



Intellectual capital and financial performance: an evaluation of the Australian financial sector

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Abstract

Purpose – The purpose of this paper is to examine the intellectual capital (IC) performance of the Australian Financial Sector for the period 2006-2008. It also aims to examine the relationship between IC performance and the financial performance of the financial sector.

Design/methodology/approach – The value added intellectual coefficient (VAIC) approach developed by Pulic is used to determine the IC performance of the Australian financial sector. The required data to calculate different constituents of IC was obtained from the annual reports of Australian Financial Sector companies.

Findings – The value creation capability of financial sector in Australia is highly influenced by human capital. About two thirds of the sample companies have very low levels of intellectual capital efficiency. The performance of various components of VAIC and overall VAIC differs across all subsectors in the financial sector. Investment companies have high value VAIC due to higher a level of human capital efficiency, as compared to banks, insurance companies, diversified financials and RIETs. Insurance companies are more focussed on physical capital rather than human and structural capital leading to lower VAIC.

Research limitations/implications – The paper analyses IC performance of only one sector of the Australian economy and there is a relatively narrow three-year period for the data collection. However, a comparative analysis of various sub sectors in the Australian financial sector justifies the contributions made by this study.

Practical implications – The findings may serve as a useful input for financial institutions to apply knowledge management in their institutions and in addressing the factors affecting IC performance in order to maximise their value creation. It will also help the management of companies in other sectors, especially those in knowledge-based industries, in understanding the contributions of various components of intellectual capital in their growth.

Originality/value – This is the first paper that examines the relationship of intellectual capital performance with financial performance of financial sector companies in Australia.

Keywords Intellectual capital, Human capital, Financial sector, Value added intellectual coefficient, Australia, Banks, Financial performance, Financial reporting, Knowledge management

Paper type Research paper

1. Introduction

In 2010, the Australian economy was one of the most stable economies in the world, having low unemployment rates (5 per cent) and low governmental net debt (8 per cent of GDP). The financial sector is the biggest sector in the Australian economy, being 11 per cent of the national GDP. This sector is regulated by two bodies, the Australian



Securities and Investment Commission and the Australian Prudential Regulation Authority. The Australian financial sector (AFS) had 4.9 per cent growth in 2010, which was one of the highest growth rates in any sector (Anon, 2011a). According to the Australian Stock Exchange (ASX), the AFS is the second largest sector by market capitalisation, and primarily consists of banks, credit unions and building societies or financial institutions, insurance companies and superannuation companies. The total assets of financial institutions have registered a compound annual growth of 10 per cent since 1991. This is attributed to two decades of stable economic growth, strong legal and regulatory frameworks and sound management of the economy.

The AFS has more than AUD\$5 trillion assets, which is four times the nominal GDP, and indicates that sector's health over the last two decades. *The Financial Development Report 2010* (Anon, 2010) has ranked Australia fifth out of 57 among the world's financial systems and capital markets, ahead of Canada, the Netherlands, Switzerland and Japan. Australia has been rated first in terms of overall financial access and has achieved solid scores in financial markets (sixth), banking (seventh) and non-banking financial services (eighth) (Anon, 2010).

The AFS has the third highest percentage of employees. Australia ranks fifth in the world in terms of the financial development index behind USA, UK, Hong Kong and Singapore, respectively; while in financial stability, Australia ranked ninth (Anon, 2011b). The World Economic Forum ranked the AFS in the top five in the world in 2010 (Anon, 2010). In the Asia-Pacific region, the AFS has one of the highest numbers of workers. Two major Australian cities, Sydney and Melbourne, together employ more than 230,000 people in the AFS, which is more than Hong Kong (191,000) and Singapore (173,000).

The business and activities in the AFS require a higher level of knowledge mainly in terms of competence and skills, a high degree of technological innovation, and a high degree of interaction between personnel and clients to generate competitive differentiation strategies based on the level of service and assistance provided to the clients (Veltri and Silvestri, 2011). Therefore, it is necessary for the financial sector companies to invest in their development of human capital, organisational processes and corporate knowledge base in order to make competitive advantage sustainable and durable. In addition, in the recent years, financial sector companies have started exploring benefits offered by new client-oriented organisational forms and by implementing new systems of managerial control. For these reasons, intellectual capital (IC) and knowledge management have emerged as core competencies for corporate growth and for protecting competitive advantage. The growth of service-based industries has increased the emphasis on employees' knowledge and creativity as a means for adding value to a business, highlighting the imperative need for the measurement and management of IC (Young *et al.*, 2009).

Considering the importance and need for valuation of IC for the services industry in general and finance industry in particular, this study contributes to finance industry practices through the valuation and comparison of the value-added intellectual coefficient (VAIC) of leading companies in the AFS with an objective of providing them with an easy-to-use method for understanding and evaluating their performance, self-benchmarking and enhancing their IC performance. This study has three main objectives. The first is to measure the IC performance of the listed financial sector companies on the ASX during the period 2006-2008. The second is to analyse IC performance within the AFS. The third is to investigate whether IC has an impact on the financial performance of these companies.

The remaining parts of this paper include a brief introduction of the knowledge economy and IC (Section 2), summary of the relevant literature (Section 3), a description of research methodology and the development of hypotheses (Section 4), empirical analysis and discussion of the results (Section 5) and conclusions (Section 6).

2. The knowledge economy and IC

2.1 *The knowledge economy*

The OECD (1996) defined a knowledge economy as one in which the production, distribution and use of knowledge is the main driver of growth, wealth creation and employment across all industries – not only those industries classified as high-tech or knowledge intensive. In outlining the nature of a global knowledge economy, the World Bank (Anon, 1998) identified the importance of knowledge and intellectual ability, and inventions and innovations, as drivers for national economic development. A broad categorisation of the knowledge economy would be one where both company and national growth is generated significantly by outputs of human mental activity as opposed to that from mercantile, production-focused economic activities (Lev, 2001). In a knowledge economy, the successful management of these activities has been identified as likely to provide a company with a competitive advantage (Prahalad and Hamel, 1998; Drucker, 1999). Cabrita and Vaz (2005) noted that the ongoing growth of national and global “knowledge” economies has seen growing interest in processes focused on the development of IC. Added to this, the growth of the knowledge economy involves an accompanying increase in the importance of defining and measuring IC, if there is to be any effective management of that asset item (Cahill and Myers, 2000).

