independent variables for each of the models were the components of VAIC. Information to calculate these values were obtained from FAME's company information database.

1. Value Added Human Capital Coefficient (HC_{VA})—how much value has been added by one financial unit invested on employees; calculated by the ratio between value added and human capital.
2. Value Added Structural Capital Coefficient (SC_{VA})—how much value has been added by one financial unit invested on structural capital. It is reciprocal to HC_{VA} in its contribution to VAIC so it is calculated as the ratio between structural capital and value added.
3. Value Added Capital Employed Coefficient (CE_{VA})—how much value has been added by one financial unit invested in physical and financial assets; calculated as the ratio between value added and capital employed.

Additionally, VAIC (the summation of HC_{VA}, SC_{VA} and CE_{VA}) was included in as a variable correlation analysis but not in regression models as it is already represented by its three coefficients.

3.6.2. Dependent Variables

Two dependent variables were chosen for the two models—Change in Share Price (CSP) for examining the relationship between VAIC and market value; Return on Assets (ROA) for examining the relationship between VAIC and financial performance.

1. Change in Share Price (CSP)—calculated as the percentage change in price between the share prices at the beginning and ending of the dates of 2009; it was obtained from LSE's website and is used as a proxy for stock market performance (Firer and Williams, 2003; Mohiuddin et al, 2006).
2. Return on Asset (ROA)—calculated as the ratio of earnings before interest and taxes, divided by the book value of total assets; it was obtained from FAME's database and used

as a proxy for financial performance (Firer and Williams, 2003; Chen at al, 2005; Shiu, 2006; Zeghal and Maaloul, 2010).

3.6.3. Control Variables

Following Zeghal and Maaloul (2010), two control variables were used in the study in both models to control for their effect on company performance:

1. Size of the Firm (Size)—measured as the Total Net Assets (TNA) of the firm (the difference between total assets and total liabilities, obtained from financial statements available in FAME's database.
2. Creditworthiness or Leverage of the Firm (Lev)—measured as the Qui Score (credit score rating), obtained from FAME's company information database.

3.6.4. Research Models

The following regression models were used to empirically examine the relationship between IC and market value (Model 1) and IC and financial performance (Model 2):

$$CSP_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it} \quad \text{(Model 1)}$$

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

3.6.5. Additional Variables

In addition to the above, the following two widely used proxies for financial performance were examined in correlation analysis, but were not included in the regression models as ROA was chosen as the dependent measure:

1. Return on Stockholder's Fund (ROSF)—the ratio between earnings before interest and tax and book value of ordinary and preference shares; obtained from FAME's database.
2. Return on Capital Employed (ROCE)—the ratio between net profit and total stockholder's equity; obtained from FAME's database.

4. Results and Discussion

4.1. Empirical Results

Following the VAIC model discussed in section 3.3, the collected data from 100 firms was used to calculate VA_{it}, CE_{it}, HC_{it} and SC_{it}, and subsequently CE_{VA} , HC_{VA}, SC_{VA} and VAIC. All calculations are shown from Appendix 4, 5 and 6. The data analysis procedure included descriptive statistics, correlation analysis and multiple regression analysis. The empirical results of these are discussed below.

4.1.1. Descriptive Statistics

Table 3 summarizes the mean, standard deviation, and range of each of the variables for the total sample of 100 firms.

Table 3: Descriptive Statistics of Variables for Total Sample

Variables	N	Range	Minimum	Maximum	Mean	Std. Deviation
CE_{VA}	100	71.1685	-0.2864	70.8821	0.973538	7.0694025
HC_{VA}	100	52.9930	-15.7747	37.2184	2.688959	4.9070555
SC_{VA}	100	37.4505	-32.9913	4.4592	0.029188	3.6107437
VAIC	100	105.3987	-32.9609	72.4379	3.691684	9.4080987
CSP	100	1.0530	-0.5460	0.5070	-0.001810	0.1970052
ROSF	100	688.8100	-516.0900	172.7200	-2.372600	65.7501843
ROCE	100	252.8000	-80.0800	172.7200	3.523700	28.4805571
ROA	100	104.4400	-81.6300	22.8100	-0.132500	11.6244453

Table 3: Descriptive Statistics of Variables for Total Sample - continued

Qui (t = 0)	100	83.0000	12.0000	95.0000	78.470000	18.9755052
TNA	95	55924838000	162000	55925000000	1997942089	8185495530

Note: The negative values of Total Net Assets (TNA) were omitted.

