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Measures that matter: an empirical investigation of intellectual capital and financial performance of banking firms in Indonesia

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Abstract

Purpose – This study aims to investigate the intellectual capital–financial performance relationship using two models, namely the conventional Value-Added Intellectual Coefficient (VAIC) model and the adjusted Value-Added Intellectual Coefficient (A-VAIC) model.

Design/methodology/approach – This study is designed as a quantitative research focusing on the relationship between intellectual capital and financial performance of the banking industry in Indonesia. As many as 114 data are derived from the publicly listed banks on the Indonesia Stock Exchange for the period of 2012–2017. The multiple regression analysis is employed to test the hypotheses studied.

Findings – In general, the result confirms that intellectual capital affects financial performance. Although not all hypotheses of the study are supported by either the VAIC model or the A-VAIC model, the results provide a deeper and new insight on how each component of intellectual capital efficiency (human capital, structural capital, capital employed, innovation capital) relates to financial performance (return on asset, return on equity, asset turnover, price to book ratio). The results also justify that further improvements in measuring intellectual capital are still needed in the future.

Research limitations/implications – This study limits its generalization since the sample is only in the Indonesian banking industry. Notwithstanding the limitation, the results imply that the Indonesian banking managers need to be aware of intellectual capital management because of its strategic role in enhancing financial performance.

Practical implications – This study contributes to the intellectual capital literature by providing empirical evidence on the use of both models, namely the conventional VAIC and the A-VAIC in the Indonesian banking industry research setting which is never been studied before.

Social implications – This study has the social implication to the enhancement of the quality life of the society. The higher the quality of intellectual capital in the banking firms, the better the banks serve the needs of the community.

Originality/value – This study contributes to the IC literature by providing empirical research on the use of the VAIC model and the A-VAIC model in the Indonesian banking industry.

Keywords Financial performance, Intellectual capital, Human capital efficiency, Innovation capital efficiency, Capital employed efficiency

Paper type Research paper

Introduction

Global business has been developing rapidly as indicated by the development of information and communication technology, science and intense global competition. Pulic (2004) explained that the success of a business depends on the capability of using knowledge. Knowledge as one form of intangible assets becomes the new source of financial performance and competitive advantage. The shift from the physical-based economy to the knowledge-based economy has challenged many scholars to find a new way to measure intangible assets, including intellectual capital. Schiavone *et al.* (2014) and Chowdhury *et al.* (2019) stated that intellectual capital is not only a driving force and an important resource in the creation of value and sustainable company development but also as a source of innovation and as a key

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in profit growth. Pulic (1998) developed the Value-Added Intellectual Coefficient (VAIC) model, a monetary-based measurement model of intellectual capital that is capable of assessing the efficiency of intellectual capital across the industry. Furthermore, Pulic (2004) also stated that value added is an indicator of business success. It shows the ability of a firm to create value. It also needs investments in resources, including salaries and interests on financial assets, dividends to investors, taxes to the state and investments in future development. The VAIC model of Pulic has been extensively used in research as well as in corporate practices to measure the intellectual capital efficiency (Nadeem *et al.*, 2018b).

Petty and Guthrie (2000) mentioned that intellectual capital is one of the approaches used in the assessment and measurement of intangible assets. When using a monetary-based model, most scholars agree that measuring intellectual capital relates to measuring human capital, structural capital and capital employed efficiencies (Pulic, 1998, 2004; Vishnu and Gupta, 2014; Ousama and Fatima, 2015; Dumay, 2016; Cleary and Quinn, 2016; Dzenopoljac *et al.*, 2017; Bayraktaroglu *et al.*, 2019; Smriti and Das, 2018; Kweh *et al.*, 2019; Chowdhury *et al.*, 2019). Scholars have proven that intellectual capital plays a critical role in enhancing firms' performance. By properly managing intellectual capital, management of a firm will be able to improve financial performance (Khalique *et al.*, 2015; Nimtrakoon, 2015; Inkinen, 2015; Dzenopoljac *et al.*, 2016, 2017; Nadeem *et al.*, 2018a, b; Andreeva and Garanina, 2016; Ozkan *et al.*, 2017; Nadeem *et al.*, 2018a, b; Kweh *et al.*, 2019; Chowdhury *et al.*, 2019). Chouaibi and Kouaib (2015) conducted a study in the manufacturing Tunisian companies using the VAIC model and revealed that both managerial ownership and ownership concentration have a positive impact on intellectual capital performance while institutional ownership has no significant effect on the VAIC.

Although the importance of intellectual capital is theoretically supported, the empirical studies show inconsistent results. Most previous studies employ the conventional VAIC model to measure the association between intellectual capital (human capital, structural capital and capital employed efficiencies) and financial performance (return on asset, return on equity, asset turnover, price to book value). Table 1 shows the results of studies trying to investigate the association between intellectual capital and financial performance.

Those inconsistent results in intellectual capital studies could be due to unclear measurements. Some critics on the conventional VAIC model have been stated by some scholars (Maji and Goswami, 2017; Nadeem *et al.*, 2018b; Vishnu and Gupta, 2014). One of the attempts to reconstruct the VAIC model was proposed by Nadeem *et al.* (2018b), called the adjusted *Value-Added Intellectual Coefficient* (A-VAIC) model. The essence of the VAIC reconstruction model into the A-VAIC model lies in one of the intellectual capital components namely structural capital which is replaced with innovation capital calculated from the R&D.

This study employed both the VAIC and the A-VAIC models. The A-VAIC model is a model adjustment developed by Nadeem *et al.* (2018b). Pulic (2004) mentioned that the calculation of value added is based on two types of capital, namely physical capital and intellectual capital. In some studies, the VAIC model has been criticized, especially in measuring structural capital using value added minus human capital (Stahle *et al.*, 2011; Vishnu and Gupta, 2014; Nimtrakoon, 2015; Maji and Goswami, 2017). In their study, Nadeem *et al.* (2018b) claimed that the A-VAIC model provides more consistent results than those of the VAIC model.

Structural capital as a component of intellectual capital relates to the unique production process. Mehralian *et al.* (2013) mentioned that copyrights and R&D are important factors for a firm in utilizing employees' knowledge. R&D investment is the main source of innovation. Baklouti *et al.* (2010) explained that R&D investment plays a critical role in improving productivity and profitability of a firm. Choong (2008) and Nadeem *et al.* (2018a) also mentioned that structural capital is a capital of innovation.