Many have argued that as the knowledge economy grows and, possibly, becomes the dominant form of commerce, then companies will largely depend on the performance of their IC for value maintenance and growth (Sveiby, 1997; Stewart, 2001; Wood, 2003; Cabrita and Vaz, 2005). Foray (2006) stated that strategic emphasis on the formation and management of human capital through training and education, and an understanding of the elements comprising IC, was essential in the knowledge economy.

2.2 *IC: definitions*

The term, IC, has some links to the transaction cost economy theories of Williamson (1975) and Flamholtz's early 1970s work on human resource accounting (e.g. Flamholtz, 1974). Through the 1990s, academic work on IC increased significantly, especially from Scandinavian and northern European academics. In this growth, various terms have been used interchangeably to cover the concept of IC, e.g. IC has been referred to as intangible assets, intangibles or knowledge assets (Bontis, 2001; Kujansivu, 2005). IC has been linked to sustainable competitive advantage of companies, mainly via value outputs being generated by the company's human resources, capabilities and competence (Bontis, 1998, 2001; Bontis *et al.*, 2000; Wood, 2003; Lonnqvist, 2004).

2.3 *Components of IC*

While many have debated the definitive description of IC (see Mayo, 2001; Ahonen and Hussi, 2002), most would accept Lev's (2001) broad definition of IC as being those sources of value to a business that have been generated by or developed from innovation, unique organisational designs or human resource practices. The commonly accepted components of IC are human capital, relational capital and structural capital (Petty and Guthrie, 2000; Kujansivu, 2005).

2.3.1 Human capital. Human capital constitutes the skills and knowledge of employees which can be further enhanced with the aid of training. Another dimension of human capital is the experience which can be developed with training programmes. Human capital can be limited to micro (individual) (e.g. personal attributes, technical competence and creativity) or macro (organisation) levels (e.g. team work, healthy work environment). Sveiby (1997) defined human capital as “the capacity to act in a wide variety of situations to create both tangible and intangible assets”.

2.3.2 Relational capital. Relational capital is linked to an organisation and its relationship with external elements such as customers, resource providers, banks and shareholders. In other words, relational capital is the ability of an organisation to create relational value with its external stakeholders. Organisations gain manifolds when they build relational capital, e.g. customer and brand loyalty, customer satisfaction, market image and goodwill, power to negotiate, strategic alliances and coalitions. However, it is not just important to create relational capital. The successful organisation should be able to maintain its relational capital as well. Sveiby (1997) defined relational capital as “relationships with customers and suppliers”.

2.3.3 Structural capital. Structural capital can be defined as the knowledge that is created by an organisation and cannot be separated from the entity. It can consist of organisational structures, procedures, routines, systems, hardware, databases and organisational cultures. The examples of structural capital can be inventions, processes, copyright, patents, technologies, strategy, systems, etc. It is this capability which enhances employee capability but is not related to employees at the individual level. Sveiby (1997) defined structural capital as patents, concepts, models, and computer and administrative systems.

2.4 Measurement of IC

The growth of the knowledge economy and an accompanying drive to measure IC seems to stem from the belief that an organisation's sustainable competitive advantage requires accurate information about the quality and health of its IC (Bontis, 1998, 2001; Bontis *et al.*, 2000; Lonnqvist, 2004). However, while many methods for IC measurement have been developed and used (see Andriessen, 2004; Pike and Roos, 2004; Chan, 2009a,b), the standard methods of financial reporting and accounting regulations have not been fully adequate to the task of reporting IC value and the knowledge economy (Lev and Zarowin, 1999; Lev, 2004; Kujansivu, 2005; Lajili and Zéghal, 2005). The reluctance of accounting generally to engage with measuring IC, is likely to influence negatively the effectiveness of investment decisions and the value of financial reports in the knowledge economy (Cahill and Myers, 2000; Holland, 2003; Bukh, 2003; Bukh *et al.*, 2005).

While there is no generally accepted method for IC measurement, the few dozen methods developed have tended to involve using market capitalisation, economic value-added techniques, “scoreboards”, or a combinations of these methods (Chan, 2009a,b).

2.4.1 VAIC. This project used the VAIC, as it produces comparative analysis between companies and across various corporate sectors to obtain a monetary measurement of IC, and because VAIC has been widely used internationally and robustly tested (Pulic, 2000, 2003, 2004; Chan, 2009a,b).

VAIC method has been used by many researchers to investigate different aspects of IC efficiency in banks and other organisations in several countries (e.g. Bornemann, 1999; Cabrita and Vaz, 2005; Chen *et al.*, 2005; Firer and Williams, 2003; Goh, 2005;

Kujansivu, 2005; Kujansivu and Lonnqvist, 2007; Mavridis, 2003a, b, c, 2004, 2005; Mavridis and Kyrmizoglou, 2005; Shiu, 2006; Tseng and Goo, 2005).

The VAIC model uses values from income statements and balance sheets to measure if there is any value adding occurring in a firm that can be attributed to and stemming from its development of IC. Goh (2005) and Tseng and Goo (2005) listed the strengths of VAIC to be that it is easy to calculate; can be applied to any size of organisation; does not require sophisticated accounting knowledge and expertise to use or understand; and uses component factors that match well with many commonly accepted definitions of IC.

