INTELLECTUAL CAPITAL IN INDONESIA: DYNAMIC PANEL APPROACH

Abstract
Purpose – *Intellectual Capital has been considered as a valuable asset in the wealth creation and sustainability of the company however limited, and mixed results are found on its impact on firm's financial performance. This research aims to investigate the influence of Intellectual Capital toward firm performance and market value of publicly listed firms in Indonesia. In addition, the comparison of the high-level and low-level knowledge industries regarding Intellectual Capital also evaluated.*
Design/methodology/approach – *A balanced panel data of 127 firms from 12 industries in Indonesia during 2010 until 2017 was evaluated using dynamic panel regression and administering a well-developed Blundell-Bond instrument (dynamic panel data estimator) to account for endogeneity problem*
Findings – *The results of this study showed that intellectual capital had a significant and positive impact on firm performance. Specifically, structural capital efficiency and capital employed efficiency have been contributed to the value creation of the company, after controlling for firm size and type of industry. Different to the theoretical expectation, this research found no significant relationship between intellectual capital and market value of the firm. However, when the sample was clustered into high-level and low-level knowledge industry, capital employed displayed positive and significant relationship in high-level industry.*
Originality/value – *This research contributes to IC research by having larger sample of Indonesian firms from all industries except banks and financial institutions and utilizing Modified Value Added Intellectual Capital (MVAIC) measurement model. To address the endogeneity problem, dynamic panel regression using system GMM was applied.*
Keywords *Intellectual capital, Firm performance, Market value, Dynamic panel data*
Paper type *Research paper*

Introduction

Previously, it was believed that the most important asset in a company would be the physical/tangible assets such as machinery, equipment, and building. However, it is no longer relevant to the current economy or what is called as knowledge-based economy (KBE), where the source of productivity and business value creation has shifted to intangible assets or also known as knowledge-based capital (KBC) eg. organization know how, software, patents, designs, and firms specific skills (Edvinsson and Malone, 1997; Stewart, 1997; Sveiby, 1997; OECD, 2013).

The World Bank and OECD, as cited by the Asian Development Bank (2014), defined knowledge-based economy as "an economy that uses information resources-technologies, skills and processes to achieve and accelerate economic growth potential"(p.X). Moreover, the knowledge-based capital (KBC) refers to various types of intangible assets that create future benefits and can be classified into three types: computerized information, innovative property and economic competencies (OECD, 2013).

Firms in OECD countries are investing in knowledge-based capital (KBC) as much as or even more than in the physical capital; in fact, in some countries, the investment made by business entities in KBC is exceeding the physical capital significantly. Based on a study conducted in the European Union and in the United States, KBC is not only boosting growth and productivity about 20% to 34% of labor productivity growth, but is also transforming firms to be more competitive (OECD, 2013).

As the largest economy in South East Asia, Indonesia has entered the Asean Economic Community (AEC) and regional economic integration in 2015 with the implication that prioritizing the economy based on the previous model of growth will be not enough to uphold its position in KBE. Indonesia needs to focus more on high-end technologies, skills, and services to sustain a high growth of economic level beyond 2015 (Asian Development Bank, 2014). The development of Indonesia in building KBE could be seen by the fact that during the year of 2003-2012, the economic growth engine and employment of Indonesia had shifted to services (an average of 3.3 percentage points) then manufacturing sector (average 1.8 percentage points) towards GDP growth. While, 82% employment out of 20 million of new job creations is in the services sector (Asian Development Bank, 2014). Remarkably, the contribution from the services sector made up 56.7% of the GDP, compared to the manufacturing sector whose contribution only made up 21.5% of the GDP in 2016 (OECD, 2016). Besides, to boost its innovative capacity, Indonesia has also participated in the innovation project by OECD for inclusive development in the area of science, technology and innovation policies (OECD, 2014). Based on those facts previously, Indonesian firms are expected to use more intangible assets in achieving competitive advantage and that leads to the statement of problem of the current study

whether Indonesian firms are utilizing intellectual capital to achieve their objectives, specifically towards firm performance and market value.

The term knowledge-based capital/asset (by economists) or intangible assets (as in accounting literature) or also referred to as intellectual capital (as in management) are often being used interchangeably (Bontis, 2001). It plays a significant role in the economy and experiencing tremendous growth of importance until today (Bollen et al., 2005) and has received many attentions from various scholars and practitioners in a worldwide over the last two decades as knowledge-based equity of organizations (Petty and Guthrie, 2000; Bontis, 2001).

From now and onwards, the term of Intellectual Capital will be mentioned as IC. The position of IC has dominated the creation of wealth in firms for the past years (Vishnu and Gupta, 2014); therefore, it is noteworthy to manage and measure IC to develop their competitive competence and achieve companies' goals (Wang, 2008). To keep the value and growth, companies will likely depend more on the performance of their IC along with the growth of the knowledge economy to dominate field of commerce (Sveiby, 2010). According to several scholars, IC is believed to be the hidden value that is not revealed in the financial reports (Edvinsson and Malone, 1997; Chen et al., 2005; Mondal and Ghosh, 2012). IC itself is not very easy to be recognized, detected and reported in the financial reports (Nazari et al., 2007; Nimtrakoon, 2015). Current financial reporting standard cannot adequately explain the underlying firm value, which leads to the problem of information asymmetry for investors and negatively influence to the value of financial statements in the knowledge-based economy (Bukh *et al.*, 2005).

The main objective of this research is to extend the study of IC in Indonesia (Feimianti and Anantadjaya, 2014; Razafindrambinina and Anggreni, 2011) as the main driver of competitive advantage in knowledge-based economy by unpacking how IC is contributing to firm performance and market value of all sector industries in Indonesia, using the Modified Value Added Intellectual Capital, that will be referred to MVAIC for the rest of the paper, a model to measure IC efficieny in more comprehensive manner (Nazari et al., 2007; Vishnu and Gupta, 2014; Nimtrakoon, 2015). Considering that the endogeneity problem between IC efficieny and firm performance or market value that is ignored in the previous study will be taken into account in the current discussion. Overall, this study contributes to body of IC literatures at least in three ways. First, Modified VAIC is used as IC measurement, unlike other previous studies that used Value Added Intellectual Capital (VAIC), an IC efficiency measurement model based on three resources (physical/capital, human and structural) as in Table I. Second, Maji and Goswami (2016) pointed out that Pooled OLS Model has shown failure in obtaining the correlation among variables over the years within a firm; moreover this research also employed panel regression as it is more suitable for panel dataset.

Besides, a firm with poor performance may affect the likelihood of its investment in IC resources. In other words, the current or later year of IC efficiency will depend on a firms' past performance (Nadeem *et al.*, 2017). Additionaly, companies with high market valuations may choose to invest more in IC resources in the future (Gupta et al., 2017). Then the relationship between IC efficiency and firm performance or market value is dynamic instead of static. The existence of dynamic relation between the current year value of independent variable and the lagged year value of dependent variable will lead to biased results if static estimators such as ordinary least square (OLS) and fixed effects (FE)/random effects (RE) are used (Roodman, 2009). Thus, dynamic panel data regression using Blundell and Bond (1998) system generalised method of moment (GMM) estimator is applied to this research to produce consistent results. In authors' knowledge, only few research about relationship of IC towards firm performance and market value that have addressed the endogeneity problem (Nadeem et al., 2017; Sardo and Serrasqueiro, 2017; Yang and Zhao, 2017).