Scholar(s)	IC element	Financial performance ROA	ROE	ATO	PBV
1. Vishnu and Gupta (2014)	Human Capital	NS	-	-	-
	Structural Capital	S	-	-	-
	Capital Employed	S	-	-	-
2. Nimtrakoon (2015)	Human Capital	S	NS	S	S
	Structural Capital	NS	NS	NS	NS
	Capital Employed	S	S	S	S
3. Ousama and Fatima (2015)	Human Capital	NS	S	S	S
	Structural Capital	NS	S	S	S
	Capital Employed	S	S	S	S
4. Dzenopoljac *et al.* (2016)	Human Capital	S	NS	NS	-
	Structural Capital	S	NS	NS	-
	Capital Employed	S	S	S	-
5. Sidharta and Affandi (2016)	Human Capital	S	S	-	-
	Structural Capital	S	S	-	-
6. Maji and Goswami (2017)	Human Capital	S	S	S	S
	Structural Capital	S	S	S	S
	Capital Employed	S	S	S	S
7. Nawaz and Hanifah (2017)	Human Capital	S	S	-	-
	Structural Capital	NS	NS	-	-
	Capital Employed	S	S	-	-
8. Razafindrambinina and Anggreni (2017)	Human Capital	NS	-	NS	-
	Structural Capital	S	-	S	-
	Capital Employed	S	-	S	-
9. Dzenopoljac *et al.* (2017)	Human Capital	NS	S	-	-
	Structural Capital	S	NS	-	-
	Capital Employed	S	S	-	-
10. Mohammad *et al.* (2018)	Human Capital	NS	-	-	-
	Structural Capital	NS	-	-	-
	Capital Employed	S	-	-	-
11. Nadeem *et al.* (2018a)	Human Capital	S	S	S	S
	Structural Capital	S	S	S	S
	Capital Employed	S	S	S	S
12. Nadeem *et al.* (2018b)	Human Capital	S	S	S	S
	Structural Capital	S	S	S	S
	Capital Employed	S	S	S	S
13. Ozkan *et al.* (2017)	Human Capital	S	-	-	-
	Structural Capital	NS	-	-	-
	Capital Employed	S	-	-	-
14. Bayraktaroglu *et al.* (2019) VAIC Model	Human Capital	S	S	NS	-
	Structural Capital	S	NS	NS	-
	Capital Employed	S	NS	S	-
15. Bayraktaroglu *et al.* (2019) Extended VAIC Model	Human Capital	S	NS	NS	-
	Structural Capital	S	S	NS	-
	Capital Employed	NS	NS	S	-
	Innovation Capital	NS	NS	S	

(*continued*)

Table 1.
Map of previous studies

Scholar(s)	IC element	Financial performance ROA	ROE	ATO	PBV
16. Smriti and Das (2018)	Human Capital	NS	-	S	-
	Structural Capital	NS	-	S	-
	Capital Employed	S	-	S	-
17. Wang *et al.* (2018)	Human Capital	S	-	-	-
	Structural Capital	S	-	-	-
	Relational Employed	S	-	-	-
18. Chowdhury *et al.* (2019)	Human Capital	S	NS	NS	-
	Structural Capital	NS	NS	NS	-
	Capital Employed	NS	NS	S	-
19. Kweh *et al.* (2019)	Human Capital	S	-	-	-
	Structural Capital	NS	-	-	-
	Capital Employed	S	-	-	-

Note(s): ROA: Return on Asset; ROE: Return on Equity; ATO: Asset Turnover; PBV: Price to Book Value; NS: Not Supported; S: Supported

Table 1.

This study continues the works of previous scholars, especially Pulic (1998) and Nadeem *et al.* (2018a). Following Nadeem *et al.* (2018a), structural capital of the VAIC model in this study is also replaced by innovation for the reason that R&D investment is the main source of innovation. Therefore, R&D expense is the measure of innovation capital. This justification is also supported by some previous studies (Vishnu and Gupta, 2014; Maji and Goswami, 2017; Nimtrakoon, 2015) which also replace structural capital by the cost of R&D. Organizations that disclose high-quality intellectual capital have better prospects for innovation, R&D improvements and strategic investment management (Carayannis *et al.*, 2014; Murray *et al.*, 2016).

This study is different from the previous studies in term of the following aspects. Firstly, the topic of this study is rarely conducted. It compares the two models, namely the VAIC model of Pulic (1998) and the A-VAIC model by Nadeem *et al.* (2018a) as an important effort in seeking the better way to measure intellectual capital and its relationship with financial performance. Secondly, because of the inconsistent results in previous studies, this study provides more justifications that further studies are still needed regarding on how to measure intellectual capital using secondary or capital market data. Finally, this study provides an empirical evidence in intellectual capital theory and literature in Indonesia as an emerging economy, specifically in the banking industry. A new data set has been established for this study. The Indonesian banking industry is chosen because it has been facing tough challenges from global players and it is one of the most intensive sectors in using intellectual capital.

Literature review and hypotheses development

The resource-based view (RBV) states that a firm's performance is driven by the unique resources owned by a firm, both tangible and intangible resources. However, a firm in the knowledge economy era is demanded to pay more attention to intangible resources. A firm must prioritize the use of internal resources to achieve its business success (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993; Lonial and Carter, 2015; Onkelinx *et al.*, 2016; Jogaratnam, 2017). Internal resources must be properly managed so that they become valuable, scarce, difficult to imitate and nonsubstitutable resources (Barney, 1991; Kristandl and Bontis, 2007; Onkelinx *et al.*, 2016; Chabowski and Mena, 2017; Jogaratnam, 2017). These resources will produce optimal product market activities, products that are more economical

and more satisfying consumer needs (Wernerfelt, 1984; Peteraf, 1993). Different strategies that cannot be duplicated by competitors make a firm and have sustainable competitive advantages (Barney, 1991; Newbert, 2008; Chabowski and Mena, 2017).

Cheng *et al.* (2010) explained that in order to develop a competitive advantage, a firm must own and develop superior resources and capabilities exceeding those of its competitors. Resources in the form of tangible assets, such as land and building, are relatively easy to obtain and replicate. However, intangible asset, such as intellectual capital, is more difficult to build. Intellectual capital is an intangible asset that is relatively difficult to measure (Kweh *et al.*, 2019). In the era of knowledge-based economy, a firm is demanded to utilize intangible assets in order to win competition. A firm must build intangible assets in the form of intellectual capital as a superior resource which can produce superior financial performance. Intellectual capital as one of the unique and superior resources cannot be easily replaced, and therefore it is a source of competitive advantage. Intangible assets are often referred to as organizational knowledge-based intellectual capital which is a source of competitive advantage (Dzenopoljac *et al.*, 2017; Osinski *et al.*, 2017; Kweh *et al.*, 2019). Intellectual capital will improve a firm's performance when it is managed properly. Some studies by previous scholars (Brennan, 2001; Inkinen, 2015; Scafarto *et al.*, 2016; Maju and Goswami, 2017; Dzenopoljac *et al.*, 2017; Hamdan, 2018; Smriti and Das, 2018; Chowdhury *et al.*, 2019) stated that the level of intellectual capital will affect a firm's performance, including employee productivity, increased employee skills and increased profit. The firms also need to disclose intellectual capital information because the omission of such disclosure may adversely influence the quality of decisions made by shareholders or lead to material misstatements (Bhasin, 2011). Therefore, the better the quality of intellectual capital within a firm, the more efficient the use of the firm's capital (Appuhami, 2007). The efficient use of capital shows that resources have been properly managed to generate value.