2.4.2 Limitations of VAIC. The VAIC model of efficiency measurement has been challenged by recent studies in the IC literature with the basic assumptions used by Pulic in developing the VAIC approach being questioned. Chang's (2007) was the first study that suggested modifications to the VAIC method and added R&D expenditure and intellectual property (IP) components in Pulic's VAIC model for IC measurement. His study presents evidence that R&D expenditure and IP are positively related with firms' market value and profitability, suggesting R&D expenditure and IP may capture additional information on IC that is omitted from Pulic's VAIC model. Maditinos *et al.* (2011) in their study suggest that the failure of the VAIC methodology to provide consistent results raises criticism on its effectiveness and gives room for questions regarding its reliability: "Does the VAIC methodology properly describe the business reality (therefore, intellectual capital has no impact on market value, financial performance, etc.), or does it need improvements/adjustments in order to better mirror the business landscape?". Maditinos *et al.* (2011) further argued that the VAIC methodology disregards the level of company risk, which is one of the most important factors determining company and IC value. Chu *et al.* (2011) criticised the VAIC approach for its inability to measure IC in companies with negative book value or negative operating profit. They argue that the VAIC model does not generate valuable analysis in companies which have their input more than their output, and as a result, their productivity is low. Stähle *et al.* (2011) shows that VAIC is an invalid measure of IC arguing that the VAIC approach involves an unsettled conception of IC capitalisation via its components of human and structural capital.

The above-mentioned critics have initiated a debate as to whether the chosen method (VAIC) is appropriate for measuring IC. However, at this point in time, there is no perfect method available for measuring IC. These critics also suggest that future researchers should consider the introduction of other control factors and efficiency determinants, which may help in producing more precise and accurate results. Despite the inherent limitations of VAIC as a method of measuring IC discussed above, its simplicity, subjectivity, reliability and comparability make it an ideal measure for the context of the present study as this study makes an original contribution to the existing IC literature by analysing IC performance of various sub-sectors within the AFS.

3. Literature review

Pulic and Bornemann (1997) was the first to study the impact of IC on the banking industry. He measured Austrian banks' IC performance (1993-1995) and Croatian banks' capital performance (1996-2000) with the VAIC model. VAIC method for the measurement has been applied in different parts of the world to measure the IC performance. Academic researchers have also tried to establish the relationship of the

IC performance with the financial performance of the companies on varied samples from different industries. Section 3.1 discusses some of the studies conducted in different parts of the world whereas Section 3.2 highlights the findings of researches conducted specifically on the banking and finance sector.

3.1 VAIC and financial performance

Bramhandkar *et al.* (2007) studied 139 drug companies and found that IC-rich companies had better financial performance than those with low levels of IC assets. Tan *et al.* (2007) studied 150 companies listed on the Singapore Stock Exchange between 2000 and 2002, and found that a company's performance had a positive relationship with the extent of IC with the growth rate of company's IC. The contribution of IC to a company's performance was also varied by industry type.

Kamath (2008) found human capital had a major impact on the profitability and financial performance of pharmaceutical companies in India. Pal and Soriya (2012) studied companies from the pharmaceutical and textile industries in India, and concluded that IC and company profitability had a positive relationship. Makki *et al.* (2009) examined six years of company data from the Lahore Stock Exchange (Pakistan) and found that companies in the oil and gas, chemical and cement sectors had the best IC performance, while the banking sector's performance was average, and public sector companies had the worst IC performance.

In a Malaysian study, Gan and Saleh (2008) found that human capital efficiency (HCE) had great importance in improving the financial performance of companies. Barros *et al.* (2010) conducted a study of the textile manufacturing sector in Brazil and showed that there was a positive relationship between value creation and IC. In Iran, Ahangar (2010) found a significant relationship between IC and company performance. In Australia, Clarke *et al.* (2011) found a direct relationship between IC and the performance of publicly listed companies. In Taiwan, Wang (2011) established a positive relationship between IC and return on assets (ROA) and market capitalisation. Chu *et al.* (2011) studied companies listed on the Hong Kong Stock Exchange for the years 2001-2009 and found that IC and company profitability had a positive relationship. Maditinos *et al.* (2011) found a positive relationship between HCE and financial performance. Phusavat *et al.* (2011) investigated IC in large manufacturing companies in Thailand, and found a positive relationship between company performance and IC. In an Italian study, Veltri and Silvestri (2011) discovered a positive relationship between accounting values and market value on the one hand, and IC and market value on the other. They also found that investors value HCE more than the other components of IC.

However, some VAIC projects have not been so positive about the link between IC and company value. In a study from Finland, Kujansivu and Lonnqvist (2007) studied 11 industry sectors and were not able to clarify the relationship between value and efficiency of IC. Chan (2009a, b), investigating companies listed on the Hong Kong Stock Exchange between 2001 and 2005, concluded that there was no definitive correlation between IC and financial performance. Ghosh and Mondal (2009) concluded that the IC performance significantly varied among studied companies but felt that IC does not fully explain profitability and market valuation of companies in India. Chang and Hsieh (2011a) examined the role of innovation capital in the value creation for companies and found that IC had a negative impact on the financial and market performance of companies.

3.2 Banking and finance and VAIC

Internationally, the banking and finance sector has been a focus for many VAIC studies. Mohiuddin *et al.* (2006) examined the IC performance from 2002 to 2004 of 17 commercial banks in Bangladesh. Their key finding was that all the banks in the study had higher HCE than other capital efficiencies. Kamath (2007) found that there were great differences in IC performance of Indian banks; while IC performance of foreign banks was better than the domestic banks in India. Yalama and Coskun (2007) analysed the IC performance of banks listed on the Istanbul Stock Exchange and found a positive relationship between IC and financial returns. El-Bannany (2008) applied variables to study the IC performance of UK banks for a period of 1999-2005. El-Bannany (2008) found that investment in information technology systems, bank efficiency, barriers to entry and efficiency of investment in IC variables had a significant impact on IC performance. Sharma and Mani (2012) did a comparative analysis of HCE of private and public banks in India for a period of 2005-2010. They found that, in the period under study, public banks made good progress in HCE performance. A study of the Malaysian financial sector by Ting and Lean (2009) also found that IC and company performance had a positive relationship.

