INTELLECTUAL CAPITAL EFFICIENCY AND FIRM FINANCIAL PERFORMANCE: EVIDENCE FROM SOUTH EAST ASIAN COUNTRIES

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Intellectual Capital Efficiency and Firm Financial Performance: Evidence from South East Asian Countries

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ABSTRACT
This study applies a modified version of the Value Added Intellectual Coefficient (VAIC) model proposed by Pulic (1998; 2000) to investigate the impact of IC on financial performance of listed firms in five South East Asian (SEA) countries: Indonesia, Malaysia, Philippines, Singapore, and Thailand over the period 2006 to 2013. The sample employed consists of 16,039 firm-year observations. Financial performance is measured using return on equity and return on assets ratios. The study employs the VAIC model to measure aggregate IC efficiency and its elements: human capital efficiency, structural capital efficiency and tangible capital efficiency.

The test results indicate that aggregate IC has a positive and significant impact on financial performance of listed firms in the five SEA countries. The results also show that, among the components of IC, human capital and tangible capital both have positive and significant impact on financial performance of listed firm in the five SEA countries. However, structural capital has a negative impact on financial performance of firms in all SEA countries other than Thailand, which contradicts the theoretical expectation.

JEL Classifications: L10, O34
Keywords: Intellectual capital, financial performance

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INTRODUCTION

Intellectual capital (IC) is considered to be one of the key sources of profit and value to firms and in recent years has received increasing attention from managers, investors, and policymakers (Edvinsson (2013), Stewart (1997)). IC relates to the knowledge, intellectual property and experience used to create value for an organisation. Therefore, it is the collective knowledge embedded in employees as well as in the structure of the firm (Roos, et al. (1997), Stewart (1997), (Edvinsson & Malone 1997)). This study applies a modified version of the the Value Added Intellectual Coefficient (VAIC) model proposed by Pulic (1998; 2000) to investigate the impact of IC on financial performance of listed firms in five South East Asian countries: Indonesia, Malaysia, Philippines, Singapore, and Thailand.

The Organisation for Economic Co-operation and Development (OECD) segregated IC into two categories: Human capital (HC) and Structural capital (SC) (OECD 1999, 2006). HC refers to the knowledge, skills and experience that reside in employees and which cannot be owned and controlled by firms. SC refers to the knowledge that resides within companies in forms such as systems, products, processes, patents, trademarks, brand names, customer databases, collaborations, and networks. SC can be owned and even traded by the firm (Edvinsson & Malone 1997; Roos, Roos, Dragonetti & Edvinsson 1997; Stewart 1997). It is difficult to measure IC as it is intangible, scarce, possesses unique character and commonly is embedded in some other asset (Lev 2001). There are no standard methods of measuring IC. However, there are two broad approaches to measuring IC in the literature: the direct and indirect methods. The choice of method depends on the identifiability criteria of IC.

One of the indirect methods for measuring IC is the IC efficiency ratio. This method uses the IC information disclosed by firms in the annual report which is not subjective in nature (Williams 2001). The ratio focuses on the ability of the IC resources to generate value for the firm. The Value Added Intellectual Coefficient (VAIC) model, developed by Pulic (1998; 2000), applies the efficiency concept by measuring the extent of output produced over input entered. Aggregate IC efficiency (ICE) is calculated as the sum of its three components: human capital efficiency (VAHU), structural capital efficiency (VAST), and tangible capital efficiency (VATA). The higher the ICE value, the better the utilization of the IC and tangible

resources (Pulic 2008). This model has received increasing attention because of its ease of data acquisition and calculation (Firer & Williams 2003), and because it makes possible comparisons of IC between firms.

Human capital is an integral part of business activities and crucial for business success. The employees can be described as the 'thinking' asset of a firm and therefore the employment of highly knowledgeable and skilled workers should favourably impact on the market valuation of firms. Unlike human capital, structural capital can be describe as the 'non-thinking' asset of a firm. It allows creation and transmission of knowledge and supports employees' productivity. Thus, structural capital is important to support human capital in achieving business operational productivity and efficiency (Bontis 1998). According to Lev, 2001, IC is also embedded in the tangible resources. Thus, it is anticipated that tangible capital is also crucial to a firm's operations.