The combined value of HC_{VA} and SC_{VA} (2.718) is greater than CE_{VA} (0.974). Hence IC components have greater value than physical and financial capital employed. In other words, firms were generally more effective in creating VA from IC than from physical and financial capital. This finding is consistent with prior literature (Zeghal, 2000; Pulic, 2004; Zeghal and Maaloul, 2010) that in the new economic era, firms accord far more value to wealth created through intellectual resources than with physical or financial resources. In addition the HC_{VA} has greater mean value (2.688) than either structural capital or physical capital's mean scores (0.0292 and 0.974 respectively). This is consistent with Zhang et al's (2006) finding that human capital is more effective in wealth creation than physical or structural capital. Hence human capital can be considered as the most valuable component of IC. The mean of aggregate VAIC is 3.692 implying that UK firms in this study created GBP 3.692 for every GBP 1.00 employed in 2009. This is lower than Zeghal and Maaloul's (2010) sample of UK firms in 2005 (GBP 4.348) probably because during the credit crisis, firms struggled to create wealth in 2009.

The lower VAIC obtained in this study for 2009 compared to the Zegal and Maaloul's (2010) VAIC score before the credit crunch indicates that firms would struggle to raise profit and increase market share due to lesser value creation in 2009. Likewise, the mean CSP for firms from three industries (banks, automobiles and high-tech) in 2009 is negative—an effect of firms suffering from the recession. The standard deviation of CSP is 19.7%, indicating significant differences and volatility of share prices between firms throughout the year. Similarly, the mean ROA and ROSF are negative implying that firms struggled to make profit during 2009. The high standard deviations of profitability ratios such as ROSF, ROCE and ROA indicate significant differences between earnings potential of firms. However the large range vales show where as some firms have suffered from huge losses a few have also managed to make high gains. This fact is not unexpected as the later months of 2009 were recovery periods for many firms (Dabrowski, 2010). However because different industries may deploy different levels of IC efficiency and may have been affected differently in the economic crisis, it is necessary to observe their data separately. Hence Table 4 illustrates the mean and standard deviation separately for each sector.

Table 4: Descriptive Statistics of Variables for Individual Sectors

Variables	Banking Sample (n = 35)		Automobile Sample (n = 35)		High-Tech Sample (n = 30)	
	Mean	SD	Mean	SD	Mean	SD
CE_{VA}	0.04096	0.0885087	2.35498	11.93017	0.449864	0.3085891
HC_{VA}	4.713143	6.7649	1.711242	4.13556	1.468082	0.924893
SC_{VA}	-0.36906	5.84492	0.545122	0.5700334	-0.108114	1.8816873
VAIC	4.385043	9.5510185	4.611343	12.5266	1.809831	2.4449105
CSP	-0.02728	0.148289	0.026657	0.2401524	-0.0053	0.1931871
ROSF	-7.559429	26.53315	-1.347714	46.6832	2.483	106.3933249
ROCE	-4.564	18.085	1.9119429	26.4384083	14.831	36.766964
ROA	-0.671143	5.5661	-2.2366	16.33119	2.950667	9.82455
Qui (t=0)	72.085714	22.5406	80.8286	15.8438812	83.17	16.1396563
TNA	5228497175	12965110036	66306237	156531090	193848413.8	367818462

The mean scores of VAIC and IC coefficients of the three industries in Table 4 suggest that the automobile sector is the most effective in creating VA from their IC resources (VAIC = 4.61), and is closely followed by the banking sector (VAIC = 4.3850). The high-tech sector is least effective of the three in value creation from IC resources (VAIC = 1.809). This result, although surprising, is

consistent with the finding of Zeghal and Maaloul (2010). This is probably because high-tech firms uses the least amount of human capital, which is the largest contributor to 'value added' among the IC components (Pulic, 1998). This finding further conforms to the statistics presented by the UK DTI (2006, p. 51) in the 'Value Added Scorecard' which commented:

"Contrary to other European countries such as Germany … in which the high-tech service … is very much involved in value creation, UK mainly leans on its traditional sectors to create VA (such as banking and automobiles). These sectors are much modernized, competitive, and innovative."