From the above discussion, it is clear that VAIC is a popular method of measurement of the IC of companies. The wide spread use of the VAIC model across countries and various industrial sectors proves this argument. The VAIC model has been used in Australia in various economic sectors: for example, the banking sector (Pulic, 2002; Joshi *et al.*, 2010), hospitality industry (Laing *et al.*, 2010), wholesale and retail industry (Laing *et al.*, 2010) and a consolidated group of listed companies (Clarke *et al.*, 2011). This paper seeks to measure VAIC performance of the financial sector in Australia and relate financial performance of the sample companies with their value creation capabilities. The current study extends the findings of Joshi *et al.* (2010) on Australian banking sector that provided an analysis of IC performance of 11 Australian banks as this study analyses the IC performance of other constituents of financial sector such as insurance, real estate and investment companies, in addition to the banking sector. Furthermore, this study also establishes relationship of IC efficiency with financial performance of the sample companies. Therefore, this paper makes an original contribution to the existing literature by conducting an elaborate comparative analysis of VAIC performance of the financial sector over its sub-sectors. Using VAIC, this paper will measure the implications of IC performance in the financial sector in Australia. This paper addresses the following research issues:

- What is the IC performance of financial sector companies in Australia and do these companies differ in their human, structural, physical capital efficiencies?
- To what extent do IC practices differ across various sub-sectors of financial sector?
- Does IC performance (measured by VAIC) influence the financial performance of sample companies?

4. Research methodology

4.1 Sample selection

The top 40 financial sector companies listed in the ASX were selected in the sample on the basis of their market capitalisation. The sample has been selected with a view to analyse the IC performance various sub-sectors in this financial industry including

trading and investment banks, insurance companies, REITs and diversified financials. These sub-sectors have been identified by the ASX on the basis of their business activities (Anon, 2011a). Seven companies were dropped from the sample leaving the final sample size at 33; these companies were not used due to the non-availability of employee cost data. The accounting information for the sample companies, e.g. ROA, was collected from financial databases such as Finanalysis and Connect 4. The three-year period from 2006 to 2008 was used for the study. Average values have been used in the statistical analysis of the data. The figures for VAIC, HCE, structural capital efficiency (SCE) and capital employed efficiency (CEE) were calculated by using the VAIC model discussed in the review of literature section above. The yearly figures are considered for purposes of calculation of VAIC.

4.2 VAIC model and variables

The VAIC model assumes that both physical and IC function to create value in organisations. IC is further classified into human and structural capital. The intangible nature of IC requires proxy measures to establish a comparative metric. The formula for the VAIC model is value added intellectual coefficient (VAIC) = human capital efficiency (HCE) + structural capital efficiency (SCE) + capital employed efficiency (CEE).

The different variables used in VAIC model are as follows: output, gross income of the banks (includes interest income, insurance income and other revenues generated by the sample companies); input, interest expense + insurance costs + other operating expenses (excluding employee costs); VA, the difference between output and input, i.e. output – input; CE, CE in the business includes both physical and HC; CEE, calculated by dividing the VA by the CE (VA/CE). CCE explains how much of the VA is generated with the CE; HC, HC of the business, i.e. employee costs considered as an investment; HCE, calculated by dividing the VA by the HC (VA/HC). HCE is an indicator of VA by the human resources employed by the business; SC, SC of the company is calculated by subtracting the value of HC from VA (VA – HC); and SCE, SCE is calculated by dividing the SC by the VA (SC/VA).

The SCE shows how much of the company's value creation is generated by the structure capital. This model assumes that both physical and IC are used in production. Both physical and IC are investment items and are treated as functions of value creation. IC is further classified into human and structure capital. Considering the very intangible character of IC, it is more or less impractical to measure IC. Therefore, the results of applied IC are used as a proxy measure to measure company performance. In other words, the amount of VA and the efficiency in utilising IC can be quantitatively measured, using the above formulae. The efficiency levels to be calculated are HCE, CEE and SCE. The sum of these efficiencies is termed as the VAIC. As a performance measurement tool, greater value of VAIC indicates a higher efficiency level of the company. If VAIC rises over time, then the efficiency level improves and a company creates more value and vice versa.

4.3 Research hypothesis and measures

The authors could not find any literature focusing on the differences in VAIC and its components across all sub-sectors of the financial sector industry in Australia. Thus, *H1* is formulated to investigate the differences in VAIC and its components across sub-sectors of the financial sector in Australia. The extant literature has been reviewed to develop hypotheses relevant to the association of financial performance with VAIC

and its components. *H2* is formulated on the basis of results of prior studies by Chang (2007), Ting and Lean (2009), Zéghal and Maaloul (2010) which posited a significant relationship between various components of IC (HCE, SCE, CEE) and financial performance. With regard to overall VAIC (*H3*) earlier studies offer inconclusive findings on the association between ROA and level of IC in different countries and across various industries. Some studies concluded that the financial performance of companies is influenced by the level of IC in the company (Firer and Williams, 2003; Chen *et al.*, 2005; Bramhandkar *et al.*, 2007; Gan and Saleh, 2008; Ting and Lean, 2009; Phusavat *et al.*, 2011; Alipour, 2012; Pal and Soriya, 2012). Another set of literary work by Laing *et al.* (2010), Maditinos *et al.* (2011) failed to confirm this relationship. As a large number of studies argue the existence of such a relationship, hence a directional hypothesis is justified. Thus, the study proposes the following three research hypotheses:

- H1*. There are no differences in VAIC and its components across all sub-sectors of the financial sector industry in Australia.
- H2*. Higher values of HCE, CEE, SCE and the sub-sector of company influence the financial performance of the financial sector, controlling for the size of the company.
- H3*. A higher value of VAIC leads to higher financial performance in the financial sector in Australia.