Prior research has noted differences in the views of knowledge between the West and Asia which suggests that the impact of IC may also differ (Kamaluddin and Abdul Rahman, 2009). There has been an increasing awareness of IC among firms in South East Asia (SEA). Instead of relying on financial assets, developing countries have been urged to capitalize on the knowledge revolution (Symposium on China-ASEAN Entrepreneurs Exchanges, 2008). Thus, the present study examines the relationship between IC and firm financial performance for five South East Asian (SEA) countries. The study also examines the impact of individual IC components on financial performance in these SEA countries.

LITERATURE REVIEW

A number of previous studies have used the VAIC model to examine the impact of aggregate ICE and its elements on firm performance in different countries. Previous studies that have examined the impact of IC on both financial and market performance using the VAIC model include Firer and Williams (2003), Chen, Cheng and Hwang (2005), Shiu (2006 a & b), Appahumi (2007), Ting and Lean (2009) Zeghal and Maaloul (2010), Clarke, Seng, and Whiting (2011), Maditinos, Chatzoudes, Tsairidis and Theriou (2011), and Mohd Ariff, van Zijl, and Islam (2016). While the results are generally supportive of aggregate ICE having a positive impact on firm performance, the results are mixed as regards the impact of the components of ICE.

Firer and Williams (2003) using a sample of 75 publicly listed firms in South Africa for the year 2001 found that ICE has a positive and significant association with market performance. However, among the individual elements of ICE, only VATA had a positive and significant impact on firms' market performance. The study by Chen et al. (2005) found that aggregate ICE and all of the ICE elements were positively associated with financial performance of firms in Taiwan. They used four performance measures: Return on assets, Return on equity, Revenue growth, and Employee productivity. The sample size of their study was 4,254 firm-year observations on publicly listed Taiwanese firms for the period 1992–2002.

Shiu (2006b) and Ting and Lean (2009) both observe a positive relationship between aggregate ICE, human capital, tangible capital and returns on assets. Similarly, Ting and Lean (2009) also find significant positive relationships between the components of IC and return on equity. The study by Appahumi (2007) finds a positive but not significant relationship between human capital and capital gain by investors. The study reported a significant relationship between structural capital and firm performance but the relationship with tangible capital was negative.

Clarke et al. (2011) examine the effect of IC on firm performance of Australian listed firms. They observed a positive relationship between ICE and firm performance, particularly for capital employed but to a relatively lesser extent for human capital efficiency. They also observed a positive relationship between human capital and structural capital efficiency in both the prior year and current year. Using a sample of 96 firms listed on the Athens Stock Exchange for the period 2006–2008, Maditinos et al. (2011) found that ICE was not significantly associated with market performance and that only VAHU had a positive association with market performance. However, they found a significant positive relationship between the human capital component of IC and returns on equity.

The findings of Ariff et al. (2016) provide not only empirical evidence on the relationship between IC and market performance among R&D engaging firms, but also provides important further evidence on the VAIC model as an IC measurement method. The authors analysed a sample of 1,328 firm-year observations drawn from multinational firms listed on the U.S. stock exchanges, which engaged in R&D activity over the period 2006-2013. The results indicate that the synergy derived from the combination of IC and tangible resources has a significant influence on the market valuation of R&D firms. The findings also suggests the importance of structural and tangible capital over human capital in R&D engaging firms.

HYPOTHESIS DEVELOPMENT

Intellectual capital is used strategically to improve firm performance. However, the success in business is better indicated by the value added by IC than the value of IC itself as many firms still struggle to manage their IC resources effectively for value creation. Value added is the difference between revenue and the cost associated with generating the revenue. The amount of value added generated from every investment made in resources will indicate the efficiency with which value is created from those resources. IC is considered to be a source of value creation and therefore, by utilizing IC, a firm is able to provide a better product and service as compared to other firms which will add value to the firm. Therefore, performance of firms would be expected to reflect aggregate IC.

The studies reviewed above have found a significant positive association between aggregate IC and firm financial performance. These findings are consistent across both developed countries and developing countries. Therefore, this study proposes that:

> H1: Aggregate IC has a positive impact on financial performance of firms in SEA countries.