The automobile sample has the greatest value creation from both structural assets and physical and financial resources (highest CE_{VA} and SC_{VA}). This is probably due to the fact that the automobile manufacturing is highly sophisticated and technology driven. The automobile sector is also clearly more machine-intensive than banking, which is the most labor intensive of the three sectors. Accordingly, the banking sample has higher mean HC_{VA} than automobiles and high-tech where as automobiles have higher SC_{VA} than the other two. As the most directly affected sector in the credit crisis (Dabrowski, 2010), the banking sample has the largest downward CSP, the lowest ROSF and ROCE as well as the lowest credit rating of the three, consistent with many banks experiencing phenomenal share price reduction, low returns, government takeovers and bail-outs since 2007 (Krugman, 2009; Dabrowski, 2010; Gof and Jenkins, 2010). The banking sample has lowest value creation from physical and financial resources (lowest CE_{VA}), as indicative of their bad-debts impairment and defaults (Neligan, 2010). Many banks also suffered from buying large amounts losses from toxic assets and closure of branches (Dabrowski, 2010) which is supported by the negative SC_{VA} score for the industry.

4.1.2. Correlation Analysis

Correlation analysis was conducted to examine the direction and strength of association between the variables, and as a first approach to test the hypotheses. Table 5 demonstrates the findings from Pearson pair wise analysis. Most of the variables have weak positive correlations—an observation similar to the findings of Mohiuddin et al (2006), Zhang et al (2006) and Zeghal and Maaloul (2010). However, as expected, VAIC has strong positive correlation (significant at 0.01 level) with the other IC components. CSP has significant and moderately positive correlations with financial performance measures (ROSF, ROCE and ROA), implying financial performance is a measure of share price. ROA, ROCE and ROSF also has moderately positive correlations between themselves, which is expected as increase in one of these performance measure is likely going to increase the others as well.

Table 5 further demonstrates that IC (VAIC) is weakly positively associated with both stock market (CSP) and financial (ROA) performance. The results hence generally support both hypotheses: H1 and H2. Each of capital employed (CE_{VA}), human capital (HC_{VA}), and structural capital (SC_{VA}) are positively associated with both CSP and ROA. This result modestly suggests supporting all the stated hypotheses: H1a, H1b, H1c, H2a, H2b and H2c. However the associations are weak, and therefore not significant. SC_{VA} was found to be weakly negatively associated with ROSF and ROCE. While unexpected, this is not surprising as it is consistent with Zeghal and Maaloul's (2010) finding.

Table 5: Correlation Coefficients of Variables for Total Sample

Variables	**CE_{VA}**	**HC_{VA}**	**SC_{VA}**	**VAIC**	**CSP**	**ROSF**	**ROCE**		**ROA**	**Qui**	**TNA**
CE_{VA}	1.00	-0.032	0.008	0.738**	0.016	0.040	0.017		0.029	0.037	-0.033
HC_{VA}		1.00	0.092	0.533**	0.165	1.120	0.185	0	0.153	0.055	0.033
SC_{VA}			1.00	0.438**	0.048	-0.058	-0.120	0	0.056	0.024	-0.006
VAIC				1.00	0.116	0.070	0.063		0.123	0.065	-0.011
CSP					1.00	0.305**	0.256*		0.416**	0.351**	-0.143
ROSF						1.00	0.581**	0	0.204*	0.166	-0.029
ROCE							1.00		0.215*	0.238*	-0.126
ROA									1.00	0.463**	0.014

Table 5: Correlation Coefficients of Variables for Total Sample - continued

Qui										1.00	-0.445**
TNA											1.00

Note: ** Correlation is significant at 0.01 level (2-tailed)
* Correlation is significant at 0.05 level (2-tailed)

Table 6 depicts the correlation coefficients of the IC components with the other variables, separately for each of the three sectors.