The following four models have been used to explore related hypotheses (Figure 1):

$$\text{Model 1: } ROA_{it} = \alpha_0 + \alpha_1 SCE_{it} + \alpha_2 CEE_{it} + \alpha_3 HCE_{it} + \varepsilon$$

$$\text{Model 2: } ROA_{it} = \alpha_0 + \alpha_1 SCE_{it} + \alpha_2 CEE_{it} + \alpha_3 HCE_{it} + \alpha_4 \text{LOGMCAP}_{it} + \varepsilon$$

$$\text{Model 3: } ROA_{it} = \alpha_0 + \alpha_1 SCE_{it} + \alpha_2 CEE_{it} + \alpha_3 HCE_{it} + \alpha_4 \text{LOGMCAP}_{it} + \alpha_5 \text{subsector}_{it} + \varepsilon$$

$$\text{Model 4: } ROA_{it} = \alpha_0 + \alpha_1 \text{VAIC}_{it} + \varepsilon$$

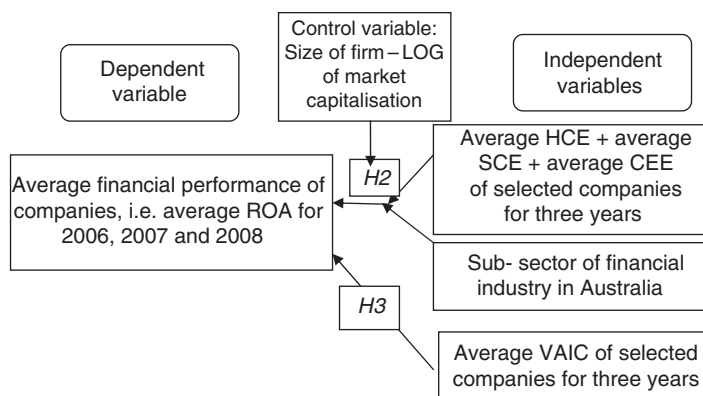


Figure 1.
Conceptual model
for research

4.4 Dependent and independent variables

4.4.1 ROA. The financial performance, as measured by ROA is used as a dependent variable. ROA is a traditional accounting performance measure of financial performance. It is computed as the ratio of operating income to book value of the total assets of the company. ROA is commonly used as a key performance indicator of profitability of companies in their annual reports. Thus, it has been widely used as a measure of financial performance in earlier research (Chen *et al.*, 2005; Kujansivu, 2005; Shiu, 2006; Bramhandkar *et al.*, 2007; Chang, 2007; Gan and Saleh, 2008; Ting and Lean, 2009; Zéghal and Maaloul, 2010; Chang and Hsieh, 2011a, b; Clarke *et al.*, 2011; Stähle *et al.*, 2011; Wang, 2011; Maditinos *et al.*, 2011; Pal and Soriya, 2012; Mehralian *et al.*, 2012; Komnenic and Pokrajcic, 2012; Besharati *et al.*, 2012).

Regression is used to test *H2* (i.e. multiple regression) and *H3* (i.e. linear regression). A linear multiple regression model was used to interpret the relationship between ROA and various independent variables. Three independent variables (CEE, HCE, SCE) and two control variables (company size and financial sub-sector) were used. Market capitalisation (calculated by multiplying the number of outstanding shares with the stock price on the reporting date) was used as a proxy for company size. ANOVA and Scheffe tests were used to explore inter-sector differences. The sub-sector category was controlled by using a dummy control variable. The Kolmogorov-Smirnov (K-S) statistics indicated that data for market capitalisation was not normal; thus, that data were log-transformed before being used as a control variable.

5. Empirical results and discussion

Table I shows the values of VAIC and its components for the sample companies.

In Table I, the Australian Foundation Investment Company has the highest VAIC at 64.235, followed by Argo Investments at 56.118. Investment companies have very high IC performance compared to other sub-sectors in the financial sector. Investment companies, at 64.39, have the best IC efficiency. Companies with the lowest VAIC are Challenger Financial Services Group (2.23) and Insurance Australia Group (2.36), followed by the Macquarie Group and Austbrokers and the Henderson Group. The average VAIC of the financial sector is 8.82. Interestingly, only seven out of 33 companies in the financial sector have a higher VAIC than the average VAIC. This indicates the low value of IC efficiency in the AFS. The top companies by VAIC scores are in the investment sector, so the averages were calculated by dropping four companies from the investment sub-sector. With this, the average VAIC falls drastically from 8.82 to 4.78. In this instance, ten companies out of a total of 29 have a VAIC of more than average VAIC for the financial sector in Australia. This table also shows the relative importance of the three components of VAIC. HCE is the main component of VAIC as it makes a major contribution to value of VAIC. HCE largely determines IC efficiency in the corporate sector, e.g. for the Australian Foundation Investment Company, its VAIC of 64.235 was 98.4 per cent contributed by HCE. For the financial sector, 88 per cent of VAIC is contributed by HCE. These findings are similar to the results of most studies conducted on banks and the financial sector in different countries (Mavridis, 2004 in Japan; Goh, 2005 in Malaysia; Kamath, 2007 in India; Joshi *et al.*, 2010 in Australia).

Table II shows the means of VAIC and its various components for all sub-sectors in the financial sector. Investment companies have highest VAIC (38.16) followed by REITs (7.33). A high value for HCE leads to a high value of VAIC, as investment companies have maximum HCE at 37.20. Similar trends have been recorded for other

Companies	Sub-sector	CEE	HCE	SCE	VAIC
Australian Foundation Investment Company	Investment companies	0.045	63.208	0.983	64.235
Argo Investments	Investment companies	0.053	55.083	0.982	56.118
Milton	Investment companies	0.055	28.514	0.965	29.534
Cromwell	REITs	0.389	10.723	0.800	11.912
Abacus Group	REITs	0.120	8.188	0.866	9.173
Goodman Industrial Trust	REITs	0.128	7.743	0.820	8.691
Peet	Real estate	0.829	6.317	0.842	7.988
FKP	Real estate	0.262	6.075	0.824	7.161
ASX	Diversified financials	0.376	5.736	0.810	6.922
Count Financial	Diversified financials	1.269	4.354	0.770	6.393
IMF (Australia)	Diversified financials	0.225	5.560	0.419	6.204
Charter Hall	REITs	0.116	4.465	0.763	5.344
AMP	Insurance	0.934	2.833	0.584	4.352
Euroz Ltd	Diversified financials	1.081	2.612	0.611	4.304
Australand	REITs	0.182	3.398	0.658	4.238
St. Georges	Bank	0.415	3.099	0.677	4.191
Mirvac	REITs	0.159	3.355	0.649	4.163
Perpetual	Diversified financials	1.131	2.403	0.577	4.111
Westpac Bank	Bank	0.423	2.920	0.657	4.001
Commonwealth Bank of Australia	Bank	0.395	2.936	0.658	3.990
Wide Bay Australia	Bank	0.332	2.894	0.653	3.879
ANZ Bank	Bank	0.365	2.740	0.632	3.737
National Australia Bank	Bank	0.341	2.497	0.578	3.416
Bank of Queensland	Bank	0.280	2.494	0.598	3.372
Suncorp-Metway	Insurance	0.284	2.268	0.519	3.071
IOOF	Diversified financials	0.535	1.863	0.429	2.827
BKI Investment Company	Investment companies	0.240	2.022	0.505	2.768
Bendigo and Adelaide Bank	Bank	0.296	1.960	0.490	2.746
Henderson Group Plc.	Diversified financials	0.694	1.651	0.393	2.738
Austbrokers	Insurance	0.535	1.620	0.378	2.534
Macquarie Group	Diversified financials	0.630	1.484	0.325	2.438
Insurance Australia Group	Insurance	0.451	1.620	0.290	2.361
Challenger Financial Services Group	Diversified financials	0.211	1.798	0.219	2.228
Average		0.418	7.771	0.634	8.822