All the studies considered so far have been based on the premise that investors perceive IC resources as an aggregate of human capital, structural capital and tangible capital. However, Chen, et al. (2005) found that the adjusted R^2 value on a model composed of the three separate IC elements: human capital, structural capital and tangible capital, was higher than the model using aggregate IC. That is, a model using separate elements of capital provided greater explanatory power than a model using the aggregate values. It would thus be useful for the management of the firms to know which IC component add more value to the firm and which may be crucial in influencing investors' judgement on firm value.

The results of the studies reviewed above are mixed with respect to the impact of the elements of IC but overall we expect that each of the elements of IC has an impact on firm performance. Hence, in this study, it is proposed that:

> H2: Human capital has a positive impact on the financial performance of firms in SEA countries.
>
> H3: Structural capital has a positive impact on the financial performance of firms in SEA countries.

H4: Tangible capital has a positive impact on the financial performance of firms in SEA countries.

RESEARCH METHODOLOGY

Sample

The sample for this study comprises firms which were listed on the Indonesia, Malaysia, Philippines, Singapore, and Thailand stock exchanges over the period 2006 to 2013. All financial data were retrieved from the Compustat and Bloomberg databases. The final sample (after deleting observations with negative or nil book values and observations with missing staff expenses) comprised 16,039 firm-year observations consisting of 2,508 firm-year observations on firms in Indonesia, 5,490 firm-year observations on firms in Malaysia, 1,356 firm-year observations on firms in Philippines, 3,494 firm-year observations on firms in Singapore, and 3,191 firm-year observations on firms in Thailand.

Measurement of variables

The dependent variable for the study is financial performance, measured as return on equity (ROE) and return on assets (ROA).

The independent variables are the individual components of IC efficiency (ICE) i.e. human capital efficiency (VAHU), structural capital efficiency (VAST) and tangible capital efficiency (VATA) and aggregate ICE which is the simple sum of these three components. According to the VAIC model, each component depends on the amount of value added which is the firm's value creation resulting from the sale of output after deducting the costs incurred in the production of that output, except for staff expenses (Pulic 1998; 2000). The components of ICE are calculated as follows:

Human capital efficiency is an index that measures the value added created by every dollar spent on employees. It is an indicator of the contribution made by human capital in creating value for the firm. VAHU is calculated as VA divided by staff expenses i.e. VAHU = VA / Staff expense[i].

Structural capital efficiency is an index that measures the value created by employing the structural capital in a firm. In the original VAIC model, structural capital is the remainder left after deducting human capital from value added (Pulic, 2000). This is based on the assumption that human capital and structural capital are inversely related with respect to value creation. To

calculate VAST, Pulic (2000) used structural capital as the numerator and value added as the denominator. However, this arrangement does not measure the ratio of value added as output to structural capital as input. Vishnu and Gupta (2014) thus proposed the use of value added as the numerator in determining structural capital efficiency, consistent with the calculation of human capital efficiency.

Given this dependence of structural capital on value added and human capital under the original VAIC model, a modified version of structural capital efficiency is used in this study. We follow Bollen, et al. (2005) in estimating structural capital as other intangible assets (i.e. intangible assets except goodwill) and also invert the Pulic ratio so that VA is treated as Output. Other intangible assets such as patents, trademarks, copyrights, franchises, licences etc are included in the measure of structural capital because these items represent the explicit knowledge embedded in the firm. Thus we apply the following formula to calculate VAST.
VAST = VA / (Other intangible assets (except goodwill)).

Tangible capital efficiency is an index that measures the value added created by the use of one unit of tangible capital. According to Lev, (2001), the role of tangible capital in creating value should not be ignored when measuring the overall IC efficiency since some IC is embedded in tangible capital. Therefore, the tangible capital efficiency is measured as VATA = VA / Tangible assets[ii].

To examine the impact of IC on firm performance, this study controls for size (SIZE), leverage (LEV), year (YEAR) and industry (IND) because the level of investment in IC may be constrained by the size of the firm, and the ability of a firm to finance such investments may be limited by the level of leverage.

Thus, using the variables as defined above, the following two models are used to examine the relationship between IC and firm financial performance for each of the SEA countries.