Table 6: Correlation Coefficients of Selected Variables for Individual Sectors

Variables	CSP	ROSF	ROCE	ROA	Qui	TNA
	Banking Sample (n = 35)					
CE_{VA}	0.125	0.409*	0.461**	0.777**	0.123	-0.075
HC_{VA}	0.354*	0.337*	0.389*	0.176	0.129	-0.066
SC_{VA}	-0.023	0.143	0.137	0.032	-0.026	0.028
VAIC	0.238	0.330	0.363*	0.151	0.077	-0.030
	High-Tech Sample (n = 30)					
CE_{VA}	0.294	0.083	-0.220	0.131	0.111	0.580**
HC_{VA}	0.440*	0.129	0.145	0.564**	0.229	-0.096
SC_{VA}	0.409*	-0.265	-0.763**	0.572**	0.239	-0.084
VAIC	0.518**	-0.145	-0.560**	0.670**	0.284	0.066
	Automobile Sample (n = 35)					
CE_{VA}	-0.007	0.083	0.036	0.052	0.034	-0.077
HC_{VA}	0.121	0.304	0.466**	0.249	0.199	0.089
SC_{VA}	-0.250	-0.723**	-0.425*	-0.213	-0.154	-0.058
VAIC	0.022	0.147	0.168	0.122	0.091	-0.053

Note: ** Correlation is significant at 0.01 level (2-tailed)
* Correlation is significant at 0.05 level (2-tailed)

For the banking sample, VAIC and other IC components are weak to moderately positively correlated with CSP and ROA, which supports both H1 and H2, as well as H1a, H1b, H2a, H2b and H2c for the banking sector. The only exception was H1c as CSP was weak negatively correlated with SC_{VA}, but the magnitude of the correlation suggests that the two variables are almost uncorrelated.

For the high-tech sample, all of the IC variables are positively correlated with both CSP and ROA. These positive associations range from moderate to relatively strong, thereby entirely supporting H1 and H2, as well as all of the associated hypotheses: H1a, H1b, H1c, H2a, H2b and H2c for the high-tech sector.

In the case of the automobile sample, HC_{VA} and VAIC were weakly positively correlated to CSP and ROA, weakly suggesting H1 and H2 to hold. However, CE_{VA} had weak negative associations with CSP (suggesting to reject H1a for the industry), while having positive associations with ROA (accepting H2a for the industry). SC_{VA} had weak negative correlation with both CSP and ROA. While this is similar to Zeghal and Maaloul's (2010) finding, it rejects H1c and H2c for the automobile sample.

In general, with the exception of structural capital, the other IC components were found to be weak to moderately positively correlated in both for the total sample as well as for the individual sectors. This reasonably suggests that greater IC efficiency leads to both higher market value and better financial performance. The structural capital coefficient, although depicted weak positive correlations in the total sample as well as for the banking and high-tech sector, demonstrated weak negative associations in the automobile sector, and hence is not definite in its impact on market value and financial performance.

4.1.3. Linear Multiple Regression Analysis

Table 7 exhibits the regression results for Model 1—the relationship between IC and stock market performance. The adjusted R-Square for the whole sample was 0.092 while for banking, automobile and high-tech samples they were 0.19, 0.035 and 0.141 respectively, implying that the model explained 9.2% of the variation of stock market performance for the whole sample, and 19%, 3.5% and 14.1% variation for the three industry samples individually. These results are low compared to Zegal and Maaloul's (2010) 33.1% for a similar model examining VAIC and stock market performance. A positive association was found between human capital and capital employed for all the three industries as well as the total sample (excepting for capital employed in the automobile sample), but the t-test results were not significant at 5%, and hence cannot conclusively support either H1 or H1a and H1b.