Table I Summary of Prior Studies on IC

Country	*Author (Year)*	*Model and Analysis Tool used*	*Significant relationships*
Overall Industry			
South Africa	Firer and Williams (2003)	VAIC; OLS Model using cross section data	Positive relationship between SCE and ROA. Positive relationship between CEE and MBV
Taiwan	Chen et al. (2005)	VAIC; Pooled OLS Model	VAIC positively associated with all measures of performance and market value
Singapore	Tan et al. (2007)	VAIC; PLS Model	Positive relationship between VAIC and firm performance
Hong Kong (2001-2005)	Chan (2009)	VAIC; Pooled OLS Model	Positive association between CEE and market value, also towards firm performance

Greece	Maditinos et al. (2011)	VAIC; Pooled OLS Model	HCE only positively associated with MBV HCE and CEE positively associated with ROE
Hong Kong (2001-2009)	Chu et al.(2011)	VAIC; Pooled OLS Model	Positive relationship between VAIC and profitability Positive relationship between all components of VAIC and measures of performance, also market value
Australia	Clarke et al.(2011)	VAIC; Pooled OLS Model	Positive relationship between VAIC and all components to firm performance, except SCE
Italy	Celenza and Rossi (2014)	VAIC; Pooled OLS Model	Positive relationship between VAIC and profitability
United Kingdom	Rahman (2012)	VAIC; Pooled OLS Model	Positive relationship between VAIC and firm performance. No significant relationship with market value.
Specific Sector			
Technology-Intensive (Malaysia)	Gan and Saleh (2008)	VAIC; Pooled OLS Model	Positive relationship between VAIC with firms' performances, but not towards market value.
Software and Pharmaceuticals (India)	Gosh and Mondal (2009)	VAIC; OLS Model using cross section data	VAIC positively associated with ROA
Pharmaceutical (India)	Vishnu and Gupta (2014)	e-VAIC (include RCE); Pooled OLS Model	VAIC positively associated with company all firm performance All components of e-VAIC positively associated with ROA, except SCE
United Kingdom	Zeghal and Maaloul (2010)	VAIC; Pooled OLS Model	VAIC, CEE positively associated with ROA and MBV

Notes : VAIC:Value Added Intellectual Capital, MVAIC: Modified Value Added Intellectual Capital, Pooled OLS Model: Pooled Ordinary Least Square Model, HCE:Human Capital Efficiency, SCE:Structural Capital Efficiency, RCE:Relational Capital Efficiency, CEE:Capital Employement Efficiency, MBV:Market to Book Value, ROA:Return on Assets, ROE:Return on Equity, ATO:Assets Turn Over

The following section discusses the conceptual framework related to theories being used in the study. The third and the fourth section, will focus on the summary of the relevant literature and hypothesis proposed in the present study. The last section will give a detailed account of the methods of the study, the results and the empirical analysis including the conclusions and limitations of the study.

Conceptual Framework and Hypotheses

Intellectual Capital

No acceptable uniform definition of IC has been approved by both practitioners and academicians until today. In the past, several scholars like Edvinsson and Malone (1997, p. 358) defined IC simply as "knowledge that can be converted into value." Stewart (1997, p. x) defined IC as "intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth." Other scholars, in brief, described IC as "something related to knowledge, wealth creation and intangibility"(Sullivan Jr and Sullivan Sr, 2000; Bontis, 2001; Vishnu and Gupta, 2014). Meanwhile Chen et al. (2005) and Mondal and Gosh (2009) believed that IC is the hidden value that does not appear in financial reports (particularly in financial statement position) but if being managed well, it will create competitive advantage for the company over time. In the present study, the definition of IC is all knowledge that can be used to create wealth and added value as the competitive advantage in achieving company's goal.

Researchers have not reached general agreement in classifying or measuring Intellectual Capital (IC). One of the earliest models of IC is Skandia Navigator (Edvinsson and Malone, 1997) or navigator model that encouraged other scholars to look beyond traditional concepts in creating an organization value. This model changed the nature of the relationship between firms and the customer, and recognize its role in value creation(Bontis, 2001). Another well-known method to measure IC is Intangible Asset Monitor (Sveiby, 2010; Mondal and Ghosh, 2009).

The problems that arise with these two IC methods are the fact that the data are unavailable for the party outside of the firm, the necessary information usually comes in the form of qualitative data that depends on judgments and cannot be translated into quantitative value (Clarke et al., 2011).

Further developing method to measure IC and its components, scholars classify it into 4 categories: direct intellectual capital (DIC) methods, market capitalization methods (MCM), Return on Assets (ROA) methods and scorecard (SC) methods (Nazari *et al.*, 2007; Tan et al., 2008; Sveiby, 2010) or a combination of these methods (Chan, 2009). Direct methods calculate IC in the form of monetary value using micro-level components of intangible assets data either as an aggregate coefficient or as an individual while Scorecard method utilized indices to show the performance and reported as scorecards or graphs (Nazari et al., 2007; Tan et al., 2008). They are more fitting to demonstrate the comprehensive conditions of a company, and it is easy to be applied at any level of an organization (Sveiby, 1997). On the other hand, MCM and ROA methods use macro-level aggregate data to measure (Nazari *et al.*, 2007). These methods are more suitable for merger and acquisition and stock market valuation (Sveiby, 1997).

The most popular measurement of IC was developed by Pulic (1998), which measures the IC efficiency quantitatively by determining value-added intellectual coefficient (VAIC) (Pulic, 2004). Consistent with the stakeholder theory that to increase the stakeholder value (shareholders, employees, customers, debtors, and government (Riahi-Belkaoui, 2003), the firm uses its physical, financial and intellectual capital. Pulic (2004) argued that the market value of the companies is created by capital (physical and financial) employed and intellectual capital (human capital and structural capital). The value of VAIC is the sum of these capital efficiencies – human capital efficiencies (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE – consist of physical and financial capital efficiency) then together HCE and SCE constitute IC efficiency (ICE) (Firer and Williams, 2003)

Human capital consists of knowledge and skills that enable employees to perform in different kinds of situations including values and motivation, and Human resources' capability is believed to be the main intangible resource (Sveiby, 1997). Experience is another factor of human capital that can be improved with training and could be divided into micro (individual) or macro (organization) levels(Joshi *et al.*, 2013).

Structural capital is also known as an internal capital that consists of organization structures, procedures, strategies, systems, hardware, databases and also organizational cultures to support employees to achieve business goals. Those capabilities are developed within the organization and cannot be separated (Joshi *et al.*, 2013). The examples of structural capital could be brand names, patents, technologies, innovations created by research and development department. Additionally, Sveiby (1997) classified structural capital as concepts, models, and computer and administrative systems. In developing structural capital, the most influential factor is human capital; therefore, that makes the process of development subjected to human capital (Nazari *et al.*, 2007)

VAIC has been widely adopted in many previous types of research that were both conducted in the developed countries (Tan et al., 2007; Zeghal and Maaloul, 2010; Joshi *et al.*, 2013) and developing countries (Chen et al., 2005; Nimtrakoon, 2015; Nadeem *et al.*, 2017).

VAIC method have several advantages. First, the data being used in VAIC is based on audited information (Firer and Williams, 2003; Chan, 2009) which makes it objective and verifiable (Pulic, 2004; Chan, 2009). Second, the method is also simple, reliable and comparable (Maditinos *et al.*, 2011) and third, VAIC provides a standardized and integrated measure that acknowledge the analysis and the comparison across organization or across nations (Sullivan Jr and Sullivan Sr, 2000; Chen et al., 2005; Zeghal and Maaloul, 2010; Nimtrakoon, 2015). Forth, external stakeholders can evaluate the IC of the company using the model promptly (Vishnu and Gupta, 2014). Moreover, the component factors used are also match in line with many accepted definitions of IC (Goh, 2005). Lastly, VAIC fits well with the condition of emerging and developing countries where there is still lack of practices in advanced accounting and less mature financial structures (Maditinos *et al.*, 2011)