Model 1: Aggregate IC and firm financial performance

$ROE_{it} = \beta_0 + \beta_1 ICE_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \boldsymbol{\delta}.YEAR + \boldsymbol{\gamma}.IND + \varepsilon$ .....(Model 1a)

$ROA_{it} = \beta_0 + \beta_1 ICE_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \boldsymbol{\delta}.YEAR + \boldsymbol{\gamma}.IND + \varepsilon$ .....(Model 1b)

Model 2: IC elements and firm financial performance

$$ROE_{it} = \beta_0 + \beta_1 VAHU_{it} + \beta_2 VAST_{it} + \beta_3 VATA_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \boldsymbol{\delta}.YEAR + \boldsymbol{\gamma}.IND + \varepsilon \quad \text{(Model 2a)}$$

$$ROA_{it} = \beta_0 + \beta_1 VAHU_{it} + \beta_2 VAST_{it} + \beta_3 VATA_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \boldsymbol{\delta}.YEAR + \boldsymbol{\gamma}.IND + \varepsilon \quad \text{(Model 2b)}$$

RESULTS AND DISCUSSION

Descriptive Analysis

Table 1 shows the results of descriptive analysis of the variables used in the study. All data are winsorized at 5% level, top and bottom. The mean value for ROE reflects that, on average, the sample firms generate between 8.5 % to 21.7% profit on total equity. The mean value for ROA indicates as expected, a relatively lower level of profitability, between 4.4% to 16.2% on total assets.

All five of the SEA countries have a mean value for ICE within the range of 10.372 to 24.696. Firms in Thailand have the highest ICE value, followed by firms in Indonesia (16.545) and firms in the Philippines have the lowest ICE mean value. In terms of IC elements, VAHU has the highest mean value, followed by VAST and VATA indicating highest efficiency for human capital. Compared to all other SEA countries, firms in Thailand have the highest mean value for VAHU, VAST and VATA followed by firms in Indonesia and firms in Malaysia. The mean value of VAHU, VAST and VATA for firms in the Philippines is the lowest among the five SEA countries.

Correlation Analysis

Table 2 shows the Pearson correlation analysis with pairwise selection of all variables used in the test models.

The correlation coefficients for ICE with ROE and ROA are positive and significant at 0.01 level for firms in each of the SEA countries except for Indonesia, indicating overall a positive association between aggregate ICE and financial performance. In terms of the ICE elements, the correlation coefficients for VAHU with financial performance are positive and significant at 0.01 level, except for Indonesia. The correlation coefficients of VAST with financial performance are positive and significant only for firms in Malaysia, Singapore and Thailand.

Table 1
Country-wise descriptive analysis of variables

Indonesia								
Stats	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
N	2508	2508	2508	2508	2508	2508	2508	2508
Mean	0.217	0.162	16.545	13.354	0.785	1.167	1.783	0.507
Median	0.116	0.047	10.577	8.119	0.881	0.725	2.088	0.511
Std. Dev.	0.347	0.347	15.450	13.817	0.248	1.456	1.454	0.245
Min	-0.205	-0.076	2.354	1.097	0.125	0.051	-2.222	0.073
Max	1.283	1.441	60.900	53.009	0.984	5.908	3.620	0.912
Malaysia								
Stats	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
N	5490	5490	5490	5490	5490	5490	5490	5490
Mean	0.086	0.047	13.230	11.893	0.796	0.542	2.019	0.391
Median	0.044	0.023	9.357	7.833	0.886	0.429	1.945	0.381
Std. Dev	0.141	0.079	13.049	12.661	0.232	0.454	0.646	0.199
Min	-0.160	-0.079	0.166	0.328	0.118	0.017	1.009	0.083
Max	0.404	0.234	52.713	50.796	0.996	1.596	3.429	0.770
Philippines								
Stats	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
N	1356	1356	1356	1356	1356	1356	1356	1356
Mean	0.143	0.067	10.372	9.105	0.866	0.305	2.184	0.410
Median	0.125	0.040	6.550	5.392	0.881	0.163	2.034	0.411
Std. Dev.	0.189	0.097	11.919	11.455	0.250	0.372	0.887	0.251
Min	-0.222	-0.096	-4.189	-5.231	0.353	-0.046	0.735	0.029
Max	0.548	0.296	45.586	42.604	1.507	1.268	3.822	0.889
Singapore								
Stats	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
N	3494	3494	3494	3494	3494	3494	3494	3494
Mean	0.085	0.044	11.033	9.549	0.750	0.628	2.156	0.427
Median	0.093	0.045	7.306	5.682	0.847	0.494	2.052	0.430
Std. Dev.	0.183	0.093	11.107	10.737	0.265	0.543	0.695	0.188
Min	-0.370	-0.182	0.450	-0.146	0.048	-0.001	1.129	0.111
Max	0.425	0.226	43.466	41.583	1.013	1.887	3.674	0.763
Thailand								
Stats	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
N	3191	3191	3191	3191	3191	3191	3191	3191
Mean	0.099	0.056	24.696	22.649	0.862	0.855	2.075	0.445
Median	0.109	0.053	11.266	9.441	0.896	0.808	1.954	0.452
Std. Dev.	0.145	0.071	33.965	33.148	0.119	0.593	0.650	0.219
Min	-0.272	-0.090	2.817	2.027	0.542	0.062	1.145	0.088
Max	0.342	0.194	138.528	134.605	0.994	2.182	3.520	0.850