Table I.
VAIC and its components
for the sample companies

sub-sectors. The HCE of all other sectors is very low as compared to the investment sector. SCE of investment companies is highest at 0.86 and is closely followed by other sub-sectors in the sample. Overall, investment companies have the lowest CEE, but higher HCE, SCE and VAIC as compared to all other sub-sectors of the financial industry. Diversified financial, insurance, banks and REITs have higher physical capital efficiency but lesser HCE, SCE than investment companies. Insurance companies have low IC efficiency compared to other sub-sectors in the AFS.

In Table III, an ANOVA test was administered to find any significance of difference between the means of VAIC and its components for different sub-sectors.

Table III indicates that with *F*-values at 4.73, 11.82, 7.5 and 11.60, and with all *p* values <0.01, there is a statistically significant difference in HCE, CEE, SCE and VAIC within all the different sub-sectors of the financial sector at 1 per cent level of significance. Therefore, significant differences exist in human, capital and structural efficiencies of all sectors of the financial sector, i.e. banks, diversified financial, insurance, investment companies and REITs in Australia. ANOVA does not analyse

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Sector (<i>n</i>)		Mean	SD	Rank
CEE	Banks (8)	0.3559	0.05327	3
	Diversified financials (9)	0.6835	0.39583	1
	Insurance (4)	0.5511	0.27574	2
	Investment companies (4)	0.0984	0.09474	5
	REITs (8)	0.2732	0.24309	4
	Total (33)	0.4177	0.31891	
HCE	Banks (8)	2.6926	0.36519	4
	Diversified financials (9)	3.0512	1.70323	3
	Insurance (4)	2.0855	0.58471	5
	Investment companies (4)	37.2069	27.74356	1
	REITs (8)	6.2830	2.55567	2
	Total (33)	7.7707	14.14182	
SCE	Banks (8)	0.6179	0.06159	3
	Diversified financials (9)	0.5060	0.19995	4
	Insurance (4)	0.4427	0.13343	5
	Investment companies (4)	0.8585	0.23588	1
	REITs (8)	0.7777	0.08221	2
	Total (33)	0.6340	0.19974	
VAIC	Banks (8)	3.6664	0.46886	4
	Diversified financials (9)	4.2406	1.84566	3
	Insurance (4)	3.0794	0.90032	5
	Investment companies (4)	38.1638	27.86537	1
	REITs (8)	7.3338	2.67911	2
	Total (33)	8.8224	14.14857	

Table II.
Descriptive of VAIC and its components for various sub-sectors of financial sector

		Sum of squares	df	Mean square	<i>F</i>	Significance
CEE	Between groups	1.312	4	0.328	4.731	0.005**
	Within groups	1.942	28	0.069		
	Total	3.254	32			
HCE	Between groups	4,019.712	4	1,004.928	11.823	0.000**
	Within groups	2,380.003	28	85.000		
	Total	6,399.715	32			
SCE	Between groups	0.663	4	0.166	7.554	0.000**
	Within groups	0.614	28	0.022		
	Total	1.277	32			
VAIC	Between groups	3,994.921	4	998.730	11.599	0.000**
	Within groups	2,410.903	28	86.104		
	Total	6,405.824	32			

Table III.
Difference in means of CEE, HCE, SCE and VAIC across different sub-sectors

Note: **Significant at 1 per cent, respectively

which sub-group is different from others. In order to understand these differences, the Scheffe test was conducted; its results are in Table IV.

Table IV explains the differences in means of various components of VAIC and overall VAIC over all the five sub-sectors of the financial industry in Australia. It also reveals the significance of these differences for inter sub-sector comparison. The UNDP (2010) underlined the importance of human capital and called attention to the fact that

Table IV.
Significance of inter
sub-sector differences
in components of VAIC
and overall VAIC

	(I) Sub-sector	(J) Sub-sector	Mean difference (I–J)	SE	Significance
CEE	Investment companies	Bank	–0.25758	0.16127	0.640
		Diversified financials	–0.58514*	0.15826	0.021
		Insurance	–0.45278	0.18622	0.235
		REITs	–0.17487	0.16127	0.879
HCE	Investment companies	Bank	34.51432*	5.64580	0.000
		Diversified financials	34.15569*	5.54026	0.000
		Insurance	35.12138*	6.51921	0.000
		REITs	30.92391*	5.64580	0.000
SCE	Investment companies	Bank	0.24058	0.09068	0.165
		Diversified financials	0.35257*	0.08899	0.012
		Insurance	0.41579*	0.10471	0.012
		REITs	0.08088	0.09068	0.937
VAIC	Investment companies	Bank	34.49732*	5.68233	0.000
		Diversified financials	33.92312*	5.57611	0.000
		Insurance	35.08439*	6.56139	0.000
		REITs	30.82991*	5.68233	0.000

Note: *Significant at 5 per cent, respectively

people are the real wealth of the nations. Some previous studies documented low emphasis on the human capital in the developing countries and highlighted the urgency of enhancing human capital (Singh and Kansal, 2011).