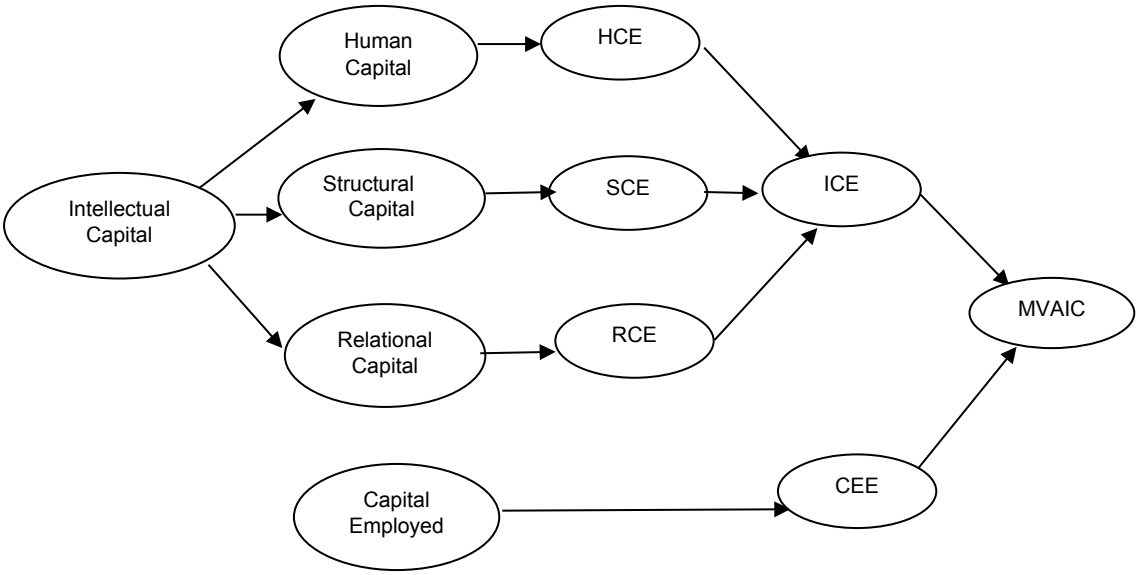
However, that being indicated by some researchers suggested that there are some limitations to the VAIC model. Stahle et al. (2011) pointed out the "perfect superimposition" between formula of human capital (HC) and structural capital (SC) or theory inconsistencies. In addition, no inclusion of relational capital (RC) to determine VAIC (Vishnu and Gupta, 2014). Another criticism raised about VAIC is the inability of the model to measure companies that experience negative book value of equity or negative operating profit which leads to negative value added score. Consequently, those companies must be removed from the sample as they prevent a meaningful analysis from being achieved (Zeghal and Maaloul, 2010; Chu et al., 2011).

Some researchers introduced Modified VAIC (MVAIC) model as extension of the original VAIC model to overcome the limitations and to measure value added efficiency in more comprehensive manner. MVAIC accommodates three

components of IC (Human Capital (HC), Structural Capital (SC) and Relational Capital (RC)) and physical capital (Capital Employed (CE)) (Nazari *et al.*, 2007; Vishnu and Gupta, 2014; Nimtrakoon, 2015)

Relational Capital (RC) as also known as external capital can be defined as the ability of an organization in collaborating with external parties or stakeholders such as suppliers, customers, creditors, trade associations, and government bodies (Bontis, 2001). Sveiby (1997) identified relational capital as "relationships with customers and suppliers"(p.x). RC is significant not only to create but also to sustain the relationship with external parties to be successful (Joshi *et al.*, 2013) and the cost required to maintain such relationship is marketing, selling and advertising (Nazari *et al.*, 2007). Therefore, it is reasonable to have marketing, selling and advertising cost as the proxy of RC.

Figure 1. Conceptual Framework



Source : Pulic, A. (2004), Nimtrakoon, S. (2015) *IC, corporate performance, and market value*

Previous research conducted in both developed or less developed countries has shown various results of the relationship between IC and the performance of the companies such as profitability or productivity and also market value.

Wang (2008) showed that there was positive and significant relationship between IC and performance of the firms in US Standard & Poor 500 publicly listed electronic firms from 1996-2005. The same result being shown by Clarke et al. (2011) who also found a direct relationship between IC and the performance of publicly listed companies in Australia. However, Joshi et al. (2013) established that value creation capability is highly influenced by human capital and two-thirds of the sample companies showed a very low level of IC efficiency in the financial sector of Australia.

In Italy, Celenza and Rossi (2014) examined 23 companies listed in the Stock Exchange from the period of 2003-2008 and found an insignificant relationship between IC and corporate financial indicators, also toward the M/B value. A similar result is being confirmed by Maditinos et al. (2011) who studied the relationship between IC, corporate's performance and market value in Greek during the period of 2006-2008 using the sample of 96 listed companies in four economic sectors, they managed to show the significant relationship between the efficiency of human capital and Return of equity. While Sardo and Serrasqueiro (2017) analyzed the association of IC, financial performance and market value for non-financial listed firms in Western Europe for the period of 2004-2015 including to evaluate the influence of ownership concentration and owner's management involvement on IC performance. Using GMM system dynamic estimator, they have revealed that IC is important resource to achieve firm's goal and all elements of IC except structural capital which has shown positive and significant result. Toward market value, the impact of IC is positive and significant while only structural capital and human capital are reported to be positive and significant.

Gosh and Mondal's study (2009) found an inconclusive result regarding the relationship between IC and corporate performance in India as they found a positive relation between IC and profitability but failed to show significant result towards productivity and market valuation. Moreover, Vishnu and Gupta (2014) studied the relationship between IC and performance of pharmaceuticals companies in India using e-VAIC model. The result showed a positive association between IC and firm performance, however not in the case of relational capital (RC).

Study by Nimtrakoon (2015) used the method of MVAIC to measure the intellectual capital of technology companies in 5 ASEAN countries and found that there is a significant positive relationship between IC and firm performance, likewise with market value, whereas the relationship between the components of IC and firm performance or market value showed the various result. While recent work of Nadeem et al. (2017) measured the dynamic relationship between intellectual capital and firm performance in Brazil, Russia, India, China and South Africa (BRICS) economies. They have found that IC efficiency is associated significantly with firm performance (Return on Assets and Return on Equity) and all individual elements of IC (human and structural) together with physical capital are positively and significantly affecting firm performance.

Razafindrambinina and Anggraeni (2011) studied the relationship between IC and corporate financial performance of consumer goods companies listed in Jakarta Stock Exchange in Indonesia and found evidence of the contribution of IC to the financial performance of the corporations. Femianti and Anantadjaya (2014) examined the same industry in Indonesia from 2008-2012 using VAIC from the perspective of market value (M/B ratio, EPS, P/E ratio) and accounting value (Debt Ratio, Return on Equity, Net Working Capital and Asset Turnover). They found that IC has a positive correlation with the market value and accounting value.

Hypotheses Development

As shown in Table I, there is an overwhelming number of works have been performed in investigating the impact of the IC to firm performance, both in overall industries or a specific sector of industry and that were conducted not only in countries with developed economy but also less developed ones. Most of the results show a positive association between IC and corporate performance (Bollen et al., 2005; Goh, 2005; Tan et al., 2007; Ghosh and Mondal, 2009; Chu et al., 2011; Clarke et al., 2011; Rahman, 2012; Vishnu and Gupta, 2014; Nimtrakoon, 2015; Sardo and Serrasqueiro, 2017; Celenza and Rossi, 2014; Dženopoljac et al., 2016; Nadeem et al., 2017). Those are definitely in line with the resource-based theory that mentioned IC as "the value driver of all companies" (Stewart, 1997) or IC as "strategic resource that is used by a firm to gain competitive advantage and create value that the firm can use to enhance its performance "(Clarke et al. 2011). IC is becoming the core of the strategy to achieve sustainable competitive advantage (Chen et al., 2005; Goh, 2005). Hence this study intends to test whether intellectual capital has a significant effect on firm performance. MVAIC which accommodates three components of IC (Human Capital (HC), Structural Capital (SC), Relational Capital (RC)) and physical capital (Capital Employed (CE) is used in this research. Therefore, we propose the first hypothesis as follows:

H1: MVAIC will be positively related to firm performance.