Table 7: Multiple Regression Results for Stock Market Performance

Model 1: $CSP_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it}$

Variables	Whole Sample		Banking		Automobile		High-Tech	
	α	t-value	α	t-value	α	t-value	α	t-value
Intercept	-0.278	-3.126**	-0.261	-2.726**	-0.294	-1.191	-0.296	-1.630
HC_{VA}	0.006	1.504	0.007	1.970*	0.008	0.042	0.037	0.594
CE_{VA}	0.000	0.075	0.13	0.496	0.001	-0.170	0.175	1.264
SC_{VA}	-0.001	-0.260	-0.002	-0.391	-0.097	-1.365	0.245	0.964
Size (TNA)	0.008	0.032	0.0052	0.250	0.0026	0.975	0.0043	0.401
Lev (Qui)	0.003	3.084**	0.003	2.233**	0.004	1.534	0.001	0.586
N	100		35		35		30	
R	0.375		0.556		0.443		0.542	
R-Square	0.141		0.309		0.196		0.294	
Adj. R-Square	0.092		0.190		0.035		0.141	
F-value	2.912**		2.596**		1.218		1.916	

Note: * Correlation is significant at 0.10 level (2-tailed)
** Correlation is significant at 0.05 level (2-tailed)

The f-value for the entire sample and banking industry were found to be significant. While we can say that the sample is jointly significant due to the f-value, it is predominantly due to the effect of the Qui Score in the model being highly significant. This is also consistent with Firer and Williams (2003), Chen et al (2005) and Zeghal and Maaloul (2010) each of whom observed a high dominance of the leverage effect in their stock market performance models. Overall, the regression results for Model 1 suggests rejecting H1, and we can say that investors in the UK stock market do not adequately consider the importance of IC and its components.

Table 8 demonstrates the regression results of Model 2—the relationship between IC and financial performance. The adjusted R-square for the whole sample was 0.241, while that of the individual industries were 0.599 (banking), 0.786 (automobile) and 0.318 (high-tech). The results suggest that the model explains 24.1% of the variation of ROA for the whole sample, and nearly 60% for banking, 79% for automobile and 32% for high-tech firms. These results support H2 suggesting IC plays a major role in creating value for the firm's profitability. Moreover, the f-values for both the whole sample and each of the industries were found significant at 5%. This conforms to prior findings of Sougiannis (1994), Riahi-Belkaoui (2003), Chen et al (2005), Zhang et al (2006), Tan et al (2007) and Zeghal and Maaloul (2010) who found significant positive association between IC and financial performance.

Table 8: Multiple Regression Results for Financial Performance

Model 2: $ROA_{it} = \alpha_0 + \alpha_1 HC_{VAit} + \alpha_2 CE_{VAit} + \alpha_3 SC_{VAit} + \alpha_4 Size_{it} + \alpha_5 Lev_{it} + \varepsilon_{it}$

Variables	Whole Sample		Banking		Automobile		High-Tech	
	α	t-value	α	t-value	α	t-value	α	t-value
Intercept	-2.767	-5.678**	-6.098	-2.415**	-8.45	-10.072**	-18.161	-2.397**
HC_{VA}	0.030	0.135	0.143	1.567	-1.051	-2.153**	1.795	0.700
CE_{VA}	0.018	0.126	48.773	7.704**	0.043	0.389	3.86	0.669
SC_{VA}	0.007	0.024	-0.038	-0.349	0.044	0.506	13.211	1.247
Size (TNA)	0.003	2.480**	0.007	1.328	0.0016	1.750*	-0.0079	-0.175
Lev (Qui)	0.347	5.878**	0.033	1.023	1.025	10.519**	0.174	1.991*
N	100		35		35		30	
R	0.531		0.811		0.907		0.663	
R-Square	0.282		0.658		0.822		0.440	
Adj. R-Square	0.241		0.599		0.786		0.318	
F-value	6.982**		11.170**		23.065**		3.608**	

Note: * Correlation is significant at 0.10 level (2-tailed)
** Correlation is significant at 0.05 level (2-tailed)