Table 2
Correlation analysis of variables

Indonesia	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
ROE	1							
ROA	0.877***	1						
ICE	0.020	-0.017	1					
VAHU	-0.158***	-0.206***	0.891***	1				
VAST	-0.503***	-0.557***	0.325***	0.555***	1			
VATA	0.600***	0.604***	0.320***	0.035	-0.461***	1		
SIZE	-0.615***	-0.684***	0.031	0.284***	0.690***	-0.710***	1	
LEV	-0.109***	-0.194***	0.042***	0.072***	0.141***	-0.076***	0.270***	1
Malaysia	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
ROE	1							
ROA	0.928***	1						
ICE	0.183***	0.183***	1					
VAHU	0.181***	0.179***	0.997***	1				
VAST	0.144***	0.147***	0.533***	0.513***	1			
VATA	0.128***	0.156***	0.459***	0.430***	0.395***	1		
SIZE	0.446***	0.346***	0.140***	0.147***	0.107***	-0.150***	1	
LEV	-0.004	-0.181***	0.121***	0.120***	0.061***	0.062***	0.330***	1
Philippines	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
ROE	1							
ROA	0.877***	1						
ICE	0.257***	0.255***	1					
VAHU	0.265***	0.260***	0.993***	1				
VAST	-0.145***	-0.154***	0.150***	0.108***	1			
VATA	0.260***	0.290***	0.465***	0.447***	-0.048	1		
SIZE	0.416***	0.226***	0.296***	0.300***	-0.097***	0.096***	1	
LEV	0.168***	-0.111***	0.121***	0.118***	-0.1260***	0.109***	0.547***	1
Singapore	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
ROE	1							
ROA	0.945***	1						
ICE	0.137***	0.113*	1					
VAHU	0.140***	0.114*	0.992*	1				
VAST	0.091***	0.064*	0.552*	0.520*	1			
VATA	0.076***	0.068*	0.364*	0.323*	0.314	1		
SIZE	0.294*	0.240*	0.143*	0.161*	0.096	-0.257	1	
LEV	-0.002	-0.117	0.180*	0.179*	0.121*	0.177*	0.226*	1
Thailand	ROE	ROA	ICE	VAHU	VAST	VATA	SIZE	LEV
ROE	1							
ROA	0.898***	1						
ICE	0.076***	0.047***	1					
VAHU	0.073***	0.040***	0.989***	1				
VAST	0.196***	0.165***	0.530***	0.542***	1			
VATA	0.247***	0.275***	0.277***	0.253***	0.371***	1		
SIZE	0.124***	0.000	0.162***	0.171***	0.190***	-0.171***	1	
LEV	-0.112***	-0.338***	0.101***	0.109***	0.157***	-0.004	0.368***	1

Note: Asterisks ***,**, and * represents statistical significance at 0.01, 0.05 and 0.10 respectively

The correlation coefficients of VATA with financial performance are positive and significant for firms in all of the five SEA counties, indicating that tangible capital is positively associated with financial performance. However the correlation analysis focuses on bivariate relationships and the impact of ICE and its elements needs to be judged in a multivariate setting.

Multivariate Analysis

Table 3 & 4 shows the results of regression analysis of the test models. Model 1 results are shown in Table 3 and Model 2 results are shown in Table 4 respectively.