Intellectual capital is the result of human knowledge. It has an important role in the strategy execution to gain a competitive advantage in business competition and to improve performance. Steward (1997) stated that intellectual capital is intellectual material-knowledge, information, intellectual property and experience that can be used to improve performance and to create wealth. Sherif and Elsayed (2016) also stated that intellectual capital is an important factor in supporting the firm's performance. Intellectual capital as an intangible asset should be effectively and efficiently managed to compete and to generate a better performance. Khalique *et al.* (2015) stated that in the contemporary knowledge-based economy, intellectual capital is gradually gaining more importance as a critical strategic asset. Some scholars (Pulic 1998, 2004; Komnenic and Pokrajcic, 2012; Vishnu and Gupta, 2014; Ousama and Fatima, 2015; Dumay, 2016; Cleary and Quinn, 2016; Osinski *et al.*, 2017; Kweh *et al.*, 2019; Chowdhury *et al.*, 2019) also mentioned that intellectual capital is not just knowledge, it consists of human, organizational or structural and relational capitals.

Profitability is commonly used to measure the success of financial performance because it provides an overview of operating results. Profitability shows profit earned by a firm in carrying out its activities, describing the extent to which the firm can manage its business. Profitability ratios, such as return on asset and return on equity, are commonly used to measure a firm's financial performance. Return on asset measures the company's ability to gain profit on assets over a certain period. Return on equity represents a return to a common shareholder and is generally regarded as one of the most important financial indicators for investors.

Human capital as an individual knowledge is represented by employees. Structural capital as the knowledge in the organization includes databases, organizational processes, strategies and any activities that are higher than the material value. Customer capital or relational capital is a knowledge that relates to external parties of the company, such as customers. Capital employed is a form of the company's efforts and capabilities to manage resources in

the form of a capital asset. Pulic (2004) stated that one unit of capital employed can generate a greater return on a company.

Intellectual capital increases the value for a firm. The greater the value of intellectual capital, the more efficient use of capital (Appuhami, 2007). The efficient use of capital shows that the resources have been properly managed. Furthermore, it will enhance profit and overall performance. Some studies (Firer and Williams, 2003; Nimtrakoon, 2015; Sidharta and Affandi, 2016; Nadeem *et al.*, 2018a; Maji and Goswami, 2017; Bayraktaroglu *et al.*, 2019; Smriti and Das, 2018; Wang *et al.*, 2018; Kweh *et al.*, 2019; Chowdhury *et al.*, 2019) revealed that intellectual capital has an effect on performance measured by return on assets. While other studies (Chen *et al.*, 2005; Komnenic and Pokrajcic, 2012; Yu *et al.*, 2010; Ousama and Fatima, 2015; Maji and Goswami, 2017; Nadeem *et al.*, 2018a) showed that intellectual capital consisting of human capital, structural capital and customer employed have an effect on return on equity as well as on asset turnover and price to book value.

Human capital helps a firm to capitalize opportunities as well as to reduce market threats. Brennan (2001) showed that the level of intellectual capital will affect the firm's performance, including employee productivity, increased employee skills and increased corporate profits. Studies of Nimtrakoon (2015); Sidharta and Affandi (2016); Nadeem *et al.*, (2018a); Maji and Goswami (2017); Bayraktaroglu *et al.*, 2019; Wang *et al.* (2018); Kweh *et al.* (2019); Chowdhury *et al.* (2019) showed that human capital has a positive association with return on asset. This means that the higher profitability is the product of the higher quality of human capital. However, other studies (Vishnu and Gupta, 2014; Ousama and Fatima, 2015; Dzenopoljac *et al.*, 2016, 2017; Razafindrambinina and Anggreni, 2017; Mohammad *et al.*, 2018; Smriti and Das, 2018) revealed that human capital has no relation to return on asset.

Some studies (Chen *et al.*, 2005; Komnenic and Pokrajcic, 2012; Yu *et al.*, 2010; Ousama and Fatima, 2015; Maji and Goswami, 2017; Nadeem *et al.*, 2018a) revealed that intellectual capital consisting of human capital, structural capital and capital employed associate with performance as measured by return on equity. A study by Dzenopoljac *et al.* (2016) showed that human capital and structural capital have no effect on return on equity as well as asset turnover, but capital employed affects return on equity and asset turnover. Chowdhury *et al.* (2019) showed that human capital, structural capital and capital employed have no effect on return on equity. Meanwhile, a study by Razafindrambinina and Anggreni (2017) showed that there is no effect of human capital on asset turnover, but structural capital and capital employed have affected asset turnover. According to Yu *et al.* (2010); Nadeem *et al.* (2018b), and Nadeem *et al.* (2018a), intellectual capital consisting of human capital, structural capital and capital employed affect financial performance as measured by price to book value. Firer dan Williams (2003) showed that human capital has no effect on price to book value.

Structural capital includes rare and unique resources. Each firm has its unique organizational culture, management philosophy and operating system that differs from other firms. If the management ignores the unique characteristics that drive value, this will result in reduced value of the firm and will affect revenue and profitability. Festa *et al.* (2017) proposed blended methods to evaluate a component of structural capital, namely the information technology service management in order to communicate better with stakeholders in relation to its value. Some studies (Bontis *et al.*, 2000; Firer and Williams, 2003; Chen *et al.*, 2005; Ting and Lean, 2009; Maji and Goswami, 2017; Razafindrambinina and Anggreni, 2017; Nadeem *et al.*, 2018a) showed that structural capital relates to a firm's profitability measured by return on asset. However, the studies by other scholars (Ousama and Fatima, 2015; Nimtrakoon, 2015; Dzenopoljac *et al.*, 2016; Nawaz and Haniffa, 2017; Ozkan *et al.*, 2017; Smriti and Das, 2018; Kweh *et al.*, 2019; Chowdhury *et al.*, 2019) revealed that structural capital has no effect on return on asset.