Despite that the t-values for both the control variables (TNA and Qui) were found significant in the total sample, only capital employed (for banking) and human capital (for automobile) were found significant for the individual industries (at 5%). Surprisingly, in the automobile sample, human capital was found to be negatively associated with ROA, which suggests that employees in the car manufacturing industry are overpaid given the value they add to the firm in generating profits. However, since Model 2 used ROA and not gross sales, it should not be confused as a measure of the employees' capability in generating revenue for the firm. The large coefficient value in the high-tech sample for structural capital is similar to the findings of Zhang et al (2006) and Zeghal and Maaloul (2010), implying that financial performance of such firms are mainly due to IC. Overall, the adjusted R-square scores and significant f-values suggest there is joint significance for each of the VAIC components on ROA—greater IC leads to better financial performance for the total sample and each of the three industries, supporting H2, as well as H2a, H2b and H2c.

For the regression analysis, two control factors (size and leverage) which could have an impact on stock market and financial performance of the firms were included. To check for multicollinearity problems, the correlation coefficients between the explanatory variables (VAIC components to Qui and TNA) can be observed from Table 6. Kennedy (1985) suggested that multicollinearity can be viewed as a serious problem only if the correlation between the suggested variables exceed 0.8 (Zeghal and Maaloul, 2010). As can be observed from Table 6, all of the correlations between VAIC components to TNA and Qui for the total sample as well as the individual industries range from -0.15 to 0.58; consequently, we can presume that multicollinearity problems do not exist.

Hetroscedasticity may occur when the standard deviations of a variable monitored over a period of time are non-constant (Saunders et al, 2000). Generally, regression analysis using hetroscedastic data still provides a valid estimate for the relationship between the variables examined, but it may judge the relationship to be statistically significant when it is not (Saunders et al, 2010). This could be a possible explanation of the significant f-score for Model 1 as shown in Table 7. Conditional hetroscedasticity is often seen in the prices of stocks when their volatility cannot be predicted (Kennedy, 1985; Saunders et al, 2010). One could assume conditional hetroscedasticity to be a likely explanation for the poor fit of Model 1 as during a period of recession, stock price changes could have been highly volatile. However, this is unlikely the case, as the standard deviation of CSP in Table 3 is by far the lowest of the variables examined. Further, the possibility of conditional hetroskedasticity to have occurred can be further rejected by the fact that after attempts were made to convert the variables

in Model 1 to natural log to reduce non-linearity effects but the outcome was found to be less fitting than before.

4.2. Discussion of Results and Managerial Implications

As the world is moving into globalization, investors and managers need non-financial disclosures to couple with traditional measures and assist them in their decision making to investing in IC (Ting and Lean, 2009). Given that traditional accounting techniques do not adequately reflect IC in evaluating firm performance in operations and stock market, this study had employed the VAIC framework to extend the efforts of academic practitioners in attempting to empirically examine the role of IC on the impact of corporate and stock market performance by using 100 firms from banking, automobile and high-tech sector's data of 2009.

The empirical findings from this study clearly reveal a significant positive relationship between IC and ROA, implying that IC resources enhance the profitability of an enterprise. The VAIC indicates efficiency in creating corporate value or the extent of corporate intellectual ability. This result indicates both the utility of intangibles in general and in IC management, and is consistent with the findings of several prior studies (Firer and Williams, 2003; Shiu, 2006; Zhang et al, 2006; Ting and Lean, 2009) that greater IC results in higher profitability. However, the study also fails to establish any significant association between IC and stock market performance. This is partly attributed to the high volatility of the price to earnings ratio of firms, especially in terms of recession. This finding also conforms to Firer and Williams (2003) and Chen et al (2005), among others whoc reported the dominance of leverage factor in their similar stock performance models. Comparing Zeghal and Maaloul's (2010) results with the findings in this study confirmed that firms created less value per unit of financial spending in the recession year 2009 than compared to prior the recession. As the study has only found sufficient evidence to support the fact that greater IC leads to higher profitability, the originally proposed thesis statement could be modified as:

Intellectual capital, which is not recognized in traditional financial statements, is becoming increasingly important in determining the financial performance of organizations as opposed to traditional assets. Greater intellectual capital results in higher profitability.