Analysis of the impact of aggregate IC on financial performance

Table 3 shows that the coefficient on ICE for ROE and for ROA are positive and significant at 0.01 level for firms in Malaysia, Philippines, Singaporean and Thailand. However, for Indonesia, the coefficient for ROE is positive but significant only at 0.05 level and the coefficient for ROA is not significant. Overall, the results suggest that aggregate ICE has a positive impact on financial performance among five SEA countries sample firms. Thus, the overall results provide empirical support for hypothesis H1. This suggests that an increase in ICE will improve the profitability level of firms. The results are consistent with the previous studies by Chen, et al. (2005), and Appahumi (2007) Clarke, et al. (2011), Zeghal and Maaloul (2010) and Mohd Ariff et al. (2016).

Analysis of the impact of IC elements on financial performance

Table 4 shows that the results for the impact of human capital on firm performance are mixed. The coefficients for VAHU on ROE and ROA are positive and significant at 0.01 level for Malaysian, Philippines, and Singaporean sample firms. The results indicate that human capital efficiency has an impact on financial performance for the sample firms in these countries and are consistent with such studies as Chen et al. (2005). However, the coefficient for VAHU on ROE is negative for sample firms in Indonesia and Thailand which contradicts the expected relationships and thus the results do not support hypothesis H2 for these two countries.

Concerning the relationship between structural capital and financial performance, the coefficients for VAST on ROE and ROA are found to be negative for all the SEA counties except Thailand. The results suggests a negative relationship between structural capital and firm financial performance, and thus do not support hypothesis H3. The result for Thailand is consistent with the results observed by Appahumi (2007) for the Thai financial sector. Similar

Table 3

Regression analysis for Model 1 examining the impact of aggregate ICE on financial performance

	Indonesia		Malaysia		Philippines		Singapore		Thailand	
	ROE	ROA	ROE	ROA	ROE	ROA	ROE	ROA	ROE	ROA
Intercept	0.429***	0.458***	-0.098***	-0.020***	-0.049***	0.020***	-0.067***	-0.002	0.063***	0.079***
	(30.433)	(34.978)	(-17.001)	(-6.198)	(-3.978)	(3.078)	(-6.243)	(-0.383)	(7.172)	(19.466)
ICE	0.001**	0.000	0.001***	0.001***	0.002***	0.002***	0.002***	0.001***	0.000***	0.000***
	(2.373)	(0.357)	(11.490)	(13.695)	(5.633)	(7.350)	(6.759)	(6.693)	(3.714)	(3.870)
SIZE	-0.151***	-0.163***	0.106***	0.053***	0.088***	0.038***	0.078***	0.036***	0.041***	0.015***
	(-38.733)	(-45.031)	(38.826)	(34.930)	(13.690)	(11.190)	(17.983)	(16.218)	(9.714)	(7.538)
LEV	0.085***	-0.014	-0.129***	-0.136***	-0.058***	-0.125***	-0.087***	-0.098***	-0.123***	-0.128***
	(3.677)	(-0.649)	(-14.507)	(-27.610)	(-2.630)	(-10.874)	(-5.339)	(-11.837)	(-9.986)	(-22.219)
Year	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Adj.R2	0.38	0.47	0.24	0.24	0.19	0.16	0.10	0.10	0.05	0.14
Observations	2508	2508	5490	5490	1356	1356	3494	3494	3191	3191
F-stat	517.023	735.067	585.083	588.018	110.263	87.738	133.248	129.295	54.053	167.305

"t statistics in parentheses" = *p<0.10, ***p<0.05, and ***p<0.01

Table 4
Regression analysis for Model 2 examining the impact of ICE elements on firm financial performance