Capital employed can increase return on asset because it contributes to the ability to generate revenue. Efficient capital employed will drive revenue and affect increased return on

asset. Some studies (Nimtrakoon, 2015; Sidharta and Affandi, 2016; Ozkan *et al.*, 2017; Qusama and Fatima, 2015; Nawaz and Haniffa, 2017; Nadeem *et al.*, 2018a; Bayraktaroglu *et al.*, 2019; Smriti and Das, 2018; Wang *et al.*, 2018; Kweh *et al.*, 2019) proved that capital employed has an effect on profitability measured by return on asset and return on equity. It has also an effect on asset turnover and price to book value (Nadeem *et al.*, 2018a).

A study by Nadeem *et al.* (2018a) showed that intellectual capital consisting of human capital, innovation capital and capital employed has a positive relationship with financial performance measured by return on equity, return on equity, asset turnover and price to book value. In contrast, a study by Vishnu and Gupta (2014) and Bayraktaroglu *et al.*, 2019 showed that innovation capital as measured by R&D has no effect on return on asset.

This study supports the argument that intellectual capital (human capital, structural capital, capital employed) affects financial performance (return on assets, return on equity, asset turnover, price to book value). Therefore, the following hypotheses are proposed:

VAIC model

H1. Human capital efficiency, structural capital efficiency, capital employed efficiency are associated with financial performance (return on asset).

H1a. Human capital efficiency is associated with return on asset.

H1b. Structural capital efficiency is associated with return on asset.

H1c. Capital employed efficiency is associated with return on asset.

H2. Human capital efficiency, structural capital efficiency, capital employed efficiency are associated with financial performance (return on equity).

H2a. Human capital efficiency is associated with return on equity.

H2b. Structural capital efficiency is associated with return on equity.

H2c. Capital employed efficiency is associated with return on equity.

H3. Human capital efficiency, structural capital efficiency, capital employed efficiency are associated with financial performance (asset turnover).

H3a. Human capital efficiency is associated with asset turnover.

H3b. Structural capital efficiency is associated with asset turnover.

H3c. Capital employed efficiency is associated with asset turnover.

H4. Human capital efficiency, structural capital efficiency, capital employed efficiency are associated with financial performance (price to book value).

H4a. Human capital efficiency is associated with price to book value.

H4b. Structural capital efficiency is associated with price to book value.

H4c. Capital employed efficiency is associated with price to book value.

A-VAIC model

H5. Human capital efficiency, innovation capital efficiency, capital employed efficiency are associated with financial performance (return on asset).

H5a. Human capital efficiency is associated with return on asset.

H5b. Innovation capital efficiency is associated with return on asset.

H5c. Capital employed efficiency is associated with return on asset.

H6. Human capital efficiency, innovation capital efficiency, capital employed efficiency are associated with financial performance (return on equity).

H6a. Human capital efficiency is associated with return on equity.

H6b. Innovation capital efficiency is associated with return on equity.

H6c. Capital employed efficiency is associated with return on equity.

H7. Human capital efficiency, innovation capital efficiency, capital employed efficiency are associated with financial performance (asset turnover).

H7a. Human capital efficiency is associated with asset turnover.

H7b. Innovation capital efficiency is associated with asset turnover.

H7c. Capital employed efficiency is associated with asset turnover.

H8. Human capital efficiency, innovation capital efficiency, capital employed efficiency are associated with financial performance (price to book value).

H8a. Human capital efficiency is associated with price to book value.

H8b. Innovation capital efficiency is associated with price to book value.

H8c. Capital employed efficiency is associated with price to book value.

Phusavat *et al.* (2012) mentioned that intellectual capital has an association with the economic development of a country indicated by the GDP per capita. Choong (2008) also stated that intellectual capital relates to investments in R&D, human capital, copyrights and brand names. The structural capital refers to the unique production processes, copyright and R&D results that can help employees to utilize their knowledge (Mehralian *et al.*, 2013). Both Choong (2008) and Nadeem *et al.* (2018b) stated that structural capital as a capital of innovation. In this study, the component of intellectual capital namely structural capital on the VAIC model of Pulic (2004) will be replaced by innovation. This argument is supported by previous studies (Vishnu and Gupta, 2014; Nimtrakoon, 2015; Bayraktaroglu *et al.*, 2019) that replace structural capital by R&D. Nadeem *et al.* (2018b) mentioned that the use of R&D as a measure of structural capital has two advantages. First, investments can directly represent structural capital. Therefore, the adjusted VAIC model includes structural capital. Different from the VAIC model of Pulic (2004), structural capital is the difference between value added and human capital. Second, the use of R&D expenditure and the copyright investments cope with the superimposition of value added and human capital.

Data and methodology

Data collection

This study employed a secondary data source in the form of annual reports of banking firms that were accessed from www.idx.co.id. The population was the banking firms listed on the Indonesia Stock Exchange (IDX). The samples derived from annual reports published by the banking firms in the period of 2012–2017. This study employed the purposive sampling method as presented in Table 2.

Research method

The VAIC model

The VAIC is a comprehensive measure of intellectual capital based on the VAIC™ model of Pulic (2004). Value added is a value that is obtained by calculating the difference between the firm's output and input. The first phase is calculating value added (VA) using the following formula:

$$VA = OP + EC + D + A$$

Value added (VA) is the sum of operating profit (OP), employee costs (EC), depreciation (D) and amortization (A). The second phase is calculating the VAIC which consists of intellectual capital efficiency (ICE) and capital employed efficiency (CEE):

$$VAIC = ICE + CEE$$

Intellectual capital efficiency (ICE) is the sum of the human capital efficiency (HCE) and the structural capital efficiency (SCE).

$$ICE = HCE + SCE$$

Then, intellectual capital components are calculated using the following formula:

$$HCE = VA/HC$$

$$SCE = SC/VA$$

$$CEE = VA/CE$$

$$VAIC = HCE + SCE + CEE$$

HCE is the ratio of VA/HC. HC (human capital) is represented by total salaries and wages. SCE is the ratio of SC/VA. SC (structural capital) is the difference of (VA − HC). CEE is the ratio of VA/CE. CE is the book value of total assets. The VAIC represents an intellectual capital coefficient of value added.

Dependent variables in this study consist of ROA (return on asset) calculated by earning after tax/total assets, ROE (return on equity) calculated by earning after tax/total equity, ATO (asset turnover) calculated by total sales/total assets and PBV (price-to-book value ratio) calculated by value of market price/book value. Independent variables consist of the VAIC components, namely HCE, SCE and CEE. Control variables in this study consist of leverage calculated by total debt/total assets, firm size calculated by the natural log of total assets and firm age calculated by firm's age.