Specifically, this research examines the association of the IC components to the firm performance. Prior studies have found that each component of IC has different impact from one to another to firm performance; HCE found to be major impact to increase the firm performance (Chan, 2009; Chen et al., 2005; Gan and Saleh, 2008; Maditinos et al., 2011; Tan et al., 2007). In contrast, SCE found not to have a significant relationship with firm performance (Clarke et al., 2011) and the same result towards RCE in Nimtrakoon (2015) and Vishnu and Gupta (2014). In fact, CEE was found to be positively related to firm performance (Chen et al., 2005; Clarke et al., 2011; Ting & Lean, 2009; Vishnu and Gupta, 2014; Zeghal and Maaloul, 2010; Joshi et al., 2013, Chu et al., 2011; Sardo and Serrasqueiro, 2017, Nadeem et al., 2017). It would be interesting to investigate the different effect of each component on firm performance as the results were mixed. Therefore, this study also investigates the effect of MVAIC components toward firm performance which lead to the following hypotheses:

H1a: HCE will be positively related to firm performance

H1b: SCE will be positively related to firm performance

H1c: RCE will be positively related to firm performance

H1d: CEE will be positively related to firm performance

IC does not only affect the firm performance but also the market value of the company. Previous findings showed that the higher the IC, the higher the market value of respective company compared to the book value (Goh, 2005; Zeghal and Maaloul, 2010; Celenza and Rossi, 2014). The investors may consider different emphasis on each component of MVAIC as it is a composite measure of HCE, SCE, RCE and CEE; therefore individual analysis is necessary (Chen et al., 2005). Firer and Williams (2003) and Chan (2009) did not find significant association between the efficiency of IC components towards market value. Even though Gan and Saleh (2008) and Rahman (2012) were able to find the relationship between IC towards profitability and productivity, they did not succeed in finding one to market value. Based on the literature review, we expect the effect of MVAIC and each component of MVAIC towards the market value of the company to be as followings:

H2: MVAIC will be positively related to the market value of the company

H2a: HCE will be positively related to the market value of the company

H2b: SCE will be positively related to the market value of the company

H2c: RCE will be positively related to the market value of the company

H2d: CEE will be positively related to the market value of the company

Furthermore, companies in different industries will emphasize and manage the assets differently, including their capabilities in handling IC to achieve their objectives (Chen et al., 2005; Liang et al., 2011). Maji and Goswami (2016) have proven that the influence of intellectual capital on firm performance is significantly higher in knowledge-based sector of industry compared to traditional one. This result is in accordance with the stakeholder theory, which stated that the technology-based or knowledge-intensive industry would employ more IC to achieve higher profit compared to traditional industry. Then logically, the knowledge-intensive companies that utilize the intellectual capital more efficiently will be perceived higher by the investors. In other words, the influence of IC on firm performance and market value is significantly higher in high-level of knowledge industry than that of in low-level of knowledge industry (Tan et al., 2007; Maji and Goswami, 2016). Accordingly, this research proposes the following hypotheses:

H3: The influence of IC on firm performance will be higher in high-level knowledge industry than the low-level industry.

H4: The influence of IC on market value will be higher in high-level knowledge industry than the low-level industry.

Methodology and measurement

Data collection and sample

The data for the present research was obtained from a database of Indonesian Stock Exchange (IDX) and Bloomberg for the selected variables during the period of 2010-2017. The sample was taken from all industries listed in the IDX except banking and financial industry (e.g., insurance and investment companies). Initially, there were 509 publicly listed firms in IDX (Indonesian Stock Exchange, 2015). Among them, 97 firms were dropped as they are in banking and financial industry.

Further, firms with negative book value of equity or negative operating profit and firms with missing data on the selected variables (unavailability of the financial statements, suspension, delisting, doing IPO after the year of 2010, no stock trading during the years) were also removed from the samples (Zeghal and Maaloul, 2010; Chu et al., 2011). The final sample consisted of 1,016 observations from 127 firms and 12 industries (Table II).

Table II Classification of Industry Group and the samples

Industry Group (based on GICS)	*Sub Sector (based on IDX)*	*Selected*
High-level knowledge industry		
Automotive & Components	-	10
Capital Goods	Building/Non-Building Constructions,Cable/Electronics,Machinery	10
Pharmaceuticals,Biotechnology,Life Sciences	-	6
Property and Real Estate	-	20
Media	Advertising Printing&Media	5
Others	Telecommunication, Computer	5
Low-level knowledge Industry		
Energy	Energy, Crude Petroleum&Natural Gas Production, Coal Mining	9
Materials	Metal&Mineral Mining,Land/Stone,Cement,Ceramic, Chemicals, Plastic&Packaging, Pulp&Paper,Metal& Allied Products,Wood Industries	21
Retailing	Wholesale and Retail Trade	14
Transportation	Transportation, Toll Road/Harbor	4
Consumer Service	Restaurant, Hotels and Leisures	8
Food, Beverage, and Tobacco	Plantation/Fishery,Tobacco manufacturers,Packaged Food,Food& Beverage	15

TOTAL	127

Notes : GICS=Global Industry Classification Standard, IDX=Indonesian Stock Exchange

Independent Variables

Based on Pulic (2004), VAIC measures the value creation efficiency from both intangible and tangible assets of the firms. Following previous research (Vishnu and Gupta, 2014; Nimtrakoon, 2015), the elements of Modified VAIC (MVAIC) are Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), and Capital Employed Efficiency (CEE).

The model starts with calculating the Value Added (VA) which is deriving from

$$VA = \text{Total Revenues} - \text{Total Expenses} \quad (1)$$

Total Revenues are all revenues obtained from providing products and services, while Total Expenses are all expenses (including depreciation and amortization) except employee's cost, interests, taxes, dividends (Chen et al., 2005; Gan and Saleh, 2008; Clarke et al., 2011; Nimtrakoon, 2015) and this is called as the Gross Value Added Approach. Employee's cost is treated as investment or a value creation entity (Chen et al., 2005; Tan et al., 2008; Clarke et al., 2011; Joshi et al., 2013)

Human Capital Efficiency (HCE) shows how much VA is created by a dollar spent on paying the employee's skill, experience, knowledge, and productivity or human capital (HC) cost in the working place (Chen et al., 2005; Clarke et al., 2011). The higher the HCE shows the effective utilization of human capital in the creation of value:

$$HCE = VA / HC \quad (2)$$

The proxy of human capital (HC) cost is salaries, wages, benefit and the training/development expenses.

Structural Capital Efficiency (SCE) shows how much the value creation is generated by structural capital (SC) and defined as (Clarke et al., 2011; Joshi et al., 2013):

$$SC = VA - HC \quad (3)$$

$$SCE = SC/VA \quad (4)$$

Capital Employed Efficiency (CEE) measures the ability of company's tangible asset (physical and financial capital) in generating the value or known as capital employed (CE) (Chen et al., 2005; Clarke et al., 2011) :

$$CE = \text{Total Assets} - \text{Intangible Assets} \quad (5)$$

$$CEE = VA/CE \quad (6)$$

Relational Capital Efficiency (RCE) represents the ability of the company in developing the relationship with customers, suppliers or other external parties stakeholders (Bontis, 2001; Nazari et al., 2007; Vishnu and Gupta, 2014; Nimtrakoon, 2015). The proxy of relational capital (RC) is marketing, selling, and advertising cost and RCE is calculated as:

$$RCE = RC/VA \quad (7)$$

Then the IC Efficiency (ICE) is expressed as:

$$ICE = HCE + SCE + RCE \quad (8)$$

The complete formula of MVAIC (Nimtrakoon, 2015) is defined as follows :

$$MVAIC = HCE + SCE + RCE + CEE \quad (9)$$

Dependent Variables

The dependent variables investigated in the current study are firms' market value and corporate performance:

(1) Market Value

Market Value signifies the total values of shares being issued by the firm and also determines how much payment is needed to acquire the firm at a particular time. Market to Book value (MBV) ratio of equity is used as a proxy of market value in the current study, in line with previous studies (Chen et al., 2005; Gan and Saleh, 2008; Maditinos et al., 2011; Nimtrakoon, 2015)

It is simply calculated by dividing market value (MV) with the book value (BV) of common stocks:

Which MV = Number of shares x Stock price at the end of the year (10)

BV = Stockholders' equity - Paid-in capital of preferred stocks (11)

(2) Corporate Performance
The corporate performance indicator being used in this study is Return on Asset (ROA). ROA is a traditional accounting measurement to know the firm performance and is widely used to determine the profitability of a company (Chen et al., 2005; Gan and Saleh, 2008; Zeghal and Maaloul, 2010; Clarke et al., 2011; Maditinos *et al.*, 2011; Stahle et al., 2011; Joshi *et al.*, 2013; Nimtrakoon, 2015; Maji and Goswami, 2016)

ROA = Operating Income/ Total Assets (12)

Control Variables

Size – How much resources that companies have will determine the value of the market to book and how good these companies can perform. The bigger the companies, the higher the market to book value and the more they are able to reach higher performance (Tan et al., 2007; Nimtrakoon, 2015; Maji and Goswami, 2016). Therefore, logarithm of assets at year-end will be the proxy of Size to control such effect.