The VAIC of investment companies is significantly higher compared to the VAIC values of banks, diversified financials, insurance and REITs, at a 95 per cent level of confidence. Overall investment companies are more efficient in value creation and vast differences exist in value created by different sub-sectors of the financial industry in Australia. Average HCE of investment companies is significantly higher than all other sub-groups of the financial sector at 5 per cent level of significance. SCE of investment companies is higher than all other sub-groups and these companies differ significantly from diversified financial and insurance companies. Table IV also presents that the average CEE value of diversified financials is significantly higher than investment companies. There are no significant differences in CEE of banks, insurance companies and REITs when compared with investment companies. Thus, *H1*, that there is no difference in value creation capabilities of different sub-sectors, is rejected. The existence of significantly varying efficiencies across sub-sectors provides a strong reason to expect that ROA of companies can be influenced by the segment to which it belongs.

For testing of *H2*, a K-S test is conducted to test normality of ROA and independent variables. K-S statistic for ROA shows K-S=1.167 with two-tailed asymptotic significance at 1.31 indicating that the ROA distribution is normal ($p > 0.05$). Only K-S value for MCAP is 1.714 with $p = 0.006$ indicates that the distribution is skewed. MCAP is log-transformed for the purposes of further analysis.

Table V shows a Pearson correlation matrix mapping associations between financial performance, market capitalisation and various components of VAIC.

Table V shows that CEE impacts the financial performance of Australian companies as there is a moderately high value of correlation between ROA and CEE ($r = 0.524$). HCE is weakly, but significantly, correlated with CEE. HCE is strongly correlated to SCE ($r = 0.612$). The highest value of correlation coefficient between independent variables is 0.612 and is well below 0.9. This indicates the absence of

	CEE	HCE	SCE	LOGMCAP	Banks	Div. Fin.	INS	INV	REITs
ROA	0.524**	-0.006	0.142	-0.454**	-0.401**	0.502**	-0.141	-0.075	0.097
CEE	1.000	-0.374*	-0.234	-0.076	-0.137	0.518**	0.158	-0.344	-0.260
HCE		1.000	0.612***	0.020	-0.199	-0.208	-0.152	0.386*	-0.060
SCE			1.000	0.008	0.014	-0.399**	0.361*	0.266	0.413**
LOGMCAP				1.000	0.434**	-0.246	0.108	-0.178	-0.219
Banks					1.000	-0.346**	-0.210	-0.210	-0.155
Div. Fin.						1.000	-0.227	-0.227	-0.346**
INS							1.000	-0.138	-0.210
INV								1.000	0.007

Notes: LOGMCAP, Log of market capitalisation; INS, insurance companies; INV, investment companies; Div. Fin., diversified financial companies; $n=33$; Values of correlation, *if p , 0.05; **if p , 0.01 and ***if p , 0.001

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Table V.

Correlations matrix for ROA with HCE, CEE, SCE, market capitalisation and sub-sectors

multicollinearity which could have invalidated the inclusion of some independent variables in the model (Tabachnick and Fidell, 1996; Haniffa and Cooke, 2002, p. 414; Field, 2005, p. 186). Table V also shows that in various sub-sectors of the financial industry in Australia, different types of efficiencies are more relevant, for example, in diversified financial companies; the physical capital efficiencies are high whereas the structural and human capital efficiencies are low. On the other hand, in insurance and REITs the SCE are significant. Similarly, investment companies are better utilising their HCE in comparison to companies in other sub-sectors of the financial industry.

To clearly understand the association of CEE, SCE and HCE on financial performance of companies, a regression model has been used (Model 1). Models 2 and 3, respectively, give regression results of CEE, SCE and HCE on financial performance controlling for the size of company and sub-sector of the industry.

Table VI presents the coefficients of various models used for explaining the association between financial performance and various components of VAIC.

Table VII reports that all the components of VAIC jointly explain only 28.5 per cent of the variation in financial performance for Australian companies (value of R^2 in Model 1). Coefficients of CEE, SCE and HCE are positive but SCE and HCE coefficients are not statistically significant. CEE contributes highest to financial performance of the companies ($B = 14.10$), followed by SCE ($B = 8.809$). These results are in line with the results of previous studies showing CEE is the major contributor to ROA (Shiu, 2006; Saengchan, 2008; Ting and Lean, 2009; Clarke *et al.*, 2011; Zou and Huan, 2011). HCE also influences ROA positively, though the effect is not significant. Recently, Sharma and Mani (2012) reported that public sector banks performed poorly due to their lower HCE.

Model 2 has a higher explanatory power, with the introduction of company size as a control variable and coefficient of determinant (R^2) increases from 28.5 to 45.5 per cent. Smaller companies with a high CEE have higher financial performance. Company size significantly influences the ROA of sample companies and confirms the results of the prior studies (Abidin *et al.*, 2009; Calisir *et al.*, 2010).

Financial performance is influenced by the sub-sectors of the financial sector, seen in Model 3 by the inclusion of "sub-sector" as a dummy variable. This increased the multiple correlation ($R = 0.789$) and the coefficient of determination (R^2) to 49.7 per cent. Compared to investment companies, banks have lower ROA; whereas diversified financials, insurance and REITs have higher ROA. This may be why the HCE of banks is lowest of all

Table VI.
Regression models with
components of VAIC,
sub-sectors and market
capitalisation coefficients

Model		Standardised coefficients β	t-value
1	(Constant)		-1.129
	CEE	0.609	3.776**
	HCE	0.077	0.387
	SCE	0.238	1.260
2	(Constant)		1.487
	CEE	0.576	4.079**
	HCE	0.075	0.432
	SCE	0.235	1.423
	LOGMCAP	-0.414	-3.164**
3	(Constant)		0.087
	CEE	0.393	2.146*
	HCE	0.046	0.203
	SCE	0.357	1.483
	LOGMCAP	-0.283	-1.939
	Banks	-0.015	-0.073
	Div. Fin.	0.457	1.840
	INS	0.100	0.493
	REITs	0.169	0.839