Referring to the conventional VAIC model of Pulic (2004), the regression equations are formulated as follows:

Description	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Total
Number of banking firms listed on the Indonesia Stock Exchange	31	35	39	41	43	46	235
Financial statements that do not provide complete information	(7)	(11)	(15)	(25)	(31)	(33)	(122)
Total of research samples							*114*

Table 2.
Sampling Procedure

Model 1:

$$ROA = \beta 0 + \beta 1\,HCE + \beta 2\,SCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 2:

$$ROE = \beta 0 + \beta 1\,HCE + \beta 2\,SCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 3:

$$ATO = \beta 0 + \beta 1\,HCE + \beta 2\,SCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 4:

$$PBV = \beta 0 + \beta 1\,HCE + \beta 2\,SCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

The A-VAIC model

The adjusted VAIC (A-VAIC) model of Nadeem *et al.* (2018a) has different independent variables of intellectual capital components, namely HCE, innovation capital efficiency (INVCE) and CEE. The first phase is calculating VA using the following formula:

$$VA = NI + LC + I + T + DP + R\&D$$

The VA is the sum of net income (NI), labor cost (LC), interest (I), taxes (T), depreciation and amortization (DP), research and development (R&D). The intellectual capital component is calculated using the following formula:

$$HCE = VA/HC$$

$$INVCE = VA/INVC$$

$$CEE = VA/CE$$

$$A - VAIC = HCE + INVCE + CEE$$

HCE is the ratio of VA/HC derived from total salaries and wages. INVCE is the ratio of VA/INVC. Innovation capital (INVC) is represented by R&D investment and copyrights. CEE is the ratio of VA/CE and CE is the book value of total assets. The A-VAIC is a modification of the VAIC (Nadeem *et al.*, 2018a; Vishnu and Gupta, 2014). Referring the A-VAIC model of Nadeem *et al.* (2018a), the regression equations of this study are as follows:

Model 1:

$$ROA = \beta 0 + \beta 1\,HCE + \beta 2\,INVCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 2:

$$ROE = \beta 0 + \beta 1\,HCE + \beta 2\,INVCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 3:

$$ATO = \beta 0 + \beta 1\,HCE + \beta 2\,INVCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Model 4:

$$PBV = \beta 0 + \beta 1\,HCE + \beta 2\,INVCE + \beta 3\,CEE + \beta 4\,LEV + \beta 5\,SIZE + \beta 6\,AGE + \varepsilon$$

Results and discussions

Descriptive statistics

Table 3 presents the results of the descriptive statistics regarding the variables of this study, namely HCE, SCE, INVCE, CEE, ROA, ROE, ATO, leverage, firm size and firm age. The results showed that ROA has the mean value of 0.012333 with the standard deviation of 0.0059191 meaning that the banking firms' ROA has a small variation. The ROE has the mean value of 0.101539 with the standard deviation of 0.0507701 meaning that the banking firms' return on equity has a small variation. The ATO has the mean value of 0.095689 with the standard deviation value of 0.0186571 meaning that the banking firms' ATO has a small variation. The ratio of PBV has the mean value of 1.363772 with the standard deviation of 0.9753687 meaning that the banking firms' PBV ratio has a bigger variation.

Table 3 also showed that HCE) has the mean value of 2.331978 with the standard deviation is 0.7858183 meaning that the banking firms' HCE has a bigger variation. The SCE has the mean value of 0.538965 with the standard deviation of 0.1157517 meaning that the banking firms' SCE has a smaller variation. The INVCE has an average value of 57.30082 and a standard deviation of 30.463977 meaning that the banking firms' INVCE has a smaller variation.

Multiple regression analysis

The multiple linear regression analysis was employed to determine the effect of HCE, SCE, CEE to the firm's financial performance proxied by ROA, ROE, ATO and PBV ratio on banking firms in the Indonesia Stock Exchange. The results of the hypotheses test are shown in Table 4 as follows:

Table 5 showed that in the VAIC model, HCE does not affect ROA. Thus, the hypothesis 1a (H1a) is not supported. This provides an empirical evidence that according to the VAIC model, human capital has not yet been optimally managed in the Indonesian banking firms to generate profit. As mentioned by Firrer and William (2003), the banking firms tend to use physical capital rather than intangible assets, such as human capital. Although the banking firms innovate in the service system, it still uses many operating tools. The development of human capital is still considered as a burden by the banking firms. This result is also in line with some studies of previous scholars (Vishnu and Gupta, 2014; Ousama and Fatima, 2015;

Variables	VAIC (Pulic, 2004) Mean	SD	A-VAIC (Nadeem, 2018) Mean	SD
Dependent variables				
ROA	0.012333	0.0059191	0.012333	0.0059188
ROE	0.101539	0.0507701	0.101540	0.0507694
ATO	0.095689	0.0186542	0.095689	0.0186541
PBV	1.363772	0.9753687	1.363772	0.9753687
Independent variables				
HCE	2.331978	0.7858183	2.381049	0.7867288
SCE	*0.538965*	*0.1157517*	-	-
INVCE	-	-	*57.30082*	*30.463945*
CEE	0.033085	0.0116410	0.033814	0.0118784
Control variables				
LEV	0.865027	0.0410727	0.865027	0.0410722
SIZE	19.50619	3.3123614	19.50619	3.3123649
AGE	40.39	16.711	40.39	16.711

Table 3.
Descriptive statistics

Variable dependent	ROA	ROE	ATO	PBV
VAIC Model				
HCE	−0.031 (*0.537*)*ns*	−0.075 (*0.101*)*ns*	−0.445 (0.001)***	0.719 (0.000)***
SCE	0.487 (0.000)***	0.561 (0.000)***	−0.049 (*0.727*)*ns*	−0.259 (*0.119*)*ns*
CEE	0.733 (0.000)***	0.548 (0.000)***	0.571 (0.000)***	0.288 (0.004)**
LEV	0.059 (0.033)**	0.510 (0.000)***	−0.042 (*0.571*)*ns*	0.126 (*0.159*)*ns*
SIZE	0.028 (*0.269*)*ns*	−0.025 (*0.576*)*ns*	0.029 (*0.673*)*ns*	−0.095 (*0.240*)*ns*
AGE	−0.106 (0.000)***	−0.178 (0.000)***	0.039 (*0.574*)*ns*	−0.196 (0.019)**
A-VAIC Model				
HCE	0.340 (0.000)***	0.423 (0.000)***	−0.532 (0.000)***	0.388 (0.000)***
INVCE	0.102 (0.009)***	−0.044 (*0.473*)*ns*	0.106 (*0.194*)*ns*	−0.102 (*0.300*)*ns*
CEE	0.867 (0.000)***	0.695 (0.000)***	0.573 (0.000)***	0.326 (0.000)***
LEV	0.130 (0.001)***	0.570 (0.000)***	−0.031 (*0.669*)*ns*	0.122 (*0.178*)*ns*
SIZE	0.048 (*0.171*)*ns*	0.024 (*0.649*)*ns*	0.011 (*0.875*)*ns*	−0.081 (*0.337*)*ns*
AGE	−0.119 (0.001)***	−0.188 (0.000)***	0.044 (*0.523*)*ns*	−0.243 (0.004)**