Industry - Based on the previous research (Chen et al., 2005; Tan et al., 2007; Clarke et al., 2011), there is a different level of influence between industries related to IC efficiency to both firm performance and market value. This study is using a dummy control variable represents the effects of 12 industry categories by Global Industry Classification Standard (GICS) and denoted by variable name, Industry.

Empirical Model

The hypotheses mentioned in the previous section are tested empirically using both static and dynamic panel data regression model. Followings are the basic empirical models for static regression:

$$DV_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + year + industry + \eta_i + \varepsilon_{it} \quad (13)$$

Where DV is dependent variable, β and γ, are vectors of coefficients on independent variables (X_{it}) and control variables (Z_{it}), respectively. η and ε are unobserved time-invariant firm effects and error term for firm i at time t, respectively.

Table III Definition of variables and measurements

Variable name	Abbreviation	Measurement
Dependent variables		
Return on Assets	ROA	Operating Income/ Total Assets
Market to Book Value	MBV	Market value (MV)/book value (BV) of common stocks
Independent variables		
Modified VAIC	MVAIC	HCE + SCE + RCE + CEE
Human Capital Efficiency	HCE	VA / HC
Structural Capital Efficiency	SCE	SC/VA
Relational Capital Efficiency	SCE	RC/VA
Capital Employed Efficiency	CEE	VA/CE
Control variables		
Size	Size	Logarithm of Total Assets

Panel data regression was employed in this study as the tool of analysis as mentioned by Baltagi (2013) due to 1) the ability to control the heterogeneity, considering that it can lead to bias in the resulting estimates; 2) having more variability, efficiency, and also less collinearity among variables due to larger data set; 3) ability to detect and measure effects that cannot be found in pure-cross section/pure-times series.

The panel data regression could either use the fixed effect (FE) or random effect (RE) model. In the opposite of the FE model, the intercept term in RE model is a random parameter which is a function of mean value plus error. To determine the appropriate panel data regression model used, robust Hausman specification test by Arrelano (1993) was applied (in Woolridge, 2002). RE model is efficient and consistent if the null hypothesis cannot be rejected or else, FE model would be preferred. Further, the presence of heteroscedasticity and serial correlations could lead to

invalidity of the variances of FE and RE estimators, such as underestimated standard errors and over-estimated t-statistics (Baltagi, 2013). Consequently, cluster-robust standard errors command was used to ensure in obtaining panel-robust estimators (Cameron and Trivedi, 2005).

In our study, the relationship between IC efficiency and firm performance or market value is dynamic instead of static. The firm who invest more in IC resources can achieve higher competitive advantage and able to reach better performance but on the other hand, the firm with high performance in the current time may change the percentage of investment in IC resources later year (Nadeem *et al.*, 2017). The same relationship established between IC and market value, the impact of investment in IC resources on the market value of the firm could be endogenously determined. High market valuation firm may choose to invest more in IC resources in the future year and vice versa (Gupta et al., 2017). To capture the dynamic relationship between independent and dependent variable then dynamic panel data regression is employed by using lags of dependent variable as regressor and used it as instruments to control the endogeneity. Since static estimators such as ordinary least square (OLS) and fixed effect (FE) or random effect (RE) cannot accommodate endogenous relationship (Roodman, 2009). Then, the equation (13) can be written in dynamic model as following:

$$DV_{it} = \alpha + \lambda DV_{i,t-1} + \beta X_{it} + \gamma Z_{it} + year + industry + \eta_i + \varepsilon_{it} \quad (14)$$

$DV_{i,t-1}$ is the lagged dependent variable

To work out on the dynamic relationship such as in equation (14), the Blundell and Bond (1998) system generalised method of moment (GMM) estimator is applied in this study. This estimator does not only use the differenced equation, but also the level equation to increase the efficiency of the results so it is specifically designed for panel data with larger *N* and shorter *T* (as in our case). Roomand (2009) mentioned that system GMM is the best estimator as it is using internal instruments to deal with endogeneity to produce consistent and unbiased results. To validate the results of system GMM there are several conditions must be satisfied and Roodman (2009) suggested diagnostic tests – first, to check the presence of first order autocorrelation (AR1) but there is none of second order (AR2) or we should reject null hypothesis of AR1 but not for AR2; second, to check Hansen J. test for overidentifying resctrictions and the null hypothesis is that all instruments are valid, so it is suggested not to reject this null hypothesis; third, difference in Hansen test is having null hypothesis of all instruments are exogeneous and that means we should not reject the null hypothesis. In addition, the number of instruments must be lower than number of groups to indicate the reliability of the results (Roodman, 2009).

Results and Discussion

Table IV displays means, standard deviations, minimum and maximum value for each variable. The data sets are presented for the entire sample.

Table IV Descriptive Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
Size	12.5675	0.762274	8.63826	14.47077
HCE	4.42075	4.236851	1.000199	40.88687
SCE	0.63254	0.222709	0.0001987	0.9755423
CEE	0.18806	0.147795	0.014819	2.315122
RCE	0.08926	0.158366	0	1.326541
MVAIC	5.32921	4.406131	1.146951	42.34091
ROA	0.11414	0.095485	0.0000416	0.878727
MBV	2.95532	2.863758	0.037918	30.18889

Notes : MVAIC: Modified Value Added Intellectual Capital, HCE:Human Capital Efficiency, SCE:Structural Capital Efficiency, RCE:Relational Capital Efficiency, CEE:Capital Employement Efficiency, MBV:Market to Book Value, ROA:Return on Assets, Size : Log of Total Assets

From table IV, it can be seen that the maximum value of HCE is 40.88687 which belongs to PT. Indo Tambangraya Megah, Tbk. in the year 2011 while the minimum value of HCE belongs to PT. Fortune Indonesia, Tbk. in the year 2016. For SCE, the maximum and minimum value also belongs to the same company as HCE which are PT. Indo Tambangraya Megah, Tbk. in the year 2011 and PT. Fortune Indonesia, Tbk. in the year 2016 respectively. The minimum value of RCE belongs to PT. Prima Alloy Steel, Tbk. in the year 2015, PT. Duta Pertiwi, Tbk. in the year 2015, PT. Petrosea, Tbk. for the years 2015 to 2017, PT. Resource Alam Indonesia, Tbk. in the year 2012 and 2014 until 2017. Meanwhile, the maximum value of RCE belongs Rukun Raharja, Tbk. in the year 2015.

For CEE, the minimum value belongs to PT. Rukun Raharja, Tbk. in 2015 and the maximum value belongs to PT. Tunas Ridean, Tbk. MVAIC has the highest variation as reflected in the standard deviaton. MVAIC is the summation of HCE, SCE, RCE and CEE and it has the highest value of 42.3409. In term of firm size as measured by log of total

assets, PT. Astra International, Tbk. has the largest firm size while PT. Merck, Tbk. in 2010 has the smallest firm size.

During the study period from 2010 until 2017, PT. Dharma Samudera Fishing Industries, Tbk. earned the highest ROA in 2014 while PT. Fortune Indonesia, Tbk. earned the smallest ROA in the year 2016. In terms of Market to Book Value, PT. Tower Bersama Infrastructure, Tbk. has the highest MBV which was in 2015, while PT. Harum Energy, Tbk. has the smallest MBV which was in 2015.

For the initial stage, Pearson pairwise correlation is conducted to know the relationship among the variables, particularly between IC components, firm performance, and market value. The result of the correlation among variables are shown in table V below.