Notes: *,**Significant at 5 and 1 per cent, respectively

Table VII.
Multiple linear regression
on ROA (dependent
variable) and components
of VAIC

Model	<i>R</i>	Adjusted <i>R</i> ²	<i>F</i>	Significance	Change statistics	
					<i>R</i> ²	<i>F</i>
1	0.594 ^a	0.285	5.260	0.005 ^a	0.352	5.260**
2	0.723 ^b	0.455	7.675	0.000 ^b	0.171	10.013**
3	0.789 ^c	0.497	4.955	0.001 ^c	0.100	1.589

Notes: Durbin-Watson = 2.015; ^apredictors: (Constant), SCE, CEE, HCE; ^bpredictors: (Constant), SCE, CEE, HCE, LOGMCAP; ^cpredictors: (Constant), SCE, CEE, HCE, LOGMCAP, INS, banks, REITs, Div Fin

the sub-sectors of the financial sector industry (Table II). This argument is further strengthened by Saengchan (2008), which showed that HCE has a highly negative correlation with cost-to-assets in banks, leading to lower profitability. El-Bannany (2008) argued that due to high barriers to entry, leading to a lack of competition, meant bank staff were not motivated to innovate, and this adversely affected the performance of UK banks.

All three models have statistical significance as *p* values are <0.01. Durbin-Watson = 1.598 is well between 1 and 3 thus the independence assumption is satisfied (Field, 2005, p. 190). Further, casewise diagnostics in Table VIII show that relative to

Table VIII.
Casewise diagnostics^a

Case	Standard residual	ROA	Predicted value	Residual
Count Fi	3.172	39.07	22.4518	16.61823

Note: ^aDependent variable: ROA

the size and efficiencies Count Fi, a diversified financial company has outperformed in terms of ROA as it has produced residual value of 16.62 per cent.

The linear regression model in Table IX did not find any strong association between financial performance and IC performance of the financial sector in Australia. VAIC does not contribute much in explaining the variance in financial performance and with F -value = 0.002 and $p > 0.05$ the model is not statistically significant. Thus, the relationship of ROA and VAIC is not significant and it suggests that VAIC has no impact on the profitability of the companies. Similarly, some recent studies fail to establish such relationships and report that ROA is not influenced by VAIC (Madininos *et al.*, 2011; Mehralian *et al.*, 2012; Mosavi *et al.*, 2012). However, these results are in contradiction with some previous research findings where a higher VAIC was found to be leading to higher ROA (Saengchan, 2008; Gan and Saleh, 2008; Ting and Lean, 2009; Ghosh and Mondal, 2009; Nik *et al.*, 2009; Calisir *et al.*, 2010; Ståhle *et al.*, 2011; Pal and Soriya, 2012). It appears that VAIC has no impact on the profitability of the firms. With such variations in findings between studies, this point needs further research.

6. Conclusion

This study makes a significant contribution to research into the impact of value creation factors on financial performance of firms in the Australian financial industry. By using the VAIC model, this study makes a significant contribution to existing literature by analysing differences in VAIC scores among the financial industry sub-sectors. The IC performance of the financial sector in Australia is highly influenced by HCE, which is similar to results reported by earlier research by Goh (2005) and Joshi *et al.* (2010). SCE and CEE have a noticeably lesser role in the creation of value in the financial sector in Australia. About two-thirds of the sample companies had very low levels of IC efficiency. The performance of various components of VAIC, and the overall VAIC score, differed between sub-sectors. Investment companies have a high value VAIC due to higher level of HCE, compared to banks, insurance companies, diversified financials and REITs. Insurance companies are more focused on physical capital rather than human and structural capital, leading to lower VAIC.

Interestingly, high levels of human and structural efficiencies do not necessarily lead to higher level of financial performance. As per the results of this study, physical capital determines ROA of the companies. This result matches earlier research findings (Shiu, 2006; Saengchan, 2008; Ting and Lean, 2009; Clarke *et al.*, 2011; Zou and Huan, 2011). HCE does not fully explain the variations in financial performance. Relatively smaller companies with high physical capital efficiency showed maximum financial performance. Similar results have been found for all sub-sectors. Although investment companies had higher levels of VAIC, SCE and HCE, their poor management of physical capital meant these companies had lower financial performance, compared to companies in the diversified financials, insurance and REITs sub-sectors. Overall, the results above highlight that IC performance has a complex relationship to the financial performance of Australian finance companies. These results are similar to

R	R^2	Adjusted R^2	SE of the estimate	F	Significance
0.008 ^a	0.000	-0.032	7.50743	0.002	0.964

Table IX.
Standardised
(simultaneous) regression
on ROA and VAIC

earlier studies on VAIC and financial performance (Firer and Williams, 2003; Maditinos *et al.*, 2011; Mehralian *et al.*, 2012; Mosavi *et al.*, 2012).

A review of past studies suggests that the VAIC method is not free of limitations and some studies such as Chang (2007), Maditinos *et al.* (2011) and Ståhle *et al.* (2011) have presented serious concerns over the basic assumptions of the VAIC questioning the validity of the method. However, authors propose that regardless of the inherent limitations of VAIC as a method of measuring IC, its simplicity, subjectivity, reliability and comparability make it an ideal measure for the context of the present study on IC performance of the AFS. The primary limitation in this study is that the data collection focused on only one sector in one country and there is a relatively narrow three-year period for the data collection. However, comparative analysis of various sub-sectors in the AFS justifies the contributions made by this study. This study also provides future opportunities for extending similar research of different countries with similar financial and banking sectors. Potential improvements to the present study could lie in its extension to a comparative study into several industrial sectors, extending the time periods investigated or extending it to a larger sample of companies.

The findings of this study have implications for financial sector companies as it provides them with an opportunity to critically analyse the contribution of human capital to their organisation and will aid the design of strategies for enhanced corporate performance. It will also help management of companies in other economic sectors, especially those in knowledge-based industries, to understand the contributions of various components of IC to their business growth. This study will help decision makers be aware of the importance of IC as a key factor that can enhance a company's ability to maintain their competitive position.

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