Table 4.
Results of multiple regression analysis

Note(s): ***: statistically significant at the level <0.01; ** : statistically significant at the level <0.05; ns : not significant

Hypothesis	Statement	Decision
H1a (VAIC)	Human capital efficiency is associated with return on asset	Not Supported
H5a (A-VAIC)	Human capital efficiency is associated with return on asset	Supported

Table 5.
Human capital efficiency and return on asset

Dzenopoljac *et al.*, 2016, 2017; Razafindrambinina and Anggreni, 2017; Mohammad *et al.*, 2018; Smriti and Das, 2018) revealing that human capital did not relate to ROA.

In the contrary, the A-VAIC model in this study shows that HCE affects ROA of the banking companies in Indonesia. Thus, hypothesis 5a (H5a) is supported. In the knowledge-based economy, human capital is expected to create efficient processes and new products or services. The existence of such efficiency will decrease operating costs, then it will increase profit. The result of the A-VAIC model in this study provides an empirical evidence that is in line with the human capital theory. In 2011, there were big changes in human resource development policies in the Indonesian banking industry, especially in the five biggest banks, such as Bank Rakyat Indonesia, Bank Mandiri, Bank Central Asia, Bank Negara Indonesia and Bank Tabungan Negara (https://keuangan.kontan.co.id/). As a result, in 2019, the Indonesia Financial Service Authority stated that banking net profit in the third quarter of 2019 reached Rp 117.59 trillion, up 6.6% compared to the same period last year of Rp 110.26 trillion (Agustiyanti, 2019). This confirms that the finding of the A-VAIC model is in line with the human capital theory.

In conclusion, the inconsistent results between the VAIC model and the A-VAIC model justify the need for further studies in measurements. The A-VAIC model seems to provide a

Hypothesis	Statement	Decision
H1b (VAIC)	Structural capital efficiency is associated with return on asset	Supported
H5b (A-VAIC)	Innovation capital efficiency is associated with return on asset	Supported

Table 6.
Structural capital efficiency and return on asset

better result as suggested by the intellectual capital theory stating that the higher the quality of human capital, the higher the financial performance of a firm.

Table 6 revealed that both the VAIC model and the A-VAIC model demonstrate the effect of SCE on ROA. Thus, both hypotheses 1b (H1b) and 5b (H5b) are supported. This finding empirically proves that a good structural capital management in the Indonesian banking firms enhances profitability. Bontis *et al.* (2000) mentioned that structural capital such as the organizational structure, organizational capacity to reach markets, hardware, software and all capabilities within the organization supports employees to improve productivity and to enhance profitability. This study also empirically proves that structural capital in the form of innovation generates higher profitability as suggested by the organizational and innovation theories. The more a firm invest in R&D to enhance innovation, the higher the profit that will be gained in the future.

As stated by the resource-based theory, innovation capital must meet the criteria of valuable, rare, inimitable and nonsubstitutable. If the firm ignores those characteristics, innovations will not optimally generate more profit. This study does not support a study by Vishnu and Gupta (2014) and Bayraktaroglu *et al.* (2019) showing that innovation capital in the form of R&D does not affect financial performance measured by ROA. However, this study supports the study of Nadeem *et al.* (2018a) revealing that a new measurement for structural capital is needed and it is proven that INVCE affects profitability. In conclusion, both the VAIC model and the A-VAIC model provide an evidence that is in line with the innovation theory.

Table 7 showed that both the VAIC model and the A-VAIC model demonstrate the effect of CEE on ROA. Thus, both hypotheses 1c (H1b) and 5c (H5b) are supported. This result empirically proves that the banking firms in Indonesia have a good capital management contributing to the firms' profitability. A good capital management will improve the firms' performance (Pulic, 2004). This study demonstrates that the better the use of capital employed, the higher the profit earned by the firm as suggested by the financial theory. If the capital asset is properly managed, then it will improve profitability. The utilization of capital employed is better if it produces a higher return from each unit of capital employed. This study is in line with some studies of the previous scholars (Chen *et al.*, 2005; Yu *et al.*, 2010; Nimtrakoon, 2015; Ousama and Fatima, 2015; Dzenopoljac *et al.*, 2016, 2017; Ozkan *et al.*, 2017; Nawaz and Haniffa, 2017; Bayraktaroglu *et al.*, 2019; Smriti and Das, 2018; Wang *et al.*, 2018; Kweh *et al.*, 2019). In conclusion, both the VAIC model and the A-VAIC model provide an evidence that is in line with the financial theory.

Table 8 showed that in the VAIC model, HCE does not affect ROE. Thus, the hypothesis 2a (H2a) is not supported. This result reveals that the stockholders do not have a sufficient guarantee from the human capital of the firms that they will get a proper return for their investment. This result is in line with the study of Chowdhury *et al.* (2019). In the contrary, the A-VAIC model shows that HCE affects ROE of the banking companies in Indonesia. Thus, hypothesis 6a (H6a) is supported and this means that the higher the HCE, the higher the profit available for the investors. ROE is an indicator of profitability in the form of return on ordinary shares. The result of the A-VAIC model in this study is in line with the human capital theory and supports several studies of the previous scholars (Yu *et al.*, 2010; Ousama and Fatima, 2015; Nadeem *et al.*, 2018a) suggesting that HCE has a positive relationship with ROE. In conclusion,

Table 7. Capital employed efficiency and return on asset

Hypothesis	Statement	Decision
H1c (VAIC)	Capital employed efficiency is associated with return on asset	Supported
H5c (A-VAIC)	Capital employed efficiency is associated with return on asset	Supported

this inconsistent results of the VAIC and the A-VAIC deserve for further studies. The A-VAIC model seems to provide an evidence that is in line with the human capital theory.