Table V Correlation Matrix of Variables

Variables	HCE	SCE	CEE	RCE	MVAIC	ROA
SCE	0.6624**					
CEE	0.2293**	0.0867**				
RCE	-0.1313**	-0.1571**	0.0830**			
MVAIC	0.9982**	0.6848**	0.2613**	-0.0952**		
ROA	0.3940**	0.4159**	0.7064**	0.0147	0.4242**	
MBV	0.2389**	0.1965**	0.3139**	0.0214	0.2510**	0.4176**
Note : ** and * indicate significant at 1% and 5% levels, respectively by two-tailed test						
MVAIC: Modified Value Added Intellectual Capital, HCE:Human Capital Efficiency, SCE:Structural Capital Efficiency, RCE:Relational Capital Efficiency, CEE:Capital Employement Efficiency, MBV:Market to Book Value, ROA:Return on Assets						

From table V, it can be seen that there is a significant and positive correlation between MVAIC and ROA. When the MVAIC is separated into its elements (HCE, SCE, RCE and CEE), all of them except RCE have significant positive correlation with ROA. HCE has significant positive correlation with other variables. SCE has significant negative correlation with RCE but it has significant positive correlation with other variables. CEE has significant positive correlation with other variables. Likewise, MVAIC also shows significant and positive association with MBV ($p<0.05$). Among MVAIC components, only RCE shows no significant correlation with MBV.

Furthermore, from the correlation table, it can be concluded that there is no strong correlation between independent variables (HCE, SCE, RCE and CEE) and dependent variables (ROA and MBV) since no variables in the regression model have a correlation coefficient (r) more than 0.8 (Gujarati, 2009). This indicates that there is no evidence of serious multicollinearity problem in the regression model.

Panel regression results: direct relationship with firm performance

Table VI presents the regression result of the relationship between IC and all components towards firm performance (ROA) using static regressions (pooled OLS and panel regression with FE estimation) and dynamic panel regression of system GMM (for comparison purposes). Based on the robust Hausman specification test (Sargan Hansen statistics, =0.000), panel regression with FE estimation is preferred rather than RE estimation. Adjusted R^2 of panel regression with FE estimation has lower score compared to pooled OLS. All results, including dynamic panel regression, show positive and significant relationship between IC and firm performance (at 1% and 5% significance level). It means the firms in Indonesia utilize IC very well to achieve higher profitability and the result is in accordance to previous researches (Chen et al., 2005; Tan., 2007; Gan and Saleh, 2008; Gosh and Mondal, 2009; Zeghal and Maaloul, 2010; Chu et al., 2011; Clarke et al., 2011; Razafindrambinina and Anggreni, 2011; Rahman, 2012; Celenza and Rossi, 2014; Vishnu and Gupta, 2014; Nimtrakoon, 2015; Sardo and Serrasqueiro, 2017; Dženopoljac et al., 2016; Nadeem et al., 2017), thus supporting H1.

Furthermore, structural capital (SC) and physical/financial capital (CEE) are significantly related to firm performance for pooled OLS result and FE panel regression that are proven to positively and significantly affect firm performance at the significance level of 1% and 10%. It is noticeable that the adjusted R^2 of pooled OLS increases from 0.3234 to 0.6434 and it increases from 0.1030 to 0.3961 in FE panel regression, suggesting that four components of MVAIC measure better than the aggregate measure MVAIC in explaining the firm performance.

Similar to previous results, when we run system GMM to measure the dynamic relationship between all components of MVAIC then structural capital found to be positively significant to firm performance at 1% (Firer and Williams, 2003; Nadeem *et al.*, 2017). Njuguna (2009) states that organizational learning is a continuous process that a firm can transform the new wealth of knowledge into innovation and could be protected in the form of brand names,

patents, technologies and copyrights to build their competitive advantage. Those resources are called structural capital in the present study.

Moreover, the system GMM is also reporting positive and significant relationship between physical/financial capital (CEE) with performance. This result is in line with previous studies (Chen et al., 2005; Clarke et al., 2011; Ting & Lean, 2009; Vishnu and Gupta, 2014; Zeghal and Maaloul, 2010; Joshi et al., 2013, Chu et al., 2001; Sardo and Serrasqueiro, 2017; Nadeem et al., 2017). Refer to the details of the result of system GMM, we can also conclude that Indonesian firms still depend on physical/financial capital more (0.207) than on structural capital (0.1187). This finding is consistent with Firer and William's (2003) argument that in emerging markets, the role of physical/financial capital cannot be ruled out as major contributor toward the value creation of the firms. Overall, these results indicate that H1(b) and H1(d) are supported, but H1(a) and H1(c) are rejected.

Table VI Static and Dynamic Panel Regression Results with firm performance (ROA) as Dependent Variable-All Firms

	Static		Dynamic
Variables	**Pooled OLS**	**FE**	**System GMM**
Lag			0.139** (0.065)
MVAIC	0.0106***(0.0006)	0.0099*** (0.00190)	0.0099** (0.0045)
Constant	0.2538***(0.038)	0.9695** (0.4342)	0.935 (0.629)
Adjusted R2	0.3234	0.1030	
F Stat/Wald Chi²	38.32/p=0.000	17.68/p=0.000	90.34/p=0.000
Sargan-Hansen Statistics		32.287/p=0.000	
Number of Groups		127	127
Number of Instruments			25
AR (2) p-value			0.924
Hansen J.test(p-value)			0.063
Difference in Hansen test(p-value)			-
	Static		**Dynamic**
Variables	**Pooled OLS**	**FE**	**System GMM**
Lag			0.3965***(0.1038)
HCE	0.0003(0.0006)	0.0020(0.0023)	-0.0006(0.0023)
SCE	0.151***(0.0117)	0.103*** (0.0260)	0.1187***(0.040)
RCE	-0.0016(0.0155)	-0.0756(0.063)	-0.0059(0.035)
CEE	0.4072***(0.0148)	0.2763*(0.144)	0.207*(0.1165)
Constant	0.045***(0.035)	0.712*(0.3644)	0.171(0.199)
Adjusted R²	0.6434	0.3961	
F Stat/Wald Chi²	115.48/p=0.000	27.44/p=0.000	353.40/p=0.000
Sargan-Hansen Statistics		120.455/p=0.000	
Number of Groups		127	127
Number of Instruments			51
AR (2)/p-value			0.135
Hansen J.test(p-value)			0.142
Difference in Hansen test(p-value)			0.748

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01.
AR(2) is Arrelano-Bond test for second order autocorrelation. FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments.
Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Return on Assets)

When we clustered the sample based on the high-level and low-level knowledge industry (as in Table VII), static panel regressing using FE is preferred compared to RE as shown by Sargan-Hansen statistics ($p<0.05$). Further, empirical evidence reveals that type of industry is having no significant difference related to the influence of IC to achieve higher firm performance as both static and dynamic panel results report positive and significant relationship at the level of 1% and 5%. Moreover, the result of dynamic panel regression indicates that the coefficient of MVAIC in high level knowledge industry is somewhat similar to low-level knowledge industry. It means the influence of IC on firm performance in high-level knowledge industry is the same with low-level knowledge industry and this finding is not consistent with Tan et al. (2007) and Maji and Goswami (2016), so H3 is rejected.

Table VII Static and Dynamic Panel Regression Results of relationship between IC and firm performance-in high and low level knowledge industry

	High level knowledge Industry		***Low level knowledge Industry***	
	Static	**Dynamic**	**Static**	**Dynamic**
Variables	**FE**	**GMM**	**FE**	**GMM**
Lag		-0,3185(0.20165)		0.161(0.1038)
MVAIC	0.0081***(0.00175)	0.01***(0.00264)	0.010***(0.0024)	0.012***(0.0029)
Constant	0.6472(0.45079)	0.4789*(0.28243)	-0.1267**(0.0505)	-0.266(0.7304)
Adjusted R^2	0.0777		0.0514	
F Stat/Wald Chi^2	15.96/p=0.000	22.60/p=0.007	15.39/p=0.000	42.65/p=0.000
Sargan-Hansen Statistics	7.227/p=0.0270		42.056/p=0.000	
Number of Observations	448	392	568	497
Number of Groups	56	56	71	71
Number of Instruments		27		25
AR (2)/p-value		0.172		0.116
Hansen J.test(p-value)		0.128		0.064
Difference in Hansen test(p-value)		0.453		0.973

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01. AR(2) is Arrelano-Bond test for second order autocorrelation. FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments. Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Return on Assets)

The value drivers of intellectual capital are not the same among industries (Chen et al., 2005; Liang, et al., 2011). To know further, we can refer to Table VIII that exhibits the results of static and dynamic panel regression between the components of MVAIC and firm performance. SCE has positive and significant influence towards ROA in both high-level and low-level knowledge industry at 1%. Meanwhile using system GMM, CEE shows positive and significant relationship with ROA at the level of 1% for high level knowledge industry, however it shows only significance at level of 10% in low-level knowledge industry. Besides, CEE has higher coefficient compared to SCE in high-level and low-level knowledge industry. That means the firms use internal capital (financial and physical capital) more efficiently than structural capital in creating higher profitability. This finding is consistent with Maji and Goswami (2016) and it is verified that tangible and intangible capital of the firms in both high-level and low-level industry have roles in achieving firm's performance.