	Indonesia		Malaysia		Philippines		Singapore		Thailand	
	ROE	ROA	ROE	ROA	ROE	ROA	ROE	ROA	ROE	ROA
Intercept	0.408***	0.468***	-0.134***	-0.043***	0.017	0.069***	-0.108***	-0.021***	-0.133***	-0.024***
	(15.855)	(19.450)	(-16.967)	(-9.735)	(0.798)	(6.336)	(-7.951)	(-3.015)	(-6.501)	(-2.506)
VAHU	-0.000	0.000	0.000***	0.000***	0.001***	0.001***	0.001**	0.000***	-0.000***	-0.000***
	(-0.276)	(-0.981)	(2.710)	(3.711)	(2.787)	(3.832)	(2.733)	(2.897)	(-4.121)	(-5.046)
VAST	-0.229***	-0.236***	-0.001	-0.001	-0.089***	-0.064***	-0.008	-0.009	0.162***	0.085***
	(-6.727)	(-7.399)	(-0.127)	(-0.174)	(-4.852)	(-6.833)	(-0.593)	(-1.416)	(6.340)	(7.236)
VATA	0.081***	0.064***	0.064***	0.040***	0.097***	0.062***	0.060***	0.032***	0.063***	0.033***
	(14.685)	(12.385)	(15.028)	(17.058)	(7.118)	(8.937)	(9.571)	(10.010)	(13.969)	(15.952)
SIZE	-0.062***	-0.085***	0.117***	0.060***	0.089***	0.039***	0.095***	0.045***	0.052***	0.021***
	(-9.578)	(-14.010)	(41.982)	(38.882)	(14.181)	(11.908)	(20.322)	(18.861)	(12.586)	(10.910)
LEV	0.015	-0.073***	-0.141***	-0.144***	-0.081***	-0.140***	-0.119***	-0.115***	-0.139***	-0.136***
	(0.671)	(-3.517)	(-16.128)	(-29.778)	(-3.768)	(-12.759)	(-7.274)	(-13.780)	(-11.757)	(-25.048)
Year	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Adj.R2	0.45	0.514	0.27	0.281	0.24	0.24	0.12	0.12	0.14	0.236
Observations	2508	2507	5490	5490	1356	1356	3494	3494	3191	3191
F-stat	404.289	531.276	410.981	429.968	87.339	86.835	100.168	99.158	100.631	198.190

"t statistics in parentheses" = *p<0.10, ***p<0.05, and ***p<0.01

results were reported by Adnan, Kamaluddi and Kasim (2013) in their study on Malaysian zakat institutions' performance.

The coefficients on VATA for both ROE and ROA are positive and significant at 0.01 level for all of the SEA counties firms. This indicates that tangible capital efficiency has a significant influence on financial performance and provides support for hypothesis H4. The results are consistent with theoretical expectations, and confirms the studies by Firer and Williams (2003), Chen, et al. (2005), Shiu (2006 a & b), Ting and Lean (2009), Clarke, et al. (2011) and Zeghal and Maaloul (2010), Stahle, et al. (2011) and Mohd Ariff et al. (2016).

Except for firms in Indonesia, the coefficient on SIZE and LEV for both ROE and ROA in respect of both ICE and its components are significant for firms in each of the SEA countries. The results suggest that firm size positively impacts financial performance of listed firms in SEA counties but leverage has a negative impact.

Overall, the amount of variation explained by the regression models in predicting ROE and ROA for Model 1 and for model 2 are similar to those found in the Taiwan study by Chen, et al. (2005), the Australia study by Clarke, et al. (2011), and the US study Ariff et al. (2016).

SUMMARY AND CONCLUSION

The present study examines the impact of aggregate ICE and its elements on the financial performance of listed firms in five South East Asian countries. Both aggregate IC and the components of ICE are measured using the Value Added Intellectual Coefficient (VAIC^{TM}) model developed by Pulic (1998; 2000) but modified in respect of measuring the VAST variable. Multivariate regression analysis is used to examine the relationship between aggregate IC and its elements with firm performance.

The study finds, in general, that aggregate ICE has a positive impact on the financial performance of listed firms in the SEA countries. In terms of the IC elements, the overall finding is that human capital efficiency and tangible capital efficiency have a positive impact on the financial performance of listed firms in the South East Asian countries. However, structural capital efficiency has a negative impact on financial performance which contradicts the theoretical expectation that structural capital helps to create and transform knowledge and support employees' productivity.

The findings suggest that the synergy derived from the combination of IC and tangible resources has a significant influence on financial performance of firms. The finding also suggests that human capital is an integral part of business activities and crucial for business success. Therefore, as with the role of tangible capital in creating value (Lev, (2001)), the employment of highly knowledgeable and skilled workers favourably impacts on firm performance. Finally, the findings provide longitudinal evidence on intellectual capital efficiency and firm performance.

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ENDNOTES

[i] Staff expense, which comprises salary and wages, compensation, remuneration, pensions and other benefits paid to employees.

[ii] Tangible assets are calculated as the difference between total assets and total intangible assets (Clarke, et al., 2011). In this study, goodwill is excluded from the calculation of total intangible assets.