Table 9 showed that the VAIC model produces different result from that of the A-VAIC model. In the VAIC model, SCE affects ROE. Thus, the hypothesis 2b (H2b) is supported. A good structural capital management should generate wealth for the investors who provide capital to the firms. SCE generates the maximum capital gains for capital owners. This results is in line with some studies of previous scholars (Yu *et al.*, 2010; Ousama and Fatima, 2015; Nadeem *et al.*, 2018a) suggesting that SCE has a positive effect to ROE. In the contrary, the A-VAIC model reveals that INVCE has no effect on ROE of the Indonesian banking firms. This study fails to prove that innovation capital management will produce more wealth for capital owners. The lack of R&D investment in the Indonesian banking industry might be one of the reasons. This result does not support the study of Nadeem *et al.* (2018a) and Bayraktaroglu *et al.* (2019), showing that INVCE has a positive relationship to ROE. In conclusion, this inconsistent results of the VAIC and the A-VAIC justify for further studies. In conclusion, the VAIC model provides an evidence that is in line with the innovation theory.

Table 10 showed that both the VAIC and the A-VAIC have the same result proving that CEE affects ROE of the Indonesian banking firms. Thus, both hypotheses 2c (H2c) and 6c (H6c) are supported. The firm's performance measured by ROE indicates the efficiency in generating profit from each dollar of shareholders' investment. This result supports some studies of the previous scholars (Yu *et al.*, 2010; Ousama and Fatima, 2015; Dzenopoljac *et al.*, 2016, 2017; Nadeem *et al.*, 2018a) proving that the HCE, the higher the ROE obtained by the firm as suggested by the financial theory. In conclusion, both the VAIC model and the A-VAIC model provide an evidence that is in line with the financial theory.

Table 11 showed that both the VAIC and the A-VAIC prove the effect of HCE on ATO. Thus, both hypotheses 3a (H3a) and 7a (H7a) are supported. This result provides an empirical evidence that the increasing HCE will enhance the revenue generating productivity of the Indonesian banking firms. SO reveals the productivity in utilizing assets to generate revenues. In conclusion, the result is in line with the financial theory and supports some studies of the previous scholars (Firer and Williams, 2003; Komnenic dan Pokrajcic, 2012; Nadeem *et al.*, 2018a; Smriti and Das, 2018) showing that HCE affects ATO.

Table 12 showed that the VAIC model fails to prove the effect of SCE on ATO. The A-VAIC model also demonstrates the same result showing that INVCE does not affect ATO. Thus, both hypothesis 3b (H3b) and hypothesis 7b (H7b) are not supported. Smriti and Das (2018), showing that SCE has a positive relationship to ATO. This result provides an empirical evidence that the Indonesian banking firms have limitations in research and development as well as innovation, and therefore they do not affect the productivity of

Table 8.
Human capital efficiency and return on equity

Hypothesis	Statement	Decision
H2a (VAIC)	Human capital efficiency is associated with return on equity	Not Supported
H6a (A-VAIC)	Human capital efficiency is associated with return on equity	Supported

Table 9.
Structural capital efficiency and return on equity

Hypothesis	Statement	Decision
H2b (VAIC)	Structural capital efficiency is associated with return on equity	Supported
H6b (A-VAIC)	Innovation capital efficiency is associated with return on equity	Not Supported

utilizing assets to generate revenues. This result does not support the study of Nadeem *et al.* (2018) showing that INVCE affects ATO. In conclusion, in the case of the effect of SCE on ATO as well as the effect of INVCE on ATO, both models fail to provide an evidence that is in line with the innovation theory.

Table 13 showed that both the VAIC model and the A-VAIC model prove the effect of CEE on ATO. Thus, both hypotheses 3c (H3c) and 7c (H7c) are supported. This provides an empirical evidence that the Indonesian banking firms have a good capital management to generate revenue. In conclusion, the result is in line with the financial theory and supports several studies of the previous scholars (Firer and Williams, 2003; Komnenic dan Pokrajcic, 2012; Yu *et al.*, 2010; Dzenopoljac *et al.*, 2016; Razafindrambinina and Anggreni, 2017; Nadeem *et al.*, 2018a; Bayraktaroglu *et al.* (2019); and Smriti and Das, 2018) demonstrating that the higher CEE, the higher the ATO gained by the firm.

Table 14 confirmed that both the VAIC model and the A-VAIC model prove the effect of HCE on PBV. Thus, both hypotheses 4a (H4a) and 8a (H8a) are supported. This finding suggests that the higher the HCE, the higher the PBV. It also reveals that the expectation of investors regarding the stock price of the Indonesian banking firms depends on a good human capital management. This result is in line with the human capital theory and the financial theory. It also supports some studies of the previous scholars (Firer and Williams, 2003; Yu *et al.*, 2010; Nadeem *et al.*, 2018; Nadeem *et al.*, 2018a) stating that HCE affects PBV.

Table 15 demonstrated that the VAIC model fails to prove the effect of SCE on PBV. Thus, both hypotheses 4b (H4b) and 8b (H8b) are not supported. This result does not support the study of Yu *et al.* (2010) revealing that SCE affects PBV. Similarly, the A-VAIC model also fails to prove the effect of INVCE on PBV. In conclusion, this result is not in line with the

Hypothesis	Statement	Decision
H2c (VAIC)	Capital employed efficiency is associated with return on equity	Supported
H6c (A-VAIC)	Capital employed efficiency is associated with return on equity	Supported

Table 10. Capital Employed efficiency and return on equity

Hypothesis	Statement	Decision
H3a (VAIC)	Human capital efficiency is associated with asset turnover	Supported
H7a (A-VAIC)	Human capital efficiency is associated with asset turnover	Supported

Table 11. Human capital efficiency and asset turnover

Hypothesis	Statement	Decision
H3b (VAIC)	Structural capital efficiency is associated with asset turnover	Not Supported
H7b (A-VAIC)	Innovation capital efficiency is associated with asset turn over	Not Supported

Table 12. Structural capital efficiency and asset turnover

Hypothesis	Statement	Decision
H3c (VAIC)	Capital employed efficiency is associated with asset turnover	Supported
H7c (A-VAIC)	Capital employed efficiency is associated with asset turnover	Supported

Table 13. Capital employed efficiency and asset turnover

innovation theory and it does not support the previous study of Nadeem *et al.* (2018) proving that INVCE affects PBV.

Table 16 showed that both models of the VAIC and the A-VAIC prove the effect of CEE on PBV. Thus, both hypotheses 4c (H4c) and 8c (H8c) are supported. This result demonstrates that the banking firms in Indonesia are capable of managing their capital to enhance stock price. This is in line with the financial theory and it supports some studies of the previous scholars (Firer and Williams, 2003; Yu *et al.*, 2010; Nadeem *et al.*, 2018a) proving that the higher CEE, the higher the PBV.

Table 17 showed the summary of hypotheses test. Both the VAIC model and the A-VAIC model demonstrate the same results except the effect of human capital on ROA and ROE as well as the effect of structural capital and innovation capital on return on equity. These findings justify that although the effect of intellectual capital on financial performance is confirmed, the development of a more accurate measure of each element of intellectual capital is still needed in the future to generate more consistent results.

Conclusion

The knowledge-based economy has shifted the strategic role of physical assets into intangible assets. Therefore, scholars are challenged to find a new way to measure intellectual capital using financial statements. This study aims to investigate the effect of intellectual capital elements (HCE, SCE, INVCE and CEE) on financial performance measured by ROA, ROE, ATO and PBV. This study compares the conventional VAIC model of Pulic (2004) with the adjusted VAIC model by Nadeem *et al.* (2018b). The comparison of both models is important in looking for an empirical evidence regarding the effect of intellectual capital elements on financial performance in different measures, especially in a specific industry. This study is also important because the previous studies still show the inconsistent results.

The banking industry in Indonesia is chosen because of the following reasons: (1) the industry is one of the most intensive sectors employing intellectual capital; (2) the industry is struggling against foreign competitors using advanced technology (3) the industry is developing intellectual capital to face the global challenges, and (4) it is also interesting to investigate whether intellectual capital also play its role in a specific industry in an emerging

Table 14. Human capital efficiency and price to book value

Hypothesis	Statement	Decision
H4a (VAIC)	Human capital efficiency is associated with price to book value	Supported
H8a (A-VAIC)	Human capital efficiency is associated with price to book value	Supported

Table 15. Structural capital efficiency and price to book value

Hypothesis	Statement	Decision
H4b (VAIC)	Structural capital efficiency is associated with price to book value	Not Supported
H8b (A-VAIC)	Innovation capital efficiency is associated with price to book value	Not Supported

Table 16. Capital Employed efficiency and price to book value

Hypothesis	Statement	Decision
H4c (VAIC)	Capital employed efficiency is associated with price to book value	Supported
H8c (A-VAIC)	Capital employed efficiency is associated with price to book value	Supported

Model	IC element	Financial performance ROA	ROE	ATO	PBV
VAIC (Pulic, 1998)	Human Capital	*NS*	*NS*	S	S
	Structural Capital	S	S	NS	NS
	Capital Employed	S	S	S	S
	Leverage	S	S	NS	NS
	Size	NS	NS	NS	NS
	Age	S	S	NS	S
A-VAIC (Nadeem *et al.*, 2018b)	Human Capital	*S*	S	S	S
	Innovation Capital	S	*NS*	NS	NS
	Capital Employed	S	S	S	S
	Leverage	S	S	NS	NS
	Size	NS	NS	NS	NS
	Age	S	S	NS	S

Note(s): ROA: Return on Asset; ROE: Return on Equity; ATO: Asset Turnover; PBV: Price to Book Value; NS: Not Supported; S: Supported

Table 17. Summary of hypotheses test

economy country. As many as 114 data are derived from the publicly listed banks on the Indonesia Stock Exchange (IDX) for the period of 2012–2017. Employing multiple regression analysis, the results confirm that intellectual capital affects financial performance. Although not all hypotheses are supported by either the VAIC model or the A-VAIC model, this study provides a deeper and new insight on how each component of intellectual capital efficiency (human capital, structural capital, capital employed, innovation capital) relates to financial performance (ROA, ROE, ATO, PBV). Further improvements in measuring each element of intellectual capital are still needed in the future to deal with some inconsistent results.

Contribution to theory

From theoretical perspective, this study provides an empirical evidence on the intellectual capital theory and literature, especially the use of the conventional VAIC model and the adjusted VAIC model in the Indonesian banking industry as the research setting. In general, this study confirms the important role of intellectual capital on financial performance. This study also provides an additional evidence to some studies of the previous scholars as presented in Table 1. Thus, this study contributes to the development of the intellectual capital theory and literature and it can be used as the teaching material in improving competencies of managers and students regarding the important role of intellectual capital within organizations.

Contribution to practice

From practical perspective, this study bridges between theory and practice in term of providing a deeper understanding to the banking managers in Indonesia on the importance of enhancing their intellectual capital development. This study suggests that managers need to verify the roles of intellectual capital in their companies, including its measurements. In the era of knowledge-based economy, managers need to deeply understand the critical role of intellectual capital on financial performance enhancement. Thus, this study implies that the banking firms in Indonesia should properly manage the efficiency of each elements of intellectual capital consisting of human capital, structural capital, innovation capital and capital employed. Intellectual capital is proven to play a strategic role in achieving the banking financial performance and competitive advantage.

Contribution to society

As knowledge-based economy becomes a serious issue in the global competition, this study provides an awareness on how good intellectual capital of the banking firms will brings more benefits to a better life of a society. The banking firms provide financial services that are beneficial to the society. When the banking firms in Indonesia have high-quality intellectual capital, the society will get more benefits in terms of excellent financial services, reduced cost of money, innovative banking programs, resource efficiencies, economic development and quality-of-life enhancement. In conclusion, this study has the social implication to enhance the quality life of the society.

Limitations and future research

This study has the following limitations. Firstly, the sample size is relatively small and limited to publicly listed banking firms in the Indonesia Stock Exchange (IDX). Therefore, caution must be applied when using the results of this study for more general purposes. Employing a larger sample size in future studies, such as including non go public banking firms as well as banking firms in the other emerging countries in the South East Asia should be encouraged. Secondly, the difficulty in collecting the complete time series data can be another issue for a research in emerging countries. Future studies should keep building a new data set of each element of intellectual capital and developing a better way to measure it. Future studies should focus on the development of new measurements of each element of intellectual capital for the secondary data. Assessing the effect of intellectual capital on financial performance using the primary data will also be an interesting study. In addition, the future study can also expand samples by including industries that also employ extensive intellectual capital, such as manufacturing, trading, services and other financial industries. Future researchers are also encouraged to conduct similar studies in other emerging countries to investigate the effect of intellectual capital on financial performance. Notwithstanding the limitations, this study still provides additional theoretical and practical supports to a deeper understanding on intellectual capital–financial performance relationship. This study implies that managers of the banking firms in Indonesia should concern with their intellectual capital, including developing its measurements. The banking intellectual capital is proven to play a strategic role in the success of financial performance.

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