It is worth to note that low-level industry incorporates structural capital slightly higher (0.129) compared to high-level industry (0.1219). This finding is contradictory with the belief that human resources capability is the main intangible resource (Sveiby, 1997) and it is confirmed by previous research (Chen et al., 2005; Gan and Saleh, 2008; Ting and Lean, 2009; Chu, et al., 2011; Clarke et al., 2011; Maditinos *et al.*, 2011; Vishnu and Gupta, 2014; Nadeem *et al.*, 2017; Sardo and Serrasqueiro, 2017). Nevertheless, the structural capital such as the organizational structures, strategies, systems, and cultures cannot be separated from the company (Joshi et al., 2013) and human capital can affect firm value indirectly through structural capital in the case of high level knowledge industry (Halim, 2010).

Table VIII Static and Dynamic Panel Regression Results of relationship between IC elements and firm performance-in high and low level knowledge industry

	High level knowledge Industry		***Low level knowledge Industry***	
	Static	**Dynamic**	**Static**	**Dynamic**
Variables	**FE**	**GMM**	**FE**	**GMM**

Lag		0.0069(0.05912)		0.3459***(0.1203)
HCE	0.0019*(0.00105)	-0.0008(0.00271)	0.0031(0.00287)	0.0004(0.003)
SCE	0.0795***(0.0292)	0.1219***(0.04521)	0.1051***(0.037)	0.129***(0.0423)
RCE	0.0314(0.02908)	0.0396(0.04269)	-0.203**(0.090)	0.0099(0.064)
CEE	0.5747***(0.11170)	0.4433***(0.12368)	0.185(0.144)	0.218*(0.131)
Constant	0.0997(0.01279)	0.2889(0.19958)	1.508**(0.575)	1.73***(0.324)
Adjusted R2	0.7722		0.1226	
F Stat/Wald Chi2	21.76/p=0.000	176.38/p=0.000	24.41/p=0.000	273.08/p=0.000
Sargan-Hansen Statistics	34.326/p=0.000		106.590/p=0.000	
Number of Observations	448	392	568	497
Number of Groups	56	56	71	71
Number of Instruments		53		51
AR (2)/p-value		0.286		0.203
Hansen J.test(p-value)		0.142		0.221
Difference in Hansen test(p-value)		0.936		0.496

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01. AR(2) is Arrelano-Bond test for second order autocorrelation. FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments. Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Return on Assets)

Panel regression results: direct relationship with firm's market value

The result of pooled OLS, static and dynamic panel data regression between IC efficiency and market value as the dependent variable is depicted in Table IX. Robust Hausman specification test (Sargan Hansen statistics, p=0.1029) suggested to use RE model instead of FE. Both results of pooled OLS and RE panel regression show overall influence of IC on market value after controlling firm size and type of industry is corroborated to be significant at p<0.01. Adjusted R^2 for pooled OLS and RE panel regression shows similar low score. But this positive and significant influence disappears when one year-lagged market value as regressor is added and the analysis was run using dynamic panel system GMM.

This finding fails to meet the theoretical expectation (Riahi-Belkaoui, 2003) that a firm with a higher degree of IC will be able to generate competitive advantage then it should contribute to higher firm's market value. That means the investors could not see the contribution of Intellectual Capital towards the value creation in the company. The explanation underlying this result could be the disclosure of the data related to IC (e.g., brand names, patents, technologies, innovations) is not adequately perceived by the investors. This is due to the rules in International Accounting Standard (IAS) 38, about Intangible Assets, and PSAK 19 (Indonesian Accounting Standard) that prohibits the recognition of internally generated brands, mastheads, publishing titles, and customer lists (Deloitte, n.d). In addition, one of the criteria to be recorded as asset is the certainty of future benefit which IC often fail to meet and make IC investments to be expensed immediately when they are incurred, hence, it is prominent that reporting IC in the financial statements is high asymmetric (Schiemann *et al.*, 2015). Disclosure of information about IC is not mandatory, but rather voluntary (Schiemann *et al.*, 2015). Therefore, investors have less or no information about the changes of IC investments value or the efficiency. Same result is also found in previous research, Gan and Saleh (2008) and Rahman (2012). Therefore, H2 is rejected.

As MVAIC is a composite measure of HCE, SCE, RCE and CEE, another separate regression is performed to test the relationship between each individual element and market value. The result in Table IX shows that, the result of pooled OLS is not the same with that of the static panel regression. Under pooled OLS, HCE and CEE are showing positive and significant relationship with market value at the level of 1%.

On the contrary, referring to the result of static panel regression that is preferred to use FE instead of RE model (Sargan Hansen statistics, p=0.000), Table IX reports that none of IC elements establish a significant result except human capital resources (HCE). However, being consistent with the previous result of relationship between IC (whole) and market value, dynamic panel system GMM is reporting none of the elements of IC including CEE (albeit having positive coefficient) to be significant at all level. This study fails to meet the expected theory and similar results also shown by Firer and Williams (2003), Chan (2009) and Celenza and Rossi (2014) who also reported no significant relationship, thus H2a, H2b, H2c and H2d are rejected

Table IX Static and Dynamic Panel Regression Results with market value (MBV) as Dependent Variable-All Firms

	Static		Dynamic
Variables	**Pooled OLS**	**RE**	**System GMM**
Lag			0.7036*(0.3726)
MVAIC	0.1712***(0.0199)	0.140***(0.0383)	0.129(0.103)
Constant	-8.8826***(1.5140)	-4.019(4.206)	2.880(10.608)
Adjusted R^2	0.2039	0.2062	
F Stat/Wald Chi^2	21.00/p=0.000	46.25/p=0.000	224.29/p=0.000
Sargan-Hansen Statistics		4.548/p=0.1029	
Number of Groups			127
Number of Instruments			25
AR (2)/p-value			0.121
Hansen J.test(p-value)			0.114
Difference in Hansen test(p-value)			-
	Static		**Dynamic**
Variables	**Pooled OLS**	**FE**	**System GMM**
Lag			-.056(0.194)
HCE	0.105***(0.0273)	0.1211**(0.0480)	-0.1075(0.3986)
SCE	0.123(0.5166)	0.1784(0.521)	3.554(7.444)
RCE	-0.8057(0.674)	-0.756(0.671)	11.689(12.322)
CEE	4.832***(0.6466)	0.453(1.019)	4.590(4.541)
Constant	-11.125***(1.510)	0.377(4.689)	-25.545(33.869)
Adjusted R^2	0.2459	0.0793	
F Stat/Wald Chi^2	21.68/p=0.000	4.26/p=0.001	13.27/p=0.775
Sargan-Hansen Statistics		27.119/p=0.000	
Number of Groups			127
Number of Instruments			40
AR (2)/p-value			0.512
Hansen J.test(p-value)			0.191
Difference in Hansen test(p-value)			0.989

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01.
AR(2) is Arrelano-Bond test for second order autocorrelation. FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments. Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Market to Book Value).

Referring to Table X, when the sample is clustered into high-level and low-level knowledge industry, it shows a noteworthy result. Both types of industry show the same result using static RE panel regression but it is not the case with system GMM panel regression that exhibits simply high-level knowledge industry to report positive and significant relationship of IC and market value at 1 percent level (Tan, et al., 2007; Maji and Goswami, 2016). It means that the firms included in high-level knowledge industry such as automotive, pharmaceutical, property and real estate, and also capital goods are appreciated and valuated differently by the investors compared to the firms in the low-level knowledge industry category such as retail trade, consumer service and food and energy in using IC resources to achieve their goal (Goebel, 2015).

The possible underlying reason towards the result could be due to the fact that the degree of voluntary disclosure about IC to investors will be depending on the type of industry. Firms in high-level knowledge industry are likely to disclose IC voluntarily compared to firms in low-level industry as confirmed by previous works (Petty and Cuganesan,

2005; Bozzolan et al., 2006; Sonnier, 2008). This study failed to establish the contribution of IC resources towards the market value in low level knowledge industry. Thus, H4 is rejected.

Table X Static and Dynamic Panel Regression Results of relationship between IC and market value-in high and low level knowledge industry

	High level knowledge Industry		Low level knowledge Industry	
	Static	Dynamic	Static	Dynamic
Variables	RE	System GMM	RE	System GMM
Lag		0.7359***(0.06577)		0.578***(0.1411)
MVAIC	0.2228**(0.10413)	0.2228***(0.08873)	0.115***(0.039)	0.033(0.0252)
Constant	-6.1990(0.327)	-6.3186(7.17261)	-1.134(0.253)	5.448(14.228)
Adjusted R2	0.2425		0.1875	
F Stat/Wald Chi^2	16.73/p=0.0192	902.83/p=0.000	24.71/p=0.000	93.49/p=0.000
Sargan-Hansen Statistics	3.162/p=0.2058		9.983/p=0.0068	
Number of Observations	448	392	568	497
Number of Groups	56	56		71
Number of Instruments		25		25
AR (2)/p-value		0.108		0.146
Hansen J.test(p-value)		0.442		0.795
Difference in Hansen test(p-value)		0.816		1.000

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01.
AR(2) is Arrelano-Bond test for second order autocorrelation.
FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments. Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Market to Book Value).

Not only that, Table XI displays the result of the static and dynamic panel regression analysis between the MVAIC components and market value in two separate industries. Empirical evidence shows that this study fails to establish the expected result, with the exception of the association between physical and financial capital (CEE) to market value that reports positive and significant relationship at the significance level of 5% (Tan et al., 2007; Maji and Goswami, 2016) in high-level knowledge industry according to the system GMM result. Meanwhile, being consistent as previous result (Table X), none of the IC components report to be significant at all level in low-level knowledge industry.

Table XI Static and Dynamic Panel Regression Results of relationship between IC elements and market value-in high and low level knowledge industry

	High level knowledge Industry		Low level knowledge Industry	
	Static	Dynamic	Static	Dynamic
Variables	RE	GMM	FE	GMM
Lag		0.6350***(0.0646)		0.353***(0.1100)
HCE	0.2085(0.15248)	0.1145(0.1345)	0.111**(0.0484)	0.031(0.059)
SCE	0.1452(1.33525)	'-0.2624(1.925)	-0.0587(0.631)	0.768(0.942)
RCE	-0.06819(0.64718)	-3.088(4.1919)	-1.818(1.177)	2.000(3.190)
CEE	3.0806**(1.26333)	5.4084**(2.436)	0.087(1.018)	0.723(1.407)
Constant	-8.0558(6.81311)	-6.9496(5.209)	12..293**(0.1478)	-11.9457(7.962)
Adjusted R2	0.2736		0.0152	
F Stat/Wald Chi2	54.51/p=0.000	188.80/p=0.000	3.02/p=0.0157	40.79/p=0.000
Sargan-Hansen Statistics	6.729/p=0.2416		42.591/p=0.000	
Number of Observations	448	392	568	497
Number of Groups	56	56	71	71

Number of Instruments	53	53
AR (2)/p-value	0.093	0.331
Hansen J.test(p-value)	0.258	0.207
Difference in Hansen test(p-value)	0.639	0.793

Notes : Robust standard errors in parentheses. Show significant at *p<0.1,**p<0.05,***p<0.01.
AR(2) is Arrelano-Bond test for second order autocorrelation.
FE: Fixed Effect, RE:Random Effect, GMM:Generalized Method of Moments. Control Variable and industry dummies were included in all specifications. Lag is one year lagged of Dependent Variable (Market to Book Value).

Tables VI-XI show the result of diagnostic tests to ensure the reliability and validity of the instruments used in system GMM (Roodman, 2009). The p-values related to AR2 has revealed that there is no second-order autocorrelation. Similarly, Hansen J. test and difference-in Hansen test indicate the fulfillment of p-values that are above any significance level.

Robustness checks

To ensure the consistency of our results, we also conducted the dynamic panel data regression previously by having validity check on additional moment restriction that can be seen from running the data using two-step system generalized methods of moment (GMM) (Table XII-XIV). Second, the dynamic panel data regression has been applied using different combination of lag options for instrument of variables(t-3), following Roodman (2009). Both are showing consistent results towards our main variables of interest.

Conclusion

As the largest economy in South East Asia, Indonesia needs to maintain its position by prioritizing on an economy that is based on the growth of knowledge or KBE and no longer rely on the growth of tangible assets as in the past. There is evidence that during 2003-2012 Indonesia has started to shift its economic growth engine and employment towards the services sector rather than manufacturing (Asian Development Bank, 2014). This study has explored the association between the intellectual capital towards the firms' performance and market value in Indonesia. With regards to the empirical findings, early examination by using Pearson pairwise correlation was able to show that there was a significant and positive correlation between intellectual capital towards firm performance and also firms' market value in Indonesia. When being separated into human capability, internal capital and relation with external parties, only the last capital displayed no significant positive correlation with firm performance and firm's market value.

Using dynamic panel regression system generalized method of moment (GMM) with Blundell and Bond (1998) estimator to address potential endogeneity issues between intellectual capital and firm performance, this research found positive and significant relationship between intellectual capital and firm performance both in low-level and high- level knowledge industry. Further analysis has identified that structural capital and capital employed were associated positively and significantly towards the profitability of Indonesian firms, after controlling the influence of firm size and type of industry. Meanwhile, the relationship with external parties were not able to escalate the firm performance and this reason could be explained by Chen et al., (2005) that the treatment of advertising cost as an expense leads to decreasing of financial performance of a company.

After correcting for endogeneity problems between intellectual capital and market value, contrary with preliminary hypothesis, this study did not find any significant positive relationship between MVAIC (as composite measure of internal and external capital) and market value. Consistent result (insignificant relationship between MVAIC and market value) was reported when the sample was clustered further into high-level and low-level knowledge industry. This result suggests that Indonesian investors are not able to see the contribution of those capital. The underlying reason is due to International Accounting Standard, the same with Indonesian Accounting Standards, that some intangible assets are prohibited to be disclosed in financial reports (Deloitte, n.d). This asymmetric information in the financial statements has made investors to have less or no information about the changes of intellectual capital investments value nor the efficiency leading to the lack of recognition of IC resources contribution toward market value. When HCE, SCE, RCE, and CEE (individual elements of MVAIC) were regressed toward market value and the sample was clustered into high-level and low level knowledge industry, it was found that physical and financial capital (CEE) had significant and positive association with market value in high level knowledge industry.

One of the limitation in this research is the relatively narrow period (8 years) of data collection, especially considering that longer period of time may reveal different dynamic relationship between intellectual capital and firm performance or market value. With longer study period, the model might be able to give more explanation and better conclusions.

This research uses ROA as measurement of profitability and specifically operating income as the numerator in the ROA calculation. Consistent with the usage of ROA as profitability measurement used in this paper, leverage as one of the control variable was excluded in this research. For comparison purposes, further research may use net income instead of operating income in calculating ROA and different proxy of firm performance could be used such as ROE thus leverage as one of the control variable should be included in the model. Moreover, the research can be extended in studying across ASEAN countries to incorporate cross-country comparison analysis and enrich the discussion.

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