Human capital was found to be the most valuable IC resource in the study due to its greater contribution in total VAIC value. As it is embedded in employees rather than firms (Edvinsson, 1997; Zeti, 2005; Muhammad et al, 2006), it can be seen that the most effective resource of wealth creation is interchangeable between firms if employees switch (Bontis, 1999). This is particularly important given the level of high turnover and downsizing during the recent recession (Dabrowski, 2010; Neligan, 2010) as firms may have unknowingly lost considerable amounts of long-term wealth creation capabilities in attempting to minimize short-term losses. Automobile firms create the greatest wealth using IC resources out of the three sectors studied and is closely followed by banks, predominantly due to the greater impact of human capital in their VAIC. Conversely, high-tech firms create the least wealth using IC resources as the human capital contribution in its VAIC is lower.

Structural capital in each of the samples was found to have a negative association with stock market performance. While this association is generally unexpected, it may be due to the fact that managing internal structural elements such as brands, processes and systems generates additional expenses for companies such as the management of control systems which are the part of structural capital. Also the structural capital value includes relational capital in the VAIC framework, and the negative association of structural capital with stock market performance could indicate wasteful spending or non-value added activities being performed in terms of relationship management, building partnerships and developing alliances with stakeholders, or the efforts in promoting the firm's image through PR activities being ineffective in raising share price.

As the VAIC framework provides a method to account for the IC resources of a firm, the study results should enhance the awareness of managers in deploying intangible assets enabling them to invest in only those IC resources which bear the greatest opportunities for increasing market value and

improving financial performance. VAIC is salient to managers as it underlines the different IC components which can be resourced more specifically (Moon and Kym, 2006; Muhammad et al, 2006). For instance, in the case of human capital, firms should enact policies and measures that enhance employee skills (through training), capabilities, satisfaction and loyalty. With respect to internal structural capital, managers should build a sustainably positive organizational culture by developing strong information and control systems, safeguard IC (through trademarks, copyrights, patents, etc), and invest in effective and efficient work processes. For external structural capital (relational capital), organizations must create fruitful partnerships with relevant stakeholders and nurture customer relationships. The results of our study can be used by Chief Knowledge Officers (CKO) of firms in the banking, automobile and high-tech industries as the VAIC method comprises standard and fairly generic indices (Moon and Kym, 2006).

5. Conclusion

5.1. Summary of Major Findings

Using data of 2009 from 100 LSE-listed UK firms including 35 banks, 35 automobiles and 30 high-tech companies, this study established that IC has a significant influence in determining the financial performance of organizations, suggesting managers value knowledge assets in the firm. Although there a weak positive association, no definite relationship could be identified between IC and stock performance, indicating investors do not adequately appreciate the contribution of IC in the enhancing market value. Firm size and financial leverage were found to be significant control variables of IC in determining performance. The study identified human capital as the most valuable component of IC. As such, automobile firms were found to create the most value using IC resources, closely followed by banks, due to their extensive usage of human capital while high-tech firms created the least value using IC resources due to its low human capital value in total VAIC.

5.2. Limitations of the Study

The major limitation of this study was time. The number of sample size as well as industries to examine for analysis was limited by the time set for submitting the dissertation. More companies or industries included in the study could increase the objectivity and reliability of the findings (Tan et al, 2007). In addition, as VAIC is a fairly recent concept, there are not many cases of its application in UK (Lee and Guthrie, 2010), which could provide sufficient basis for background analysis before determining the direction of the research.

5.3. Suggestions for Further Study

As for the outcome of the study, impact of the control variables was clearly more significant based on their t-values as opposed to the VAIC components. Additional research could include more control variables to adequately examine their impact. This study included only leverage (Qui Score) and size (TNA) as they were available from FAME's financial information database. If available, the intrinsic value of the share could be used in future to calculate the market value of firms, which in turn could be used to calculate a proxy for market-to-book ratio and used in place of CSP for Model 1 to examine a more 'real' impact of IC on market performance. In addition, research could be conducted to examine the associations studied in this paper across time as this study is cross sectional representing only 2009. Finally, as it is a new model, the basic assumptions of VAIC should be critically reviewed to assess their potential consequences for the validity of empirical testing and